RESEARCH STUDIES SERIES

CASE STUDIES IN THE USE OF LAND-BASED AERIAL FORCES IN MARITIME OPERATIONS, 1939-1990

By

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PREFACE

This is the fourth in a series of research studies—historical works that were not published for various reasons. Yet, the material contained therein was deemed to be of enduring value to Air Force members and scholars. These were minimally edited and printed in a limited edition to reach a small audience that may find them useful. We invite readers to provide feedback to the Air Force History and Museums Program.

The author, contract historian William S. Hanable, president of Research North, based in Westport, Washington, completed the final draft manuscript two years ago, in December 1996. Through a series of case studies, spanning a period of more than fifty years, he examines in detail the development and employment of land-based air power in maritime operations. Although the emphasis is on World War II, modern examples of land-based air power, through the end of the Cold War, are also examined.

His conclusions are that historically land-based air forces seldom received priority in operations against maritime targets, nor—despite their demonstrated achievements in the crucible of battle—have the land-based forces been "optimally organized, equipped, and trained for air-sea warfare when hostilities began." Nonetheless, over the period covered in this volume, land-based air power has clearly transformed the nature of naval warfare. The influence of that change in the years ahead remains to be seen.

Jacob Neufeld, General Editor
August 1998

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CHAPTER I

INTRODUCTION

Historians have written much about naval aviation in general and carrier aviation in particular. But they have said relatively little about the role of land-based aerial forces employed in maritime operations. Proponents of various air doctrines have acknowledged, discussed, and even trumpeted that usage since Louis Blériot flew across the English Channel in 1909. Long overdue for synthesis and historical analysis, it is the subject of this book.

Many factors affected maritime applications of land-based aerial forces between the first air war that began in 1914 and the world's last major conflict, the Gulf War, that ended in 1991. They included inter-service rivalry, evolving doctrine, aircrew skills, available aircraft and related technology, operational requirements, and the nature of targets. The beliefs and concerns of strong personalities also played an important role. The case studies in this book address each of these influences as they affected the employment of land-based aircraft in maritime operations. Understanding them is important. Certainly, between 1918 and the present, as events unfolded the threat or application of land-based air power has to some degree influenced nearly every naval plan and action.

Land-based aerial forces for the purpose of these case studies are defined as heavier-than-air and lighter-than-air craft operating from land bases. They include amphibian planes, float planes, and flying boats (each sometimes called sea planes) operating from shore bases. They do not include aircraft on wheels or skids launched from vessels, or sea planes operating with tender support. In many of the case studies presented, however, land and sea-based aerial forces cooperated and, in certain cases, it is not always possible to entirely segregate one from the other.

These case studies also treat numerous issues common to the employment of land-based aerial forces in maritime operations. World War II campaigns include the Battle of the Atlantic (1939-1943); European Coastal and Mediterranean Operations (1940-1943); North Pacific Operations (1942-1945); and Southwest Pacific Operations (1941-1945). Post World War II case studies presented include operations in the Falklands War (1982); the Iran-Iraq War (1980-1988), and the Cold War (1947-1991).

The Battle of the Atlantic may be the most significant instance of land-based air power applied to maritime operations. These aircraft became a vital element protecting convoys between North America and Britain that ensured Britain continued in the war. Strictly interpreted, Arctic convoys were not a part of the Battle of the Atlantic. I have included them in this section because of the impact the Arctic convoys destined for the Soviet Union had on resources allocated to the Battle of the Atlantic.

Allied and Axis air power disrupted Mediterranean naval operations and supply convoys. It interdicted supply convoys and hampered operations of naval combatants. Axis air power in Europe, which was entirely land-based, attacked Allied convoys in the Mediterranean that supplied forces operating in North Africa and on Malta, and restricted operations of Allied surface combatants during the first years of the war.

Application of land-based air power to North Pacific maritime operations was solely an Allied activity. Although occurring in a near-forgotten and ultimately a strategically unimportant theater, in this theater Allied army and navy land-based aircraft opposed an invading fleet, interdicted supply convoys, threatened enemy naval combatant operations, and struck at coastal shipping. These operations encountered many of the difficulties and

opportunities that occurred in more important theaters. They also highlighted the importance of air power even in what has been described as the worst flying environment in the world.

World War II application of land-based air power in maritime operations in other Pacific theaters ranged from the sinking of the Royal Navy's *Prince of Wales* and *Repulse* in early December 1941 to the aerial mining of Japanese home waters in 1945. In the years between 1941 and 1945, American and Japanese land-based aerial forces played important roles in attacking naval combatants and merchant shipping. The need to protect or secure bases for land-based air power also impelled several of the Pacific campaigns.

Post-World War II employment of aircraft operating from land bases in maritime operations never again occurred on so large a scale as it did between 1939 and 1945. The only possible exception was the Cold War, which became a near half-century-long worldwide minuet between two superpowers. During that dance, American and Soviet air and naval forces conducted training, reconnaissance, and “presence” missions that frequently exposed aircrews to warlike conditions. While the Cold War continued, other nations applied land-based air power in several "hot" wars. These ranged from suppression of insurrections to full-blown conflicts that involved coalitions of nations.

These smaller hot wars again showed the effectiveness of land-based air forces in interdicting water supply routes. The Falklands War of 1982 involved the first intensive use of new technologies in employment of land-based aircraft in naval combat. The advances included vertical take off and landing (VSTOL) aircraft, air and surfaced launched missiles, and satellite reconnaissance.

Cold War dimensions of the use of land-based aerial forces in maritime operations became worldwide as the Soviet Union developed a blue-water navy in the 1970s. Real-world maritime electronic intelligence collection, reconnaissance and patrol, and simulated strikes against naval forces became daily endeavors for land-based air forces of NATO and the Soviet Union. Aerial refueling, pioneered prior to World War II, became an integral part of these post-World War II air operations. So too did the use of air-based command and control. Large land planes again proved to be effective over-water platforms for such functions. The technological evolution and military effects of these activities significantly influenced events in the Cold War.

Almost eighty years elapsed between this most recent instance of land-based aerial forces affecting maritime operations and World War I (1914-1918), the world's first air war. Fragile, guy-wired and fabric-covered aircraft developed quickly into more aerodynamic instruments of destruction. Opposing aviators passed almost immediately from exchanging rude gestures to exchanging machine gun bursts and to bombarding enemy forces ashore and afloat. By the time the first air war ended, combat aircraft went to sea on and took off from ships. Combat aircraft also took off from land bases for aerial reconnaissance of ocean waters, searching for enemy ships and submarines, and for strikes against them when found.

Organizing for aerial warfare came quickly after Blériot's cross-channel flight and spurred development of military and naval aviation organizations. In 1912, Britain established the Naval Wing of the Royal Flying Corps. That same year France established the Aviation Maritime and the German and United States navies purchased their first aircraft. Italy in 1913 established the Aeronautica delia Regia Marina.[1]

When World War I began in the summer of 1914, the major belligerents possessed air

arms.* Most people involved believed at the outset of the war that aerial forces would be employed in land and naval combat in similar fashion. Aircraft would locate enemy forces and direct the fire of army artillery and naval guns. "Spotting" for artillery and naval guns via aircraft seemed very promising. So too did aerial strikes with bombs and torpedoes. Both functions depended for success on improved communications and weapons technology.[2]

British, French, and German naval exercises in 1913 supported theories about potential employment of aircraft in maritime operations. Observation aircraft could extend a fleet's horizon from twelve to sixty miles. Tests indicated that aviators might be able to locate submerged submarines and mines as well as surface ships. Wartime operations proved that aviators could spot submerged submarines and mines at shallow depths only in relatively calm and clear waters. War experience also showed that five miles was the average distance at which aviators could see and identify a surfaced submarine. Lookouts on surfaced submarines usually spotted aircraft before being seen.[3]

The potential of air power, even in 1914, raised issues that became significant in determining the missions of aerial forces. Writing in that year, Rear Admiral Paul Behncke, deputy chief of Germany's naval staff, urged that the German Navy's Zeppelins bomb London. Like some strategic air power advocates to follow, he suggested that bombing civilian population centers would spread panic and break the enemy's will to resist. Implicit in his suggestion was a strategic bombardment mission that would compete with the mission that employed land-based aerial forces in maritime operations.[4]

The competition for air resources between strategic and tactical missions became obvious in 1918. By then, advances in technology had made long-range strategic bombing missions feasible. When the British Admiralty developed a requirement for 1,180 aircraft for antisubmarine warfare (ASW) in 1918, only 557 aircraft were made available, largely because the Royal Air Force's new Independent Air Force, assigned a long-range bombing mission, claimed priority in aircraft allocation.[5]

Throughout the war, aircraft were employed effectively against submarines, in reconnaissance, and in strikes against minor enemy naval forces and merchant shipping. Aerial strikes against major combatants were limited and unsuccessful. Even the German cruiser *Goeben*, grounded in the Dardanelles in January 1918, survived six days of air attack. During that episode, British aircraft flew more than 200 sorties against the ship, dropped fifteen tons of bombs, but struck the cruiser only twice. Those bombs that did hit the ship caused only minor damage.[6] Britain began using non-rigid lighter-than-air craft (blimps) for antisubmarine patrols in 1915. In 1916, shore-based Austrian sea planes operating over the clear waters of the Adriatic Sea bombed the French submarine *Foucault*. When the bombs forced the submarine to the surface, its crew scuttled the boat.

In 1917, shore-based British flying boats began patrols over the North Sea. They proved effective in forcing German U-boats en route to operational areas to stay submerged and exhaust their batteries. By the last six months of the war (February-November 1918), the Allies had an average of 310 (mostly British and American) aircraft available each day for antisubmarine patrol in waters off the United Kingdom.

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*On the side of the Central Powers this included the Austro-Hungarian Empire and Germany. On the side of the Triple Entente (later the Allies) this included Britain, France, and Russia. Nations that would later join the conflict such as Turkey on the side of the Central Powers and Italy, Japan, and the United States on the Allied side also developed aerial forces.

The Allies also used aircraft over American waters for antisubmarine work. When U-boats attacked coastal shipping off America's Atlantic coast in the spring of 1918, sea and air ASW patrols began immediately. The air patrols claimed no U-boat sinkings, but on August 14, 1918, aircraft and sub chasers forced *U117* to submerge before the U-boat could attack a passing tanker.

The U-boats' vulnerability to air attack prevented most attempts to torpedo ships in air-escorted convoys. During the last year of the war, U-boats made more and more attacks at night when they were less likely to be spotted from the air. From May to July 1918, a significant number of U-boat operations also moved farther away from land, where they might be outside the range of aerial ASW escorts and patrols.[7] During the year, German submarines sank only two ships sailing in convoys escorted by both aircraft and surface ships.[8]

Aircraft also proved effective in strikes on enemy light naval forces. One of the most dramatic examples of air power as a new dimension of sea power occurred in the summer of 1917. On August 11, German sea planes flying from a naval air station on Borkum Island at the mouth of the Elbe River put a flotilla of British coastal motor boats out of action. The sea planes sank three of the six craft, which were en route to attack German minesweepers, and badly damaged the remaining three. The surviving boats drifted or were towed into neutral Dutch territory.[9]

By 1917 aircraft had also improved enough to deliver larger bombs and torpedoes. German single-engine Gotha biplanes used torpedoes to sink several ships in the English Channel that year. In the Mediterranean, an RAF Handley-Page twin-engine bomber sank the Turkish destroyer *Yadighair-I-Milet*. This was the largest warship to be sunk by air attack during World War I.[10]

These increasing uses of aerial forces in maritime operations led to over water air-to-air combat. Armament, flying skill, and luck influenced the result of aerial combat between sea planes, but the superior performance of land planes unencumbered by floats or pontoons usually determined the outcome of aerial combat with land planes. Consequently, land planes increasingly became involved in maritime operations, which aggravated competition between army and navy air arms for scarce airframes and power plants.[11]

When World War I ended in November of 1918, air and sea power advocates knew that aircraft had added a new dimension to naval warfare. They also knew that air power, to be effective, had to be within range of enemy fleets. To that end, aircraft could be carried on and launched from ships, or long-range land planes, lighter-than-air craft, or sea planes could be based on land, at the ocean's edge. All of these alternatives were realities by 1918.

During the next two decades military theorists argued about the relationship of air power and sea power. Others disputed the merits of strategic versus tactical applications of air power. Attempts to implement the emergent doctrines resulted in the acquisition and allocation of various aircraft among military services. Doctrinal decisions and their outcomes influenced the capability and readiness of land-based aerial forces for maritime operations in another war.

Land-based aerial forces capable of maritime strike operations often became involved in the tension between advocates of "air power" as a decisive force alone and vested tactical air interests of ground and naval forces. Within the air power communities of nations such as Germany, Great Britain, and the United States, decision makers most often gave maritime operations low priority in comparison with strategic bombing.

Strategic air power advocates argued for procurement of large, long-range heavy bombers, and that these aerial forces had to be concentrated to be effective. They further

claimed that concentrated, unescorted bombers could be effectively employed in destroying an enemy's will and ability to make war. For most, this meant precision daylight bombing of enemy production and utility centers rather than attacking enemy air, ground, and naval forces. These arguments became particularly vocal among the military in Britain and the United States.

National air forces evolved in differing fashions between World War I and World War II, based on national threat assessments, economic capabilities, and military preferences. Service doctrines took into account geographic position and perceived threats and national capabilities. The development of these doctrines occurred as newly-formed air arms struggled to establish their identities and missions in the face of opposition from tradition-bound proponents of ground and sea forces. The air arms and independent air forces often defined threats, capabilities, and doctrines in different ways. In all nations that developed significant air forces between World War I and World War II, these struggles influenced the disposition and capability of land-based aerial forces to participate in maritime operations. This was of particular importance in Britain, Germany, Japan, and the United States.

In Great Britain, the RAF embraced strategic bombardment, while its leaders continued to argue with naval authorities over the ability of aircraft to destroy battleships. Neither the RAF nor Royal Navy encouraged joint exercises or joint planning. Britain's First Sea Lord and Chief of Naval Staff between 1933 and 1938 said of the air danger, immediately after his appointment, "All rubbish. What we want are battleships."[12]

Despite parochial attitudes and the Royal Navy's confidence in its armor and antiaircraft weapons, during the interwar years British admirals in the Mediterranean found themselves worrying about Italian air attacks. When Britain and Italy clashed over the latter's adventures in Abyssinia in 1935, Britain's Mediterranean fleet withdrew from the island of Malta to Alexandria, Egypt. Intelligence reports warned that the Italians contemplated attacking the British fleet in the western Mediterranean with aircraft based in Italy and Libya.[13]

After the Abyssinian crisis faded, the Royal Navy again discounted the threat of land or sea-based air power. Naval officials relied on thickened armor and new antiaircraft guns for defense of their ships. Gunnery trials with eighty-mile-per-hour radio-controlled target drones that took no evasive action convinced the Royal Navy's leaders that they were navigating on the right course. Few, if any, British naval officers carefully evaluated the role or potential threat of land-based aircraft employed in maritime operations.[14]

At the same time, RAF leaders ashore gave maritime aerial operations little attention or priority. In 1936, Group Captain Arthur Harris (later Air Chief Marshal and Commander-in-Chief, RAF Bomber Command) said that reconnaissance of enemy naval bases was the only way to locate opposing naval forces. Flying aircraft over the sea was, he said, a waste of time. Moreover, according to Harris, the Air Staff reserved the right to withdraw aircraft from naval support at any time for the RAF's primary mission of strategic bombing.[15]

In the United States, post-World War I development of land-based aerial forces that could engage in maritime operations became involved in a three-way struggle among proponents of different approaches to organizing air arms. Participants in the debate included air power advocates for either an independent air force, or an Army air force that controlled all aviation, and those who did not advocate major organizational change. The latter did want better allocation of resources to, and integration of, aerial forces into ground and naval strategies and tactics.

In 1919, the Joint Board of Aeronautics[**] declared that Army aviation should support all phases of ground warfare, while naval aviation should use carrier and land-based aircraft to support all phases of a naval campaign. Land-based naval aviation, according to the board, would be needed particularly for convoy escort, reconnaissance, and attacks on enemy naval bases. Both Army and Navy aviation, the joint staff concluded, would need to cooperate in coastal defense.[16]

Some air power advocates, most notably Brigadier General William "Billy" Mitchell, opposed such a division of labor. They argued that air power, a new and important dimension of warfare, all by itself would prove an effective substitute for sea power. Appointed to the position of Assistant Chief of the Army Air Service after his return from France, Mitchell became an outspoken air power advocate. He asserted in articles, books, and speeches that air power could and should replace sea power as the principal means of defending the United States.

In July 1921 Mitchell tested his theories in bombings of surrendered German warships. Flying low, and after a number of bomb runs, Mitchell's bombers sank the anchored destroyer *G-102*, cruiser *Frankfurt*, and battleship *Ostfriesland*. Navy officials complained that Mitchell's airplanes did not pause between bombing runs to allow damage assessment. They also said that bombing tethered ships was hardly a realistic test. But the sinkings, followed by similar results in bombings of the obsolete American battleships *Alabama*, *New Jersey*, and *Virginia* in 1921 and 1923, provided support for Mitchell's arguments. After the tests, Mitchell said that an air force could establish air superiority over a fleet, neutralize its antiaircraft guns, and then sink combatants and auxiliary vessels. Air power alone, he pronounced, could defeat any fleet threatening America.[17] In the United States, airmen advocated long-range bombers as the best means to destroy an enemy fleet threatening American coasts. The Air Corps, they claimed, could replace the Navy as America's first line of defense. The air doctrine taught at the Air Corps Tactical School in the 1930s acknowledged that:

> Aviation alone cannot protect our merchant marine or our troop movements by sea, but it can unaided accomplish the other functions of sea power -- defense of the nation against waterborne invasion and reduction or elimination of enemy merchant shipping.[18]

More traditional military and naval thinkers did not, of course, agree with so optimistic an assessment. A "Joint Action of the Army and Navy" (the paperwork format for inter-service agreements at the time) in 1934 defined the Air Corps role as that of an arm of the Army. The Air Corps' purpose was to support land operations and directly defend the American coast. A 1931 agreement between General Douglas MacArthur, Army Chief of Staff, and Admiral William V. Pratt, the Chief of Naval Operations, had limited the Army Air Corps to operations no further than 100 miles from the coast. The Navy was to operate aircraft from carriers and land bases for operations farther out to sea and to protect shipping even within the 100-mile zone. After MacArthur and Pratt retired, the agreement was abrogated in the mid-1930s. A situation followed in which the Army Air Corps had little interest in using its land-based aircraft for any maritime operations and the Navy was prohibited from operating land-based aircraft.[19]

Air Corps thinking diverged from published doctrine by the late 1930s. Air Corps Tactical School training emphasized an air force's strategic role. The B-17, accepted for Air

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[**]The Joint Board of Aeronautics was a subcommittee of the Army-Navy Joint Board.

Corps use in 1937, was justified and authorized for its role in coast defense. Tactical exercises conducted with the Norden bombsight, adopted in 1933, suggested that high altitude bombing could hit moving ships as well as stationary targets. Air Corps leaders, however, came to see the B-17 and the Norden bombsight as the principal tools of daylight offensive strategic bombardment. As a result, at the end of the inter-war period, the Army Air Corps had long-range aircraft capable of operating at great distances over the oceans but little interest in or preparation for maritime operations.[20]

Germany, a continental power, emerged from World War I with no overseas colonies and surrounded by potentially hostile nations. German air planners, hidden in the army staff, faced defense challenges different from those of maritime nations. No oceans, or even narrow seas such as the English Channel, protected most German borders from its likeliest opponents, the other continental powers of Europe. German forces had to be prepared for immediate land combat in the event of war. As a result, Germany gave priority to creating a tactical air force ready for land warfare.[21]

German efforts to rebuild an air force became public only after 1933 when Adolf Hitler became chancellor and head of the German armed forces. In 1935 published German doctrine said that the Luftwaffe's tasks were air superiority, support of the army and navy, attacks on enemy industry, and interdiction. At the same time, lectures at the German Air War College at Gatow nearly all addressed strategic application of air power, while the German aircraft industry proved slow to develop long-range heavy bombers. Nevertheless, by 1938 the Luftwaffe had grown to a force of 15,000 officers and 370,000 enlisted personnel operating a large number of fighters, dive bombers, and medium bombers.[22]

In the 1930s, air power doctrine also evolved in the island nation of Japan. By this time the Japanese Navy had long since determined that the United States was its most likely opponent. Because the Washington Naval Treaty of 1922 limited Japan's tonnage in aircraft carriers, the Japanese Navy turned to land-based aircraft for fleet protection and naval air strikes. Admiral Issoruku Yamamoto, while chief of the Technical Bureau of Naval Aviation in the 1930s, decided the Navy should develop long-range, land-based medium bombers.[23]

The Japanese naval air arm had reorganized in 1921 with the assistance of RAF experts. The Japanese army air arm focused solely on tactical support of army ground forces. The Japanese navy air arm focused on fleet support, coastal defense, convoy protection, and sea and antisubmarine patrols. By the time Japan's carrier aircraft attacked Pearl Harbor in December 1941, Japan had about 2,700 army and navy aircraft. About 3,500 pilots, 50 percent of whom had combat experience, flew army planes and 2,500 pilots, 10 percent of whom had combat experience, flew navy planes.[24]

Japan trained only about 100 naval pilots each year in the 1930s. Their rigorous five-year training program included advanced study of flight and aircraft design as well as extended flight training. Enlisted pilots arrived at their squadrons with as much as 100 hours of solo time while officer pilots might have twice that number of hours.[25]

Pre-World War II Japanese naval strategy envisioned the Japanese fleet destroying the American fleet in a single engagement, similar to Admiral Heikachiro Togo's victory over the Russian Fleet in 1904 at the Battle of Tsushima Strait. As the American fleet steamed west, Japanese air, destroyer, and submarine attacks were to weaken their opponent's initially stronger navy. By the late 1930s, this "Zengen Sakusen" or slashing strategy depended on carrier-launched air strikes and land-launched air strikes from bases in the Mandate Marshall, Caroline, and Mariana Islands.[26]

Commander Minoru Genda, an experienced Japanese naval aviator who would later plan the Pearl Harbor attack, studied at the Japanese Naval War College in 1936. While

there, he wrote:

> Naval power should be mainly divided into the surface force, the land-based air force and the submarine force....Naval land-based air forces will be made up with two and more land-based flotillas, which, in turn, will consist of two or three air groups, and each air group will comprise thirty-six Type 96 land-based medium bombers and the same number of carrier fighters.[27]

More traditional naval thinkers reacted in Japan to Genda's proposals as their counterparts in Britain and the United States might have. They attacked his ideas and questioned his mental competence. Japan, however, came to the end of the 1930s well prepared to use land-based aircraft for naval purposes.[28]

When World War II began in September 1939, most belligerents that would use land-based aerial forces at sea found themselves ill-prepared. In Britain, the RAF reserved to itself the use of land-based aircraft. But the RAF was unabashedly devoted to strategic bombing. In Germany, the Luftwaffe reserved to itself all aircraft. Although doctrinally committed to support naval operations, the Luftwaffe was ill-equipped for long-range over-water operations. In Japan, the Army air arm was devoted exclusively to army support while the Navy air arm was well equipped, organized, and trained for use of both carrier and land-based aircraft in maritime operations. In the United States, the Army air arm was organized and equipped to use its land-based aircraft in maritime operations, but had little inclination to do so. Fiat limited the Navy air arm to operation of carrier aircraft and sea planes. The demands of war would reveal flaws in all of these forces.

Endnotes to Chapter I

1. Lee Kennett, *The First Air War* (New York: The Free Press, 1991), p. 188.
2. *Ibid*., pp. 189-90, p. 197.
3. *Ibid*., pp. 196-97.
4. Williamson Murray, *Luftwaffe* (Baltimore, Md.: Nautical & Aviation Press of America, 1985), p. 4.
5. Paul G. Halpern, *A Naval History of World War I* (Annapolis, Md.: Naval Institute Press, 1994), p. 425.
6. R. D. Laymen, *Naval Aviation in the First World War: Its Impact and Influence* (Annapolis, Md.: Naval Institute Press, 1996), p. 58; Kennett, *The First Air War*, p. 191.
7. Halpern, *A Naval History of World War I*, p. 168, pp. 425-31.
8. Terry Hughes and John Costello, *The Battle of the Atlantic* (New York: The Dial Press, 1977), pp. 33-34.
9. Halpern, *A Naval History of World War I*, pp. 443-44.
10. Layman, *Naval Aviation in the First World War: Its Impact and Influence*, p. 210.
11. Kennett, *The First Air War*, p. 203-4.
12. B. H. Liddell Hart, *The Liddell Hart Memoirs 1895-1938, Volume I* (New York: G. P. Putnam's Sons, 1965), p. 325.
13. *Ibid*., p. 329-30.
14. *Ibid*., p. 331.
15. Murray, *Luftwaffe*, pp. 306-8.
16. Alan R. Millett and Peter Maslowksi, *For the Common Defense: A Military History of the United States of America* (New York: The Free Press, 1984), p. 369.
17. Wesley Frank Craven and James Lea Cate, *The Army Air Forces in World War II*, Vol. I, *Plans and Early Operations January 1939 to August 1942*, 1948 (Washington, D.C.: Office of Air Force History, reprint ed., 1975), p. 39.
18. Quoted in *Ibid*., pp. 51-52.
19. *Ibid*., pp. 67-69.
20. Millett and Maslowski, *For the Common Defense: A Military History of the United States of America*, pp. 384-85.
21. Murray, *Luftwaffe*, p. 1.
22. *Ibid*., p. 7-12.
23. Len Deighton, *Blood, Tears and Folly: an Objective Look at World War II* (New York: Harper Collins Publishers, 1993), p. 524.
24. Craven and Cate, *The Army Air Forces in World War II*, Vol. I, *Plans and Early Operations January 1939 to August 1942*, p. 77, p. 80.
25. Deighton, *Blood, Tears and Folly: an Objective Look at World War II*, p. 421.
26. Minoru Genda and Masataka Chihaya, "How the Japanese Task Force Idea Materialized," in *The Pearl Harbor Papers*, Donald M. Goldstein and Katherine V. Dillion, eds., (Washington, D.C.: Brassey's, 1993), p. 3.
27. *Ibid*., pp. 6-7.
28. *Ibid*., p. 7.

CHAPTER II

THE BATTLE OF THE ATLANTIC

The Battle of the Atlantic, usually defined as the total fight for Atlantic sea lanes between 1939 and 1945, stretched from the Antarctic to the Arctic Ocean, and from Europe's western edge to America's eastern rim. Germany lost that battle. The *Luftwaffe*'s failure to support the *Kriegsmarine* caused the defeat according to some participants and some historians.[1] As Admiral Karl Dönitz, Flag Officer, U–boats, wrote to Hitler when he withdrew his submarines from the North Atlantic convoy routes at the end of 1943:

> it is simply incomprehensible that the Germans fought the war at sea without air reconnaissance or a naval air force, as if—in the 20th century, the century of flight—aircraft did not exist.[2]

Dönitz underscored that point while reviewing the U–boat war for Germany's senior naval commanders in June 1943. The crisis, he said, had occurred because Germany had built a strong submarine force but not developed a matching maritime air capability. This astounding conclusion came from a man who, as late as August 1942, proclaimed "The U–boat has no more to fear from aircraft than a mole from a crow."[3]

Despite what Dönitz believed to be inadequate maritime air support, Germany came close to winning the battle. Only a combination of increasingly strong Allied air and naval forces, newly-developed superior technology and weapons, and the incomparable contribution of signals intelligence overcame Nazi interdiction of Allied sea lines of communication. Fifty years later analysts argued over the significance of land-based air power in the battle. This chapter examines three phases of the Battle of the Atlantic: the contest for control of trans-Atlantic sea lanes, Allied air efforts to combat German surface raiders, and Arctic convoy battles.

Organizing Land-Based Aerial Forces for the Battle

Each belligerent in the Battle of the Atlantic organized and engaged its land-based aerial forces in maritime operations differently. In each case, inter-service struggles for control of air power, rather than efficiency, governed the organizational schemes.

Command of the German aircraft used in reconnaissance and combat over the sea reflected the outcome of several years' jockeying between the Luftwaffe and the Kriegsmarine. Hermann Göring, *Luftwaffe* Commander-in-Chief (C-in-C), enjoyed Hitler's personal confidence while Admiral Erich Raeder, *Kreigsmarine* C-in-C did not. This preordained the outcome of the competition.

In January of 1939 Hitler created the position of "General of the *Luftwaffe* with the Commander-in-Chief of the *Kreigsmarine*." This officer, reporting directly to the Commander-in-Chief of the *Luftwaffe* and the Commander-in-Chief of the *Kreigsmarine*, was in wartime to control all air units assigned to the German Navy. After Germany launched its attack on Poland in September, the *Luftwaffe* gradually reassigned squadrons previously designated for sea combat to its own air fleets. In March of 1941 the *Luftwaffe* general officer with Commander-in-Chief of the *Kreigsmarine* recommended abolition of his own position as unnecessary. Despite this recommendation, the position

existed until March 1944, collecting information on maritime-related air operations, because Raeder hoped in vain to regain some control over maritime air formations.

Göring exercised control over flying units engaged in maritime operations by establishing "fleigerführers" responsible for them. These officers, assigned geographic areas of responsibility, reported to general officers commanding air fleets and deployed aircraft engaged in reconnaissance and combat over the sea. Lt. Col. Martin Harlinghausen became Fliegerfürher Atlantik. He reported to the general commanding Luftflotte 3. His command included two bomber Gruppen and one bomber Staffel flying two and four-engine land-based bombers supplemented by a coastal air Gruppe (Küstenfliegergruppen) flying float plane fighter-bombers and flying boats. Fliegerfürher Nord reported to the commander of Luftflotte 5 and directed German air operations over Arctic waters. Other *Luftwaffe* commands had responsibility for air operations over the North Sea, the approaches to the Baltic Sea, and waters immediately adjacent to German and German-occupied territory in Western Europe.[4]

British organization for maritime air operations also reflected the outcome of inter-service rivalries. By the time the Battle of the Atlantic began, the Royal Air Force (RAF) had firmly established its responsibility for all land-based aerial forces. The RAF's Coastal Command operated all aircraft engaged in maritime patrol and convoy escort. This command also had the principal role in anti-shipping strikes and offensive operations against U–boats although Bomber Command and Fighter Command sometimes participated in these activities. The Royal Navy's Fleet Air Arm (FAA) operated only carrier and ship-based aircraft. In practice, however, some of these would go into combat from land bases rather than from afloat platforms.

Coastal Command was ill-prepared in 1939 to fight U–boats. Asdic (sonar) equipped surface ships, the Royal Navy believed, could deal with the submarine threat. As a result, Coastal Command's aircrews trained primarily for reconnaissance and strikes against surface ships.[5] The command included ten general reconnaissance squadrons equipped with short-range twin-engine Ansons; one general reconnaissance squadron equipped with Hudsons, which were military conversions of Lockheed's Super Electra airliners, but able to carry more bombs and machine guns that the Ansons; one attack squadron operating Vildebeest torpedo bomber biplanes, and four long-range flying boat squadrons. Two of the latter flew obsolete twin-engine Londons and Straners and two flew four-engine Sunderlands.[6]

The RAF took until January 1940 to equip Coastal Command aircraft with radar. Twelve of the primitive ASV (Air-Surface Vessel) I devices then available went into the command's Hudsons. Pilots had to fly at 200 feet to avoid backscatter clutter on the ASV I receivers. At that altitude, the small sets could locate surfaced submarines at a maximum distance of two and one-half to three miles under optimum conditions. Bigger radars later installed in the large Sunderlands could detect U–boats on the surface at a distance of about twenty-five miles. Better radars still required good operators and good maintenance to work well. A review of seventy-seven U–boat sightings made between August and September of 1941 showed only fifteen achieved by radar. Analysts attributed this dismal record to poor equipment, poor servicing, and poorly trained operators. Despite accounting for only 20 percent of the sightings analyzed in the review, radar was very important. Only with it could aircraft counter U–boats' preferred method of night surface attacks.[7]

German submarines, even when located by RAF aircraft in the first months of the war, had little to fear from the air. The twin-engine Ansons could carry only four 100-pound bombs. When a No. 233 Squadron Anson made the first Coastal Command attack on a submarine off the coast of Scotland on September 5, 1939, its fuzed bombs bounced off the water, exploded in midair, and brought down the airplane. They did not damage the

submarine, which turned out to be a Royal Navy boat.[8] In the following year aircraft help to destroy only four of twenty-nine U–boats sunk. Of these four, *U31* fell victim solely to a Bomber Command twin-engine Blenheim off Germany's coast on March 11, 1940, and three others to Royal Navy ships and Royal Air Force planes working in concert.[9]

A year after the war began, in September 1940, Coastal Command's original fifteen squadrons had more than doubled to thirty-one. These included more Hudsons plus twin-engine Whitley and Wellington bombers. By this time 450-pound naval depth charges had been modified so that they could be dropped from aircraft. They proved more effective antisubmarine weapons conventional bombs. But it was not until well into 1941 that the command received its first long-range Catalina twin-engine flying boats and four-engine Liberator bombers. By then both the Allies and Axis had conducted combined air, sea, and ground operations to capture Norway. That campaign demonstrated the powerful influence land-based air power could exercise on amphibious operations. Its outcome also significantly affected the later use of land-based aerial forces in the Atlantic theater.

The Trans-Atlantic Sea Lane Campaign

The contest for trans-Atlantic sea lanes began immediately in September 1939. Allied and Axis forces regarded enemy warships and merchant ships as legitimate targets. Both sides initially restricted attacks on neutral ships even though suspected of carrying goods for one of the warring parties. Belligerent nation ships caught at sea or in foreign ports when war broke out were at greater risk from surface raiders or submarines. Aerial forces, whether sea or land-based, were heavily engaged closer to the European continent. They only gradually became involved in the battle for control of transoceanic sea lanes.

Britain dispatched its first convoys from the English Channel to Gibraltar on September 7, 1939. Trans-Atlantic convoys began with sailings from Kingston, Jamaica, and Halifax, Nova Scotia, to the United Kingdom between September 15-23. Coastal Command aircraft escorted westbound convoys to the limits of their range when possible. Poor training and poor equipment led to ludicrous reports. One aircraft reported a convoy in the middle of Paris' Place de la Concorde. Other planes dutifully reported a convoy's progress westward for two days before its ships were discovered still at anchor off Liverpool.[10]

Sunderland "Y" of No. 228 Squadron was probably the first RAF land-based aircraft to participate in sinking a U–boat during World War II's fight for Atlantic sea lanes. On January 30, 1940, depth charges from the Royal Navy sloop *Fowey* damaged *U55* after the submarine attacked Convoy OA.80G. When the flying boat brought up two destroyers to finish off a surfaced *U55*, the U–boat's crew scuttled their craft.[11]

Once Germany was victorious in Norway and France, both Axis and Allied air forces devoted more attention to the trans-Atlantic battle. On July 1, 1940, a Royal Australian Air Force (RAAF) No. 10 Squadron Sunderland, based near Plymouth in southwest England, cooperated with a Royal Navy corvette to sink *U26* in the North Atlantic. About 6:00 a.m., the flying boat and the cruiser *Rochester* almost simultaneously discovered the surfaced submarine, which had been damaged by depth charges while attacking a convoy on the night of June 30-July 1. A salvo of four 250-pound bombs from the Sunderland dropped just ahead of U26. The German boat tried to submerge, failed, and lurched to the surface as four more bombs fell forty yards away. By this time the *Rochester* had closed to a thousand yards and opened fire with its deck guns while the U–boat commander was ordering his crew to scuttle *U26* and abandon ship. No. 10 Squadron and the corvette *Gladiolus*, which had depth-charged U–26 during the night shared credit for the kill.[12]

Coastal Command Fairey Battles began operating from an air base in Iceland on August 27, 1940. In the Central Atlantic, a No. 202 Squadron London flying boat damaged the Italian submarine *Bianchi*. In addition to new bases, better RAF antisubmarine equipment appeared. By the fall of 1940, most Coastal Command aircraft had Mark II ASV radar installed. Experiments also began with the use of aircraft-mounted searchlights. The RAF called Leigh Lights after their inventor, Squadron-Leader H. de V. Leigh. The lights proved invaluable during night attacks on surfaced U–boats, but only five experimentally-equipped Leigh Light aircraft were available as late as May 1942.

Captain Bernhard Jope of I/KG 40 struck the *Luftwaffe*'s first significant early blow in the transoceanic battle on October 26, 1940. Flying a I/KG 40 Fw 200 on patrol from Bordeaux, France to Stavanger, Norway, Jope sighted the 42,348-ton *Empress of Britain* seventy miles north of Ireland's Bay of Donegal. Jope's bombs set the liner, which was carrying servicemen and their families home, on fire. *U32* then torpedoed the ship. Another British passenger ship, the *Windsor Castle*, suffered severe damage when bombed by a I/KG 40 plane west of Ireland nine days later.

Between November 7 and 30 Convoy HX.84 became the focus both for *Luftwaffe* attacks and RAF defense. A II/KG 40 Fw 200 bombing set afire one of the convoy's ships, the 2,734-ton Swedish freighter *Vingaland* on November 7. The following day the Italian submarine *Marconi* torpedoed the burning freighter. On November 18, an RAF Sunderland employed ASV radar to locate either *U47* or *U100* when they approached the convoy. This marked the first time in actual operations that the ASV radar located a submarine.

Both sides reaffirmed their recognition of the importance of the air-sea battle for control of the Atlantic as 1941 began. Germany and Britain reorganized and reallocated forces early in the year.

Winston Churchill labeled the struggle for control of the Atlantic "The Battle of the Atlantic" on March 6, 1941. During 1940, Allied shipping losses in the North Atlantic had totaled nearly 1.8 million tons. U–boats accounted for the bulk of these sinkings. Churchill formed a Battle of the Atlantic Committee to coordinate all aspects of British efforts in the contest. Coastal Command headquarters moved from Plymouth to Liverpool. The British Chiefs of Staff agreed that the Admiralty should exercise operational control of Coastal Command. Churchill directed the reallocation of squadrons of Whitleys and Wellingtons from Bomber Command to Coastal Command. Coastal Command also gained priority for installation of ASV radars. A joint RAF-Royal Navy committee decided with difficulty that Coastal Command would have first choice in delivery of new long-range B–24s being produced in American factories.[13]

The decision in favor of Coastal Command generated strong protests from senior Royal Air Force officers. Their complaints highlighted contrasting views of air and naval leaders that continued throughout the war in British and American councils. Air force authorities defined success in the fight against submarines in terms of boats sunk. Naval authorities defined that success in terms of convoys safely escorted. Air Vice Marshal Sir Arthur Harris of Bomber Command argued particularly vehemently. He complained that over a six-month period one squadron had flown 144 sorties. During them, the squadron's aircraft had sighted only six submarines, attacked only four, and sunk only one. He emphatically rejected the safe arrival of ships as a measure of the effectiveness of aerial ocean patrols and convoy escort.[14]

Germany reorganized its aerial and naval forces for the Battle of the Atlantic about the same time England did. On January 7, 1941, the Flag Officer, U–Boats, assumed operational command of I/KG 40 with its Fw 200 Condor long-range reconnaissance aircraft. These were conversions of four-engine airliners that were capable of trans-Atlantic flights.

In addition to flying in reconnaissance roles, the planes could also be used as horizontal bombers with up to 4,000-pounds of bombs stored in gondolas under their fuselages and in wing racks. German Navy operational control of the Fw 200s permitted better control of joint U–boat and Fw 200 operations. It solved coordination problems such as the ones that occurred because *Luftwaffe* map grids did not correspond to those used by the *Kreigsmarine*. Dönitz regarded aircraft as an essential complement to the U–boat weapon. Enemy ships had to be located before they could be destroyed. Their low silhouette made submarines the worst possible point from which to locate other ships. Aircraft, he said, were far superior to any sort of ship for this purpose.

Under naval operational control, I/KG 40 aircraft stationed in France shuttled between Bordeaux and Stavanger, Norway on regular maritime patrols. The Fw 200s located and trailed Allied convoys while the U–boat commander positioned his submarines to intercept them. Concurrently the Fw 200s bombed the convoys to sink or damage ships, distract convoy escorts, and otherwise slow down the convoys, which took evasive action. The Condors also reported data critical to weather forecasts. U–boats sighting convoys in turn directed Fw 200s to them.

An Fw 200 reconnoitering the North Atlantic on January 8, 1941 sighted and sank one Allied merchant vessel. Three days later another Fw 200 located a convoy en route to Gibraltar. This enabled a U–boat to destroy one of the convoy's ships. On January 16 an Fw 200 sighted and bombed an outbound North Atlantic convoy, sinking two ships. Between January 21 and 23, Fw 200s sank more Allied seven ships. On January 28 after aerial reconnaissance located outbound convoy SC.19, five Fw 200s attacked. Each aircraft damaged or sank two ships while U–boats brought to the scene sank two additional ships.

Flying over the North Atlantic to attack convoys, I/KG 40 Fw 200s destroyed fifteen ships, damaged two ships later sunk by U–boats, and damaged three additional ships between January 7 and February 4. Aerial attacks on ships sailing independently or straggling behind convoys about the same time accounted for an additional three ships destroyed and two damaged. Fw 200s also assisted U–boats in sinking seven other ships. Similar combined air and submarine patrol and attacks throughout 1941 continued to devastate Allied convoys, stragglers, and independent sailers en route to or from Gibraltar or crossing the Atlantic.

Strikes against Allied shipping became more difficult and dangerous as convoy defenses improved. Axis aircraft abandoned most direct attacks on ships as antiaircraft fire improved. They bombed and strafed only when cloud cover and weather made surprise runs on ships possible. Most often, the Fw 200s just reported convoy sightings to U–boats command. This often frustrated aircrews. U–boats sometimes could not close with the convoys because of communications difficulty or their original positioning.

Better air coverage and escort in the Eastern Atlantic forced U–boat operations farther west as early as April 1941. For the Allies, this increased Iceland's importance as a base for air patrols. When Coastal Command aircraft began flying from Icelandic bases, they covered an area of the Atlantic in which U–boats had previously been safe from air attack. For the Axis, redirection of U–boat operations to the mid-Atlantic meant that only convoys to and from Gibraltar steamed within the *Luftwaffe*'s reach.

Allied mid-Atlantic ASW patrols increased in effectiveness as Catalina flying boats and Hudson land planes replaced the Fairey Battles initially sent to Iceland. The lumbering Catalinas, although called "tired bumble bees" by U–boat crews, could fly to a distance of 800 miles from shore. The faster Hudsons first arrived in Iceland in June 1941. One aircraft could

search 100 square miles of ocean for submarines in four hours. It took five fast warships six days to complete the same task.

A tremendous breakthrough in signals intelligence also aided in the war against U–boats. In the same month that the Hudsons arrived in Iceland, Britain's Government Code and Cypher School (GCGS), located at Bletchley Park outside London, and the listening stations that fed it information proved able to intercept and decode radio messages sent by the German Navy headquarters controlling U–boats. The messages detailed U–boat patrol areas, transit routes, and much other valuable information. Although there were occasional interruptions due to poor intercept conditions and changing code systems, the usual flood of information enabled the British Admiralty to maintain an Atlantic chart showing on a daily basis the position of each German submarine on patrol. The United States Navy set up a similar "Operational Information Section" within the Commander-in-Chief, United States Fleet (COMINCH) headquarters in early 1942. It received information garnered from intercepted U–boat communications intercepted by USN cryptologic activities and from USN direction-finding stations. The British and American tracking rooms shared information via a secure communications link.[15]

Careful study of the experiences of two years antisubmarine air warfare also improved Coastal Command capability in the U–boat war. The command's aircraft received new white paint on their under and side surfaces to make them more difficult to see from ships. Tactical instructions specified the most effective method of attack on U–boats. Although Allied shore-based aircraft had sunk no submarines in 1939, in 1940 they accounted for three by themselves, and four in cooperation with ships out of a total of forty-two U–boats sunk by various means. In 1941, Allied shore-based aircraft accounted for four enemy submarines (three German and one Italian) by themselves, and cooperated with ships to sink two others.[16]

While the RAF, RCAF, and RAAF fought the German submarines, American Army and Navy air arms prepared to join the Battle of the Atlantic from eighteen air bases strung along the United States' coast from Maine to Florida. The Navy positioned eighty-three PBYs, or Catalinas as the British called them, and Hudsons at its installations and the Army moved aircraft to coastal bases. When the United States joined the war in December 1941, the United States Army Air Forces (USAAF) had 103 planes near the Atlantic coast. These included fifty-one trainers, eighteen scouts, fourteen utility aircraft, seven transports, six patrol planes, three torpedo planes, three fighters, and one bomber. None, according to the Army Air Forces command operating them, were suitable for offshore patrol. The Army aircraft came under Navy tactical control in June 1941. Although the Army Air Forces administered, supplied, and trained USAAF antisubmarine forces, the Navy scheduled their missions and dispatched them on combat operations.[17]

Once again, naval and air force philosophies collided. Navy doctrine prescribed that the aircraft be stationed in geographically defined naval districts and controlled by district commandants. Air force commanders believed that the land-based aerial forces should be employed as mobile striking forces. The planes, they said, should be able to move at will across the naval district boundaries. Two years later these differing views resulted in the Navy taking over operation of all land-based antisubmarine aircraft.[18]

American land-based aerial forces first joined the Atlantic sea lane fight in July 1941. Though not a declared belligerent, United States naval surface ships and flying boats began escorting convoys through the Western Atlantic. An April 1941 agreement between the United States and Denmark also permitted American construction and use of air bases in Greenland. A similar agreement with Iceland followed in July. American air bases also

opened on British territory in the Western Hemisphere as a result of the 1941 Lend-Lease program.

On July 1, Patrol Wing 7 started reconnaissance flights from Argentia, Newfoundland. Five days later USN flights started to supplement RAF reconnaissance from Iceland. Patrol Squadron 73 began operating PBYs from Reykjavik. Patrol Squadron 74 began operating twin-engine, twin-tail Mariner flying boats from Hvalfjord. American surface warships and aircraft shared the results of their reconnaissance with their British counterparts while their presence deterred U–boat attacks on ships they had under escort. American warships and aerial forces quickly became engaged in an undeclared war with the German U–boats.

Luftwaffe attacks on Convoy SL.81 in the North Atlantic at the beginning of August encountered a new defensive technique. The convoy, located by German radio intelligence and under U–boat attack since August 2, included the catapult merchant ship (CAM) *Maplin*. A single-engine Hurricane catapulted from the *Maplin* on a flight from which there could be no return shot down an Fw 200 of I/KG 40 on August 3. The fighter's pilot, beyond the range of land, then had to ditch in the icy sea where hypothermia could kill him within minutes. Despite the desperate countermeasure, additional Fw 200s of I/KG 40 successfully bombed two merchantmen sailing with the convoy. Another Fw 200 of I/KG 40 also had more luck on August 11 when it attacked and sank a 2,852-ton freighter from Convoy HG.69 west of Gibraltar.

There were few air-to-air encounters between the long-range Allied and Axis aerial forces. Occasionally the Fw 200s and their Allied counterparts engaged in elephantine dogfights. Generally, the RAF maritime forces sought out and attacked U–boats just as the *Luftwaffe* maritime forces sought out and attacked surface vessels. The limited number of aircraft available, the range limitations of those involved, the difficulty of locating submarines, and the vastness of the Atlantic meant air attacks on U–boats could never be more than sporadic.

The RAF did score twice on August 26, 1941. A RAF plane forced U143 to submerge west of Ireland thus preventing it from attacking Convoy OS.4. On the same day, Catalina "J" of No. 209 Squadron cooperated with the trawler *Vascama* to sink *U452*.

One of the most dramatic air versus U–boat encounters happened the next day. No. 269 Squadron Hudson "S" sortied from Iceland piloted by Squadron Leader J. Thompson. He depth charged and strafed *U570*. Depth charge shock waves caused sea water to reach the submarine's batteries. This generated chlorine gas that forced the crew out of the boat. The German commander surrendered with a white flag. The Hudson circled over its prize until a No. 209 Squadron Catalina and surface ships arrived to take off the German crew and tow the U–boat to Iceland. Communications codes found on *U570* helped significantly in the radio intelligence war so important in the battle for control of the Atlantic sea lanes. The boat itself became HMS *Graph* in September 1941.

Successes such as the capture of *U570* came rarely to Allied and Axis aircraft participating in the fight for sea lanes. More often, excruciatingly long flights with no enemy contact engendered boredom for aircrews on both sides. Successful air attacks were not always necessary to enhance convoy safety. Surfaced, U–boats could use their diesel engines to plow ahead at seventeen knots. They usually chose to submerge at just a threat of bombing and strafing. Underwater, the U–boats had to run on electric motors and could maintain only two to three knots for limited periods of time. Convoys could leave them behind at this speed. The submarines also had difficulty escaping underwater if antisubmarine surface ships were within striking distance.[19]

When an I/KG 40 Fw 200 sighted convoy OG.73 on September 1, a U–boat group positioned itself to intercept. On September 10, a No. 209 Squadron Catalina forced *U501* down south of Iceland. British surface warships soon arrived to finish off the sub. The following day, No. 209 and No. 269 planes provided air cover for convoy SC.42 sailing south of Iceland. I/KG 40 Fw 200s sighted and reported several convoys over the next several days while RAF aircraft dropped depth charges on *U561* and *U65* in the North Atlantic.

In late September a convoy bound for Gibraltar from England became the focus of a running air-sea battle. On September 21, an I/KG 40 Fw 200 fatally damaged the 906-ton rescue ship *Walmer* steaming behind Convoy OG.74 southwest of Ireland. Another Fw 200 shadowing the convoy went into the sea after attack by a Martlet fighter from the escort carrier *Audacity*. A Fulmar fighter flown off the CAM *Springbank* then drove off a second Fw 200 approaching the convoy on September 24. Two days later, the *Springbank* and two other ships fell victim to three U–boats brought to the convoy by I/KG 40 Fw 200s. An RAF aircraft based in Cornwall then damaged *U205*. In all, cooperation between U–boats and land-based aircraft cost Convoy OG.74 six ships. During the battle a carrier fighter shot down one *Luftwaffe* plane and an RAF land plane damaged one submarine.

September 1941 also saw the arrival of a new and significant player in the antisubmarine war. American-built and designed B–24 Liberator aircraft began to take part. The four-engine planes could carry up to twenty-four depth charges in their bomb bays and patrol to a distance of 700 miles. Their high wings facilitated visual lookout for surfaced U–boats.

A Coastal Command squadron began flying Liberators in mid-September 1941 but lost half of them almost immediately to RAF's Ferry Command. Instead of hunting submarines, the Liberators transported senior officials back and forth across the Atlantic. Competition for Liberators being produced then became even more intense as bomber commands discovered their usefulness.[20]

Convoy OG.75 came under sporadic *Luftwaffe* surveillance beginning on October 2. Aerial reconnaissance aircraft between October 5 and 7 found and sank only a small steamer. On October 10, a Fw 200 relocated the convoy so that three U–boats could intercept it on October 12. *U83* torpedoed a 2,044-ton Portuguese freighter and a floating crane in the convoy but a convoy escort aircraft forced *U563* to submerge before it could attack. After another Fw 200 regained contact with OG.75 on October 24, British aircraft and surface vessels drove responding U–boats and Italian submarines away. In this encounter the Royal Navy destroyer *Lamerton* and an RAF No. 202 Squadron London flying boat operating from Gibraltar cooperated to sink the Italian sub *Ferraris* on October 25, 1941.[21]

There was little dramatic action over Atlantic sea lanes in November 1941. Planes of I/KG 40 planes continued to search for convoys so that they could bring U–boats to them. They relocated Convoy OS.10 on November 2 so that U–boat attacks on it could continue. The RAF achieved a notable success at the end of the month when Whitley "B" of No. 502 Squadron destroyed *U206* in the Bay of Biscay on November 30.

The last month of 1941 saw a replay of earlier running air-sea battles over convoys. U–boats and Fw 200s assaulted Convoy HG.76 in the North Atlantic after aerial reconnaissance reported its location on three successive days. Escorting surface ships drove off the U–boats. On December 18, Martlets (as the Fleet Air Arm designated its American-built Grumman F-4F-3 radial engine fighters) flew off the escort carrier Audacity to shoot down two Fw 200s assisting the submarine. Martlets tallied similar scores the next day but U–boat attacks on the convoy continued until December 23.

Despite the Allies' improving efforts at antisubmarine warfare, the struggle for control of trans-Atlantic sea lanes in 1941 had been expensive and violent. At a cost of twenty German and three Italian submarines sunk in the North Atlantic, Axis undersea naval forces had sunk 2.4 million tons of Allies shipping in the North Atlantic during 1941. British aircraft had assisted in three of the U–boat kills and were solely responsible for one. Although the Kriegsmarine had lost about 40 percent of its average operational submarine strength during the year, the commissioning of sixty-nine new U–boats in the last quarter of 1941 promised an even bloodier shipping war in the North Atlantic during 1942.[22]

United States Army Air Forces land planes joined United States Navy aircraft in the Atlantic battle on the day following Japan's December 7 raid on Pearl Harbor. The USAAF's First Air Force launched offshore patrols from Dow Field, Maine; Westover Field, Massachusetts; and Langley Field, Virginia on the afternoon of December 8. Army-Navy peacetime efforts had created a situation in which American planes "carried bombs useful against anything but submarines, navigators who had theretofore been prohibited from flying offshore, and pilots who were as ignorant of the Navy as the Navy was of them."[23] Sent to war against submarines, USAAF fliers became involved in fiascos that equaled RAF Coastal Command's first experiences. In one instance, the pilot of a twin-engine B–25 Mitchell medium bomber pilot mistook recognition signals frantically sent by an American destroyer as the blinking of antiaircraft fire. His bomb run on the ship missed it by 400 yards.[24]

American naval air strength was not much greater than that of the Army Air Forces. At this time the Navy had twelve-plane PBY units at Argentia and Norfolk. There were also half-squadron detachments split between Jacksonville and Key West plus San Juan and Trinidad. In addition, a squadron of Mariner flying boats (PBMs) was at Argentia and a squadron of single-engine Kingfisher float planes was at Bermuda.[25]

Allied wrangling about air assets devoted to the antisubmarine campaign became heated early in the year. When Britain's First Sea Lord, Admiral Sir Dudley Pound, asked for assignment of more land-based heavy bombers to Coastal Command, senior RAF officers resisted. According to the head of Bomber Command, Air Vice Marshal Sir Arthur Harris, "The naval employment of aircraft consists of picking at the fringes of enemy power . . . of looking for needles in a haystack."[26]
Harris and his superior, RAF Chief of Staff Air Marshal Sir Charles Portal, advocated bombing the U–boat construction facilities and bases in France and Germany would be more effective in combating the U–boat menace than convoy escort or maritime air patrols.

At this stage of the war, however, the Allies did not have enough long-range aircraft or the technical means to make this a valid option. The RAF could not conduct precision daylight bombing and the bombs in use could not penetrate the thick concrete shelters that protected submarines in port. Nonetheless, Churchill supported Portal and Harris in the argument. Over the next twelve months Allied air forces dropped 33,000 tons of bombs on U–boat building yards and pens. In that effort, they lost 882 bombers with their valuable aircrews in the process but did no significant damage. The bombings made the communities in which the U–boats homeported unlivable but did little to interfere with submarine operations.[27]

United States Army Air Forces squadrons gradually entered the battle for Atlantic sea lanes after December 1941. Although the Eastern Sea Frontier had 167 Army aircraft assigned by March 1942, only half were twin-engine medium bombers suitable for antisubmarine warfare. None of the Army crews at this point had the ocean navigation training essential to their task.[28]

RAF aircraft began the first offensive air attacks on U–boats at sea in 1942. These occurred in the Bay of Biscay, which five out of six U–boats crossed on their way from home ports to patrol lines in the Atlantic. Whitley "F" from No. 502 Squadron damaged *U129* as the boat crossed the bay on April 1. "F's" squadron mate "M" likewise interfered with *U590's* crossing of the bay on April 14. These attacks marked a situation in which enough Allied aircraft were available to escort convoys and to mount offensive operations against the U–boats beyond the convoy routes.

Additional air patrols over the Bay of Biscay in June 1941 brought additional positive results. The first success came as one of four Wellingtons experimentally fitted with Leigh Lights encountered the Italian submarine *Luigi Torelli*. After Squadron-Leader J. Greswell's first run in No. 172 Squadron's Wellington "F" failed because of a bad altimeter setting in the aircraft, he got an unusual second chance. The Italian skipper, misled because the aircraft illuminated his boat, did not submerge. He fired recognition flares instead. Greswell responded with another Leigh Light bath and four 250-pound depth charges released from an altitude of fifty feet. Subsequent attacks on the *Torelli* by Royal Australian Air Force No. 10 Squadron Sunderlands "X" and "A" forced the Italians to beach the boat on June 11. That same day another No. 10 Squadron Sunderland, "F," inflicted enough damage to force *U105* to return to port. Less serious damage occurred on June 23 when RAF No. 58 Squadron Whitley "C" bombed *U753* as she crossed the bay returning from a Western Atlantic patrol.

In further Biscay action, No. 172 Squadron Wellington "M" sank *U502* on July 6 and damaged U159 on July 12, 1942. On July 17, No. 502 Squadron Whitley "H" and No. 61 Squadron Lancaster "F" destroyed *U751*. Then on July 27 an attack by No. 311 (Czech) Squadron Wellington "A" on *U106* forced the boat back to port. During continued air interdiction of submarine transit routes in the bay, RAF No. 113 Squadron Wellington "H" sank *U578* on August 10. The Italian submarine *Morosini* and her crew probably went to the bottom as a result of Allied air attack on August 11.

At the end of August 1942, Biscay air patrols damaged several Axis submarines and sank one. RAF No. 502 Squadron Whitleys "B" and "O" damaged *U256* on August 31. RAAF No. 10 Squadron Sunderlands "U" and "R" damaged the Italian submarine *Giuliani* on September 1 and No. 304 Squadron (Polish) Wellington "A" further damaged the *Giuliani* on September 2. No. 77 Squadron Whitley "P" sank *U705* on September 3.

As land-based air power interfered with Axis submarine transits to the open ocean, Allied air escort of convoys and Axis air attack on them continued. A USN VP-74 Mariner aided by radio direction finding located and sank *U158* off Bermuda toward the end of May 1942. The Condors by this time were focusing on Gibraltar-bound convoys. Most of the U–boats with which the *Luftwaffe* cooperated on trans-Atlantic sea lane interdiction had switched their operations to mid-Atlantic areas, beyond the range of Allied land-based aircraft and beyond Condor range.

On June 11, 1942, a I/KG 40 Fw 200 located convoy HG.84 as it steamed south from England and managed to escape a Hurricane launched from the catapult ship *Empire Moon*. A second Condor relocated HG.84 on June 14 and led *U552* to it. Other U–boats followed and sank several of the convoy's ships. Similar air-naval cooperation followed on June 16 when *U571* and two Fw 200s again found HG.84. The next day a KFlGr 106 attack badly damaged the Royal Navy destroyer *Wild Swan* which had arrived on-scene as a part of a surface warship group coming to aid the HG.84. At the end of 1942, most Condors previously used against Gibraltar convoys were relocated to the Mediterranean and to the Russian front.

On the other side of the Atlantic, American and Canadian antisubmarine air patrols began to have a few successes. On June 13, 1942, American naval and army aircraft

cooperated with the USN patrol craft *PC458* to damage *U153* off the Panama Canal. The USN destroyer *Lansdowne* then sank the submarine. Almost a month elapsed before Allied air forces in North America could claim additional victories in the air war against the submarines. On July 7, a U.S. Army Air Forces 396th Bomb Squadron plane patrolling off the American east coast sank *U701*. Then on July 31, a Royal Canadian Air Force (RCAF) No. 113 Squadron Hudson sank *U458* off Nova Scotia. The next day a U.S. Coast Guard plane sent *U166* to the bottom outside the mouth of the Mississippi River. RCAF Hudsons from No. 113 Squadron then damaged *U754* in the waters off Nova Scotia on August 2.

Action in the air war against U–boats shifted again to the mid-Atlantic on August 9, 1942, when RAF No. 120 Squadron Liberators based in Northern Ireland assisted Convoy SC.94, which U–boats had been attacking since August 5. The Liberators accounted for no submarines, but forced them away from the convoy or facilitated surface ship action against them.

Other British Liberators flying from Cornwall provided similar assistance to Convoy SL.118. No. 120 Squadron Liberator "F" damaged *U89* on August 16 and U653 on August 18. USN VP-73 Catalina "R" on North Atlantic air patrol from Iceland sank *U464* on August 20, 1942.

Air attacks on U–boats in the last months of 1942 reflected the increasing availability of air power for the task, although by this time the number of operational U–boats had increased from 121 in April 1942 to 196 in October 1942. Of these, about twenty-four were operating in the North Atlantic with another twenty lurking in North American coastal waters.[29]

Land-Based Aircraft Operating Against U–Boats, September 1942[30]

Date	Unit/Aircraft	U–Boat/Area	Results
Sep 15	No. 58 Sq Whitley "Q"	*U261* (North Atlantic)	Sunk
Sep 16	343rd Bomb Sq B–24	*U156* (Western Atlantic)	None*
Sep 23	No. 210 Sq Catalina "U"	*U255* (North Atlantic)	Sunk
Sep 28	No. 48 Sq Hudsons "A" and "Z"	*U262* (North Atlantic)	Damaged

**U156* was trying to rescue survivors, including Italian POWs, from the torpedoed liner *Laconia* and the attack drove her away.

Land-Based Aircraft Operating Against U–Boats, October 1942

Date	Unit/Aircraft	U–boat/Area	Result
Oct 2	99th Bomb Gp B–18	*U512* (Western Atlantic)	Sunk
Oct 5-6	VP 73 Catalina "I" and No. 269 Sq Hudson "N"	U582, U619, U257 (North Atlantic)	*U562*, *U619* sunk, *U257* damaged
Oct 12	No. 120 Sq Liberator	*U597* (North Atlantic)	Sunk
Oct 15	No. 120 Sq Liberator "H"	*U615*, *U437*	Thwarted*

Oct 16	No. 120 Sq Liberators, VP-84 Catalinas	U–boats attacking Convoy SC.104 (North Atlantic)	Thwarted
Oct 20	No. 224 Sq Liberator "H"	*U216* (North Atlantic)	Sunk
Oct 22	No. 179 Sq Liberator "B"	*U412* (North Atlantic)	Sunk
Oct 27	VP-84 Catalina "A"	*U664* (North Atlantic)	Sunk
Oct 27	No. 120 Squadron Liberators No. 206 Sq Fortress "F"	U–boats attacking Convoy HX.212 (North Atlantic) *U627* (North Atlantic)	Thwarted Sunk
Oct 30	RCAF No. 145 Sq Hudson RCAF No. 10 Sq Digby	U658 (Western Atlantic) U520 (Western Atlantic)	Sunk Sunk
Oct 31	RAF No. 120 Sq Liberators	U521 (North Atlantic) near Convoy EG.4	Thwarted

*"Thwarted" indicates an attacking submarine driven away by aircraft.

Land-Based Aircraft Operating Against U–Boats, November 1942

Date	Unit/Aircraft	U–boat/Area	Result
Nov 1	VP-84 Catalina "A"	*U664* (North Atlantic)	Sunk
Nov 5	No. 120 Sq Liberators Liberator "H" VP-84 Catalina "H"	U–boats attacking Convoy SL.145 (North Atlantic) *U89* (North Atlantic) *U408* (N. of Iceland)	Thwarted Damaged Sunk
Nov 10	USAAF aircraft from Trinidad	*U505* (Western Atlantic)	Damaged (aircraft downed by own bomb)
Nov 13	No. 500 Sq Hudson "D"	*U411* (Central Atlantic)	Sunk
Nov 18	No. 608 Sq Hudson "V"	*U613, U91* (Central Atlantic)	Damaged
Nov 19	No. 608 Sq Hudson "D" No. 608 Sq Hudson "G"	*U413* (Central Atlantic) *U98* (Central Atlantic)	Damaged Sunk
Nov 24	No. 233 Sq Hudson "Q" No. 405 Sq Hudson "J"	*U263* (Central Atlantic) *U263* (Bay of Biscay)	Damaged Damaged

Land-Based Aircraft Operating Against U–Boats, December 1942

Date	Unit/Aircraft	U–Boat/Area	Result
Dec 7	No. 120 Sq Liberator "H"	U–boats attacking Convoy ONS.148 (North Atlantic)	Thwarted
Dec 8	No. 120 Sq Liberators "B" and "M"	U–boats attacking Convoy ONS.148 (North Atlantic)	Thwarted

Dec 11	VP-84 Catalina "H"	*U611* near Convoy ONS.148 (North Atlantic)	Sunk

Historians generally acknowledge that 1943 marked the victory of Allied air and naval efforts against Axis submarines in the Battle of the Atlantic. The victory came in the face of an all-out U–boat effort, which was repulsed by a combination of land and sea-based air power, surface ships, and radio and radar warfare. Allied operational research also played an important part in the battle. Scientists analyzed combat records and then recommended significant changes. They proposed such innovations as fewer, larger convoys; revised fusing on depth charges; and revised interval patterns in depth charge drops. Locations of wolf pack assembly and refueling points were being decoded and this was instrumental in the victory.[31]

Better aircraft and more of them combined with the other factors to win the victory. By February 1943, RAF Coastal Command had thirty-four antisubmarine squadrons and sixteen other flying units. Of the antisubmarine squadrons, eight flew Sunderland and four Catalina flying boats. The remaining squadrons operated a mix of mostly Hudsons, Wellingtons, Halifaxes, Flying Fortresses, and Liberators.

New models of Liberators available in late 1942 or early 1943 could be equipped for very long range patrols by placing extra fuel tanks in one of their bomb bays. This meant reducing their loads from twenty-four to eight depth charges. Armor plate, liners for self-sealing fuel tanks, bottom turrets, and engine turbo-superchargers also came off.[32]

That made Very Long Range (VLR) Liberators lethal antisubmarine aircraft. One spent more than seven hours above a convoy 800 miles from its home base on December 7, 1942. Coastal Command estimated that just twenty-four of these VLR planes could close the mid-Atlantic "gap" outside the range of existing aircraft.[33] It had only fourteen available to operate over the North Atlantic in February 1943. In part this resulted because many Liberators went to strategic bombing commands. But it was also a consequence of Coastal Command allocating aircraft suitable for very long range conversion to Bay of Biscay offensive patrols.[34] Relief came only after March 1943 when participants in an Atlantic Convoy Conference decided to establish Royal Canadian Air Force (RCAF) and USAAF Liberator squadrons in Newfoundland.[35]

The new VLR aircraft became so important that top Allied leaders discussed them at the January 1943 Casablanca conference. The modified Liberators combined the best available combination of speed, range, and weapons load for fighting U–boats in mid-ocean. The British came to the conference with statistics showing that four more Atlantic gap air patrols launched each day would reduce shipping losses by 65 percent.

Despite their own statistics, the British allocated their share of new Liberators first to Bomber Command for its strategic campaign. They did the same with ten-centimeter radar sets. The American allocation of the VLR Liberators went to General Eisenhower in North Africa. They operated against submarines only from bases in Morocco. Churchill, however, was willing to use American resources in lieu of British. He appealed directly to President Roosevelt in the matter. As a result, the USAAF 6th Antisubmarine Squadron moved to Newfoundland in April 1943.[36]

In the interim, Coastal Command Hudsons tried unsuccessfully to make-up for the lack of long-range aircraft. When they flew from Bluie West airfield in Greenland to close the mid-Atlantic gap, high operational losses caused by flying in bad weather over mountainous terrain stopped the attempt. At this time Coastal Command had only about 200 aircraft

assigned to Atlantic convoy escort and patrol. Of these, only two-thirds were available for operations on any given day.[37]

The American Navy possessed 112 VLR Liberators compared with Coastal Command's twenty-four, and might have helped close the mid-Atlantic gap. Instead, Admiral Ernest J. King, Commander-in-Chief of the United States Fleet (INCHCOM) in 1943 sent seventy of the long-range planes to the Pacific theater for against the Japanese. Other USN Liberator squadrons operated from California and Caribbean bases.

Although not present in the maximum numbers possible, the Liberators joined Flying Fortresses and other aircraft previously allocated to patrol the sea lanes and played an important part in the triumph over U–boats. The Britons believed the B–17s carried too small a weapons load to be effective in strategic bombing. The American-built bombers could carry only 1,750-pound of bombs compared to 3,000 to 5,000-pound bomb loads in British-manufactured four-engine Halifax and Lancaster bombers. Unlike the American Army Air Forces, the British did not hesitate to use the Fortresses in antisubmarine warfare.[38]

Land-based air's 1943 contribution to the victory began on January 15 when Fortress "G" of RAF No. 206 Squadron sank *U337* near Convoy ONS.160 in the North Atlantic. Further successes followed in February. Liberator "X" of No. 120 Squadron bombed *U465* and drove other U–boats away from Convoy SC.118 in the North Atlantic on February 6. The following day Fortress "J" of No. 220 Squadron sank *U624* and cooperated with the U.S. Coast Guard cutter *Bibb* to drive other submarines away from this same convoy.

On March 18, 1943, RAF No. 120 Squadron VLR Liberator "G" risked a 900-mile flight from Castle Archdale in Northern Ireland to cover Convoy SC.122. When the plane arrived over the convoy, it broke up a U–boat attack before it had to fly back to its base. No. 86 Squadron Liberator "M" then relieved the first aircraft and continued to thwart U–boats attempting to torpedo the convoy's ships. On the same day in the Central Atlantic a USAAF Liberator from the 1st Antisubmarine Squadron sank *U524*.

Three days later RAF No. 220 Squadron Fortress "B" sank *U384* and Fortress "G" damaged *U666* while escorting Convoys HX.229 and SC.122 in the North Atlantic. No. 206 Squadron Fortress "L" sank *U469* on March 25 and *U169* on March 27, also in the North Atlantic.

In late March, the RAF intensified its Biscay interdiction efforts. Operation Enclose I sent 182 sorties over the bay between March 21 and March 28. Few U–boats were sighted. They surfaced to travel and charge batteries only at night. During daylight hours the boats sacrificed speed for stealth by submerging. Despite these tactics, RAF No. 172 Wellington "I" aided by a Leigh Light damaged *U332* on March 21. No. 172 Wellington "G," also aided by a Leigh Light and using radar sank *U665*. Air attacks on U–boats were hazardous. *U338* proved that by shooting down an RAF No. 58 Squadron Halifax.

Operation Enclose II continued the Biscay offensive. Between March 28 and April 11, 1943, *U376* sank and *U465* suffered casualties as a result of night air attacks. The losses incurred in Operations Enclose I and II caused Dönitz to order a change in submarine tactics. It was clear that the German Metox radar detector was not effective against a new model Allied radar. German submarines henceforth traveled submerged at night. In daytime, they traveled on the surface and relied on their antiaircraft fire to repulse air attacks. Initial successes seemed to indicate that U–boats traveling in groups on the surface might effectively oppose bombing and strafing runs.

Aircrews sortieing to the Bay of Biscay on Operation Derange, between April 13 and June 6, 1943, encountered the new U–boat tactics. The operation produced ninety-eight U–boat sightings, sixty-four attacks on them, and seven sinkings.

Operation Derange, April 13-June 6, 1943

Date	Unit/Aircraft	Result
Apr 26	No. 172 Wellington "R"	*U566* Damaged
Apr 29	No. 224 Liberator "H" RCAF No. 224 Liberator "D"	*U437* Damaged *U332* Sunk
May 1	No. 172 Wellington "N," RAAF No. 61 Sunderland "M"," No. 612 Whitley "E"	*U415* Damaged
May 2	RAAF No. 461 Sunderland "M"	*U465* Sunk
May 5	No. 58 Halifax "S"	*U663* Sunk
May 6	No. 10 OTU Whitley "K"	*U214* Damaged
May 15	No. 58 Halifax "M" No. 10 OTU Whitley "M"	*U463* Sunk *U591* Damaged
May 16	No. 58 Halifax "R"	*Tazzoli* Sunk
May 25	No. 10 OTU Whitley "J" Sunderland attacks	*U523* Damaged *U441* Damaged, aircraft downed; *U666*, *U594*, *U648*, *U662*, *U459* down aircraft
May 31	No. 58 Halifax "R," No. 228 Sunderland "X," and RAAF No. 10 Sunderland "E" No. 224 Liberator "Q" No. 336 Beaufighter "B"	*U563* Sunk *U621* Damaged *U418* Sunk (with rockets)

The 1943 convoy battles also introduced very effective new airborne antisubmarine weapons and supporting activities. Air-launched torpedoes with acoustic homing heads went into action for the first time On May 12. Loran (long range navigation) began service over most of the North Atlantic. It allowed navigators to plot extremely accurate fixes at distances of 600 miles during the day and 1200 miles at night regardless of weather. Magnetic Airborne Detector (MAD) equipment enabled its operators to detect submarines at depths of 200 feet or more and determine their position relative to an airplane. Sonobuoys used in connection with MAD could pick up submarine sound waves at a distance of two miles and transmit that identification about seventeen miles to a height of 500 to 1,000 feet. These new technologies added to the decimation of U–boats by Allied ships and aircraft.[39]

May 1943 was probably the turning point in the Battle of the Atlantic. The Germans lost twenty-eight U–boats in the North Atlantic. Surface vessels sank eleven of them, while aircraft and surface vessels combined to share credit for two. Land-based aircraft alone destroyed nine, while carrier aircraft accounted for three. Three more sank as a result of collision or unknown causes. In actions in the Bay of Biscay, the Mediterranean, and North

American coastal waters during the month, twenty-one more U–boats went to the bottom. Aircraft accounted for sixteen of these. Germany's shipyards and training program for submariners could not replace such losses.[40]

On November 7, 1943, Admiral Dönitz ordered his boats to withdraw from the main North Atlantic convoy routes. In doing so he conceded victory in the contest for Atlantic sea lanes to the Allies. Of the more than 700 German U–boats destroyed in the Atlantic and Arctic Oceans, and in the immediate vicinity of the British Isles between 1939 and 1945, 305 U–boats fell victim to Allied land-based aerial forces while another twenty-eight went to the bottom because of combined land-based aircraft and surface ship action.[41]

Combating Surface Raiders

Allied land-based aircraft also played a major role in preventing heavy German warships from entering the sea lane contest more than occasionally. Winston Churchill probably had the most comprehensive grasp of what it took to defeat Nazi Germany. Writing after victory, he noted that fear of the RAF kept Germany's battleships and battlecruisers in port for most of the war.[42]

Nazi Germany's navy was not, relative to Allied navies, as powerful as that of Kaiser Wilhelm. The *Kreigsmarine* did not have the strength to challenge the Royal Navy in a fleet engagement. But one or two of its major surface combatants could destroy any convoy escort and obliterate any merchant shipping they encountered. Because of this capability, prewar British plans called for the RAF to bombard German capital ships in their harbors. The Royal Navy was to engage them when they put to sea.[43]

When war came On September 3, 1939, the RAF set out within forty-eight minutes after Britain issued a declaration of war with Germany to find the *Kreigsmarine*'s ships. A reconnaissance aircraft photographed them where the Kiel Canal empties into the North Sea, at Wilhelmshaven, and in Schillig Roads. The latter embayment of the North Sea has Wilhelmshaven on its western shore and Bremerhaven on its eastern shore. Fifty-four Blenheim and Wellington bombers took off on September 4 for a major raid in flight-strength increments.[44]

Flight Lt. K. C. Doran, in one of No. 110 Squadron's Blenheims, and flying at fifty to 100 feet in and out of heavy clouds, came upon the pocket battleship *Admiral Scheer* in Schillig Roads. Three of the Blenheims in his flight made bomb runs on the surprised Germans from 500 feet. Doran's 500-pound general purpose bombs hit the *Scheer's* armored deck amidships and bounced off into the sea. A second Blenheim's bombs fell into the sea. Other aircraft in the flight could not complete their attacks. One crashed into the training cruiser *Emden*, killing the aircrew and several sailors. The remaining aircraft participating in the raid suffered heavy casualties from antiaircraft and fighter opposition but inflicted no damage. Several were unable to find the target. At the mouth of the Elbe, Wellingtons found the battlecruisers *Scharnhorst* and *Gneisenau* anchored. But horizontal bombing from high altitude did no damage to the stationary vessels.[45]

In subsequent weeks, Bomber Command sent its airplanes out on daylight squadron-strength reconnaissance hoping to find German warships at sea in clear weather. One lesson of the September 4 raid was that the ships, if found, should be approached from bow or stern. The armed reconnaissance flights discovered that the RAF dictum that three bombers in formation could fight off fighters was flawed. Instead, the bombers usually went down in flames. The reconnaissance in force continued through the end of 1939 and inflicted little serious damaged. Wellingtons, as a part of a policy to "conserve the bomber force," were

ordered not to go below 2,000 feet. Aircraft and aircrew losses were high, in some cases as much as 50 percent.[46]

RAF Attacks on Major German Warships in Port[47]

Date	Location	Results
Jul 19-20, 40	Wilhelmshaven	*Tirpitz* & *Scheer* unharmed
Mar 30-31, 41	Brest	*Gneisenau* & *Scharnhorst* unharmed
Apr 3-4, 41	Brest	*Gneisenau* & *Scharnhorst* unharmed
Apr 6, 41	Brest	*Gneisenau* torpedoed by Beaufort, damaged enough to require dry dock repairs
Apr 10-11, 41	Brest	*Gneisenau* in dock after hit by RAF aerial torpedo, hit by four bombs further damaged
Apr 12-13, 41	Brest	*Gneisenau* & *Scharnhorst* unharmed
May 4-7, 41	Brest	*Gneisenau* & *Scharnhorst* unharmed
Jun 13-14, 41	Brest	*Gneisenau* & *Scharnhorst* unharmed
Jul 24, 41	Brest	*Scharnhorst* hit five times, suffered serious electrical system damage
Sep 13-14, 41	Brest	*Gneisenau* & *Scharnhorst* unharmed
Dec 17-18, 41	Brest	*Gneisenau* slightly damaged, *Scharnhorst* unharmed
Feb 26-27, 42	Kiel	*Gneisenau* damaged, remains under repair until laid up in 1943
Mar 30, 42	Trondheim	*Tirpitz* unharmed
Apr 27-28, 42	Trondheim	*Tirpitz* unharmed
Nov 12, 1944	Trömso	*Tirpitz* capsized and sunk

On January 23, 1941, the *Gneisenau* and *Scharnhorst* sailed from Kiel to raid Allied shipping in the Atlantic. They evaded surface and air patrols to embark on a two-month long

voyage. Aircraft sighted them only three times as they sank twenty-two ships. Ship-borne planes made two of the sightings. A Coastal Command Hudson reported them 200 miles from Brest, where they arrived on March 22. Repeated air raids on them in port thereafter cost the RAF heavily, but kept the two ships out of action for the rest of the war.[48]

The sinking of the *Bismarck*, a story told often, involved land-based air only briefly, but importantly. As the battleship attempted to reach the safety of Brest after being seriously damaged in encounters with Royal Navy ships and carrier aircraft, British forces lost contact with her. A No. 209 Squadron Catalina, piloted by an American Navy ensign giving an RAF flier a check ride, spotted the Bismarck 700 miles west of Brest. This quickly led to her final dispatch by British ships and planes on May 27, 1941.

Other German heavy warships sunk in harbor by RAF bombing included the battlecruiser *Admiral Scheer* in 1944 and the cruisers *Emden*, *Koln*, and *Lützow* in 1945. All had either been relegated to the role of floating artillery to support ground action or laid up in 1943 to make men and materials available for the U–boat war.[49]

Armored warships lying in harbor, tied up to docks, or in dry docks proved to be tough targets. High altitude precision horizontal bombing proved generally ineffective against these tethered targets. Low-level horizontal bombing brought better results but cost the attackers dearly. RAF efforts to destroy German heavy surface combatants before they could break out to raid Allied shipping at times required as much as 10 percent of Bomber Command's efforts. When ships such as the *Scharnhorst* and *Gneisenau* were under repair and not at sea threatening critical Allied merchant tonnage making trans-Atlantic voyages, Britain's navy did not have to allocate its own battleships and their escorts to defend against them.

Arctic Convoys

Allied supply convoys to the Soviet ports of Murmansk and Archangel in the Arctic began on August 21, 1941. The first one sailed only sixty days after Hitler turned on his Soviet ally and constituted a significant demonstration of support for the newest Ally, the Soviet Union. The beleaguered British enthusiastically embraced their former enemy. America followed Britain's lead. British and American aircraft, tanks, trucks and other war supplies were soon loaded aboard freighters that steamed from ports in Britain, Canada, and the United States to Soviet ports in the Arctic. By the time the war ended these convoys had moved 25.2 percent of all war supplies sent by the Allies to the Soviet Union. Combined with the 47.1 percent of these supplies sent to the USSR across the Pacific, and the 23.8 percent sent through Persia, Arctic convoy deliveries proved critical in the war against Germany.[50]

Allied shipping in the Arctic risked attack from German air power, surface naval forces, and submarines. Although British (later both British and American) warships escorted the merchant ships, the convoys sailed beyond the reach of land-based Allied aircraft. On occasion they had the protection of aircraft carriers, merchant aircraft carriers, or merchant ships able to catapult single aircraft into the sky. On rare occasion, the convoys received protection of land-based aircraft of the Soviet Air Force. This aerial support, however, only came in the vicinity of Soviet bases east of Norway.

The convoys, whether originating in the United Kingdom or North America, sailed as far as possible from the reach of German land-based air power. They steamed northwest of Iceland, thereafter skirting the edge of drifting Arctic ice but within the range of German long-range reconnaissance aircraft. East of Iceland and north of Jan Mayen Island, the convoys came within range of German attack aircraft.

Hitler dispatched substantial *Luftwaffe* forces plus *Kreigsmarine* capital ships and their escorts and U–boats to the Arctic to oppose the convoys. Fliegerführer Nord established his headquarters at Oslo, Norway, where he could cooperate with the admiral in charge of Marinegruppe Nord. The fliegerführer directed all air reconnaissance, air escort of ships, and anti-shipping strikes north of 58˚ North. In 1943, the Marinegruppe war diary would record that cooperation with the northern air command was good, but hampered by a limit on bombers made available by the *Luftwaffe* High Command and by a shortage of aviation fuel.[51]

Luftwaffe formations opposing Allied Arctic convoys operated from bases in occupied Norway. New air bases opened just south of North Cape at the extreme northern tip of mainland Norway. German land-based aerial forces threatening the convoys included bombers, dive-bombers, and the *Luftwaffe*'s only torpedo-carrying aircraft. Torpedo pilots, trained at the *Luftwaffe*'s three-week torpedo school in Grosetto, Italy, usually used the "Golden Comb" attack. This low-level line-abreast approach to targeted vessels provided the maximum spread of torpedoes. When possible, the approach came at twilight so that the aircraft were obscured by a darkened sea while the ships they attacked were silhouetted against the sky. The most successful raids proved to be those that combined horizontal and dive-bombing with torpedo attacks. High and medium-altitude horizontal bombing, while not too effective against moving targets, often distracted defensive efforts and permitted the dive bombers and torpedo-carrying aircraft to deliver devastating blows.

Luftwaffe Order of Battle in Norway[52]

Base	Organization	Maximum # Acft	Type Aircraft
Banak	Luftflotte 5 KG 30 I and II/KG 26 1(F)/22 1(F)/124 Westa 6		Headquarters Ju 88 He 111 Ju 88(LR) Ju 88(LR)
Bardufoss	I and II/KG 26 1(F)/22 1(F)/124		He 111 Ju 88(LR) Ju 88(LR)
Kirkenes	I/StG 5 1(F)/22 1(F)/124		Ju 87 Ju 88(LR) Ju 88(LR)
Stavanger	Coastal Gruppen 406 Coastal Gruppen 906		He 115 Bv 138 He 115 Bv 138

Tromsö	Coastal Gruppen 406 Coastal Gruppen 906		He 115 Bv 138 He 115 Bv 138
Trondheim	I/KG 40		Fw 200
Various	JG 5		Me 109

The number of aircraft of any particular type at a given location fluctuated with operational demands, losses, and maintenance programs. In February 1942, at the beginning of the campaign against the Arctic convoys, the German anti-shipping forces in Norway consisted of sixty long-range bombers, thirty dive-bombers, thirty single-engine fighters of the *Luftwaffe* and fifteen German Navy float planes. In addition to attacking Allied convoys to the Soviet Arctic, these anti-shipping aircraft protected nickel mines, interdicted shipping in the White Sea, and bombed Russian ports and communications in their operations area. They also supported army operations on the Finnish front.[53]

Allied Convoy PQ.12 became the first in the Arctic to suffer *Luftwaffe* attack. On March 5, 1942, a German reconnaissance aircraft reported the convoy's location south of Jan Mayen Island. Although bad weather prevented air strikes from being launched against the convoy, the battleship *Tïrpitz* and three escorting destroyers sailed to intercept it. They located and sank only *Ijora*, a Soviet freighter straggling behind the main convoy.

A few weeks later, on March 27, a 2/KFlGr 406 Bv 138 sighted Convoy PQ.13. The convoy, dispersed by bad weather, soon lost two freighters to air attack and three others to destroyer and U–boat attack. Ju 88s from III/KG 30 led by Captain Hajo Herrmann bombed and sank the freighters *Raceland* (4,815 tons) and *Empire Ranger* (7,007 tons) while destroyers and U–boats sent three other Allied merchantmen to the bottom. When Convoy PQ.13 did reach Murmansk, German bombers sank the 6,850-ton *Empire Straight* and 4,747-ton *New Winminster City* in the harbor. Southbound return convoys also came under *Luftwaffe* attack. On April 13, III/KG 30 Ju 88s sank the 7,164-ton *Empire Cowper* and 5,486-ton *Harpalion* in Convoy QP.10. Subsequent air attacks on the convoy did no serious damage.

In early May 1942, the first twelve torpedo-equipped aircraft of I/KG 26 arrived in Norway. The dive bomber strength of KG 30 had reached about sixty Ju 88s by this time. In addition to dropping conventional bombs, the Ju 88s also could drop circling torpedoes that descended into the ocean on parachutes, but because these torpedoes ran in erratic circles they posed little danger to ships. On May 2, I/KG 26 He 111s torpedoed and sank the 5,848-ton *Botavon* and 3,807-ton *Cape Corso* in Convoy QP.11. They also damaged the 6,153-ton *Jutland*, which *U251* finished off. Convoy PQ.15, sailing north between April 26 and May 7, lost three ships to torpedo aircraft.

A week later, *Luftwaffe* reconnaissance located British cruisers and destroyers returning from escorting merchant ships to Murmansk. Torpedo and bombing attacks by II/KG 26 and III/KG set the cruiser *Trinidad* afire. After the uncontrollable fire drove the crew off their ship, other British vessels used gunfire to sink it on May 15.

Luftwaffe flights on May 25, 1942, located Convoy PQ.16 sailing from Iceland to Murmansk. II/KG 26 He 111s and III/KG 30 He 111s and Ju 88s attacked immediately. They damaged the freighter *Carlton* while losing one torpedo aircraft and two bombers to anti-aircraft fire. On May 27, more than 100 aircraft from KG/30 and I/KG 26 returned to the

convoy. Bombing sank the freighters *Alamar*, *Mormacsul*, *Empire Lawrence*, and *Empire Purcell* while a torpedo attack sank the *Lowther Castle*. The intensive assault accounted for more than 30,000 tons of badly-needed Allied shipping. The raid also damaged four freighters and the escorting destroyer *Garland*. Only three German aircraft were lost.

On May 30, 1942, as the surviving ships of the convoy entered the White Sea, they faced Ju 87 dive-bombers. When aerial reconnaissance indicated that none of the ships had reached a Russian port, the *Luftwaffe* concluded that it had destroyed the entire convoy. The dive-bombing, however, had failed to sink or seriously damage any other ships. When the convoy came within range of Soviet land-based fighters, Soviet Northern Fleet interceptors opposed the *Luftwaffe* attack aircraft.

The *Luftwaffe* also interdicted the convoys by airdropping mines at the entrance to Kola Inlet. In addition, German air raids struck at the ships even after they had reached an Arctic port. On June 1-2, 1942, I/St G Ju 87s destroyed the 6,850-ton British freighter *Empire Starlight* and damaged the Soviet submarine *Shch-404* at Murmansk. Sea mines airdropped into Kola Inlet sank two American freighters, the 5,686-ton *Steel Worker* on June 3 and 4,823-ton *Alcoa Cadet* on June 21. On June 24, I/St G Ju 87s sank the British minesweeper *Gossamer* in Kola Inlet.

In early July 1942, 1/KFlGr 906 He 115s attacked Convoy QP.13 with no success. Convoy PQ.17 did not escape air assault despite a heavy escort. The convoy included thirty-six merchant ships, two rescue vessels, and a tanker to refuel escorting warships. The convoy escort included two antiaircraft cruisers, six destroyers, four corvettes, seven minesweepers and trawlers, and two submarines.

After the effort against Convoy PQ.16, most of the *Luftwaffe* formations in Norway had gone to the Finnish front. Only the torpedo-equipped formations had remained in Norway because of the difficulty of relocating their stocks of torpedoes and ground crews. By the time Convoy PQ.17 had left Iceland for Archangel on June 27, however, German naval authorities had decided to interdict the sea lane to northern Russia with all the forces at their disposal: land-based aircraft, surface combatants, and U–boats. The surface combatants available included the battleship *Tirpitz*, cruiser *Hipper*, and four destroyers at Trondheim and the battlecruisers *Scheer, Lützow*, and six destroyers at Narvik.[54]

During the last two weeks of June 1942, I/KG 40 Fw 200s from Trondheim had reported the assembly of Convoy PQ.17 in the harbor at Reykjavik, Iceland. German spies at the harbor and radio intercepts confirmed the aerial reconnaissance. As the convoy left Reykjavik on June 27, a Fw 200 flying low to get beneath fog cover nearly crashed into the escorting cruiser *London*.

With Convoy PQ.17 revealed, the *Luftwaffe* rebuilt its strength in northern Norway. A total of 264 aircraft threatened the convoy.

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Luftwaffe Strength in Norway, Late June 1942

Type of Aircraft	Number
Ju 88 (LR bombers)	103
He 111 (torpedo-bombers)	42
He 115 (torpedo float-planes)	15
Ju 87 (dive-bombers)	30
Fw 200 (LR reconnaissance)	8
Ju 88 (LR reconnaissance)	22
Bv 138 (LR reconnaissance)	44

When the fog cleared on June 30, aerial reconnaissance and trailing U–boats relocated the convoy steaming north. It would remain beyond the reach of *Luftwaffe* strike aircraft until it changed course north of Bear Island and steamed east. That course took it within reach of air bases in Norway at Bardufoss, Banak, and Kirkenes.

Convoy PQ.17's strong escort drove four U–boats away when they attempted to attack the convoy on July 2. An air raid by eight Gruppe 406 He 115s sortieing from their base at Sörreisa near Trömso, Norway, also failed to score any kills when heavy antiaircraft thwarted the attack.

Successful air attacks on Convoy QP.17 began on July 4 when the fog cleared and the convoy was located north of Bear Island in the Barents Sea. An He 115 from 1/FlGr 906 torpedoed the 7,191-ton freighter *Christopher Newport*. The attack so severely damaged the ship that her escorts later had to sink her. On the evening of July 4 when the convoy was still in the Barents Sea about 800 miles northwest of Archangel, I/KG 26 torpedo attacks by twenty-five He 111s with Captain Bernot Eicke in command sank the 4,841-ton freighter *Navarino* and damaged the 7,177-ton *William Hooper*. *U334* later finished off the *Hooper*. Aerial torpedoes also sent the 6,144-ton Soviet tanker *Azerbaidzhan* to the bottom. In destroying the three ships, the *Luftwaffe* lost three aircraft. The Germans' after action review concluded that poor coordination between bomber and torpedo aircraft limited the effectiveness of the strikes.

On July 5, 1942, the British Admiralty, fearing attack by heavy German surface ships, ordered the ships in Convoy PQ.17 to scatter. Germany surface combatants, however, sortied only briefly, leaving Altenford, Norway, on the morning of July 5 and retiring later that day because of an anticipated threat from British carrier aircraft.[56]

German air raids that followed the scattering of Convoy PQ.17 devastated the fleeing merchantmen. KG 30's three groups led by Captains Konrad Kahl, Erich Stoffregen, and Hajo Herrmann took turns attacking. Lieutenant Clausener's Ju 88 dive-bombing quickly sank the 6,476-ton *Peter Kerr*. Other bombs sank the 5,564-ton *Washington*, the 5,203-ton *Bolton* Castle, the 5,644-ton *Pan Kraft*, and the 1,559-ton rescue ship *Zaafaran*. Ships damaged by air attack on July 5 included the 7,168-ton *Paulus Potter*, the 7,195-ton *Earlston*, the 6,645-ton *Empire Bryon*, and the fleet tanker *Alderdale*. The *Potter*, abandoned, drifted for a week until sunk by *U255*.

Further air attacks by II/KG 30's Captain Dohne and Lieutenant Bühler sank the 5,411-ton tanker *Pan American* on July 6 and damaged the 5,060-ton *Hoosier*, the 5,255-ton El *Capitan*, and *Samuel Chase* on July 10. U–boats later finished off the *Hoosier* and *El Capitan*.

In all, *Luftwaffe* raids on Convoy PQ.17 over a period of five days sank eight ships totaling 48,218 tons and damaged eight other vessels totaling 54,093 tons which U–boats subsequently sank. During the 202 sorties required, *Luftwaffe* units expended sixty-one torpedoes and 212 tons of bombs. They lost five aircraft.

The convoy also lost nine ships directly to U–boats. Only eleven of Convoy PQ.17's thirty-six merchant ships finally reached their destination port of Archangel. Allied war matériel lost as a result of the Convoy PQ.17 sinkings included 3,350 military vehicles, 430 tanks, and 210 aircraft.[57]

Despite its success, the destruction of Convoy PQ.17 highlighted continuing coordination problems between the *Luftwaffe* and *Kreigsmarine*. General Major Stumpf, commanding officer of Luftflotte 5, claimed credit for destruction of the whole convoy. U–boat commanders complained that they had been endangered by the bombing attacks. The German naval staff claimed sole credit for shadowing the convoy.

Convoy PQ.18, located by *Luftwaffe* Bv 138 flying boat on September 8, 1942, near Jan Mayen Island, proved more challenging. The convoy consisted of thirty-nine freighters and a tanker plus two Royal Navy tankers and a rescue ship. The British aircraft carrier *Avenger* augmented the convoy's large escort of antisubmarine and antiaircraft vessels. Hurricanes from the carrier immediately forced the *Kreigsmarine* Bv 138 flying boats to shadow the convoy from maximum range.

German air attacks on Convoy PQ.18 began on September 13. KG 30 Ju 88 dive-bombing was immediately followed by I and III/KG 26 torpedo attacks. Prior to the attack, the arrival of III/KG 26 had increased the *Luftwaffe* torpedo forces by thirty-five Ju 88s, which could be adapted to either dive or torpedo bombing. Twenty-four I/KG 26 He 111s from Bardufoss approached the convoy in two waves flying low to minimize radar warning. Major Werner Klümper, former chief instructor of the *Luftwaffe* torpedo school at Grosseto, Italy, commanded them. A third wave of 16 Ju 88s of III/KG 26 from Banak under Captain Klaus Nocken followed.

Despite heavy antiaircraft fire, the He 111s and Ju 88s launched thirty torpedoes toward Convoy PQ.18's starboard column. Fortunately for these attacking aircraft, the *Avenger's* Hurricanes were not on the scene but still in pursuit of KG 30's Ju 88s. No torpedo planes went down, although six were so badly damaged that they never flew again. The air assaults destroyed the 5,432-ton *Wacosta*, the 4,826-ton *Oregonia*, the 6,131-ton *Macbeth*, the 5,441-ton *Africander*, the 6,209-ton *Empire Stevenson*, and the 3,124-ton *Sukhona*. In addition, U–boats sank three other ships in the convoy totaling 19,742 tons.

Interference from Hermann Göering himself minimized further damage to Convoy PQ.18's merchant ships. The *Luftwaffe* commander-in-chief ordered that KG 26 concentrate on the *Avenger* during September 14 raids. When Klümper led twenty-two He 111's back to the convoy to attack the carrier, misidentification of a large merchantman as the carrier endangered Klümper's group. After aborting off an initial attack, the He 111s flew over the convoy at low altitude to reach the carrier, exposing themselves to the guns of the merchant ships and their escorts. Ten Hurricanes from the *Avenger* attacked the German torpedo bombers when they were outside the curtain of anti-aircraft fire. The combination of fighter interception and AA fire destroyed five of the He 111s. Nine others suffered such heavy damage that they had to be written off after returning to base. The fighters and flak made

an effective attack on the convoy impossible. Only Klümper and one other pilot succeeded in dropping their torpedoes. These had to be launched at a too-acute angle and the *Avenger* easily took evasive action. After September 14, fog and low clouds precluded further air attacks on Convoy PQ.18.

For most of the rest of 1942 unfavorable weather and strong escorts prevented further significant attacks by aircraft on the Arctic convoys. Between October 29 and November 9, however, KFlGr 406 located freighters steaming between Iceland and Murmansk. II/KG 30 Ju 88s sank the 7,363-ton *Dekabrist* and damaged two other ships which U–boats later eliminated. Between December 15 and December 25, 1942, *Luftwaffe* attacks destroyed five ships of Convoy JW.51A in Kola Inlet, off Murmansk. *Luftwaffe* reconnaissance also located Convoy JW.51B sailing from Loch Ewe, Scotland, to Murmansk, triggering Kriegsmarine interception of the convoy.

Scattered *Luftwaffe* attacks on Arctic convoys in 1943 never repeated the successes achieved in 1942 raids. He 115 torpedo aircraft from 1/KFlGr 406 unsuccessfully attacked Convoy JW.52/RA.52 on January 24, 1943, losing two aircraft in the process. After *Luftwaffe* reconnaissance located Convoy JW.53 on February 23, I/KG 30 Ju 88s damaged one 7,058-ton ship on February 25. Subsequent raids on the convoy while it was at sea produced no results. When the convoy reached Murmansk, I/St G 5 dive-bombers between February 27 and 28 damaged three ships totaling 11,341 tons. On March 6 and March 13, I/St G 5 Ju 87s and I/KG 30 Ju 88s destroyed the 7,173-ton *Ocean Freedom* and damaged a 6,744-ton merchant ship. In the meantime, intense AA fire drove twelve I/KG 30 Ju 88s away from Convoy RA.53.

As 1943 continued, *Luftwaffe* attacks on Arctic convoys decreased as did the frequency of the convoys. All torpedo aircraft devoted to air interdiction of the Arctic convoys began moving to the Mediterranean after the Allied invasion of North Africa on November 7, 1942.

Only He 115 float planes, dive bombers, and reconnaissance aircraft remained at Norway's Arctic bases. They faced strong opposition from convoy escorts. They also received counter-air strikes against their home bases by Soviet Naval Air units.

In 1944, stronger convoy escort groups included small aircraft carriers. Carrier aircraft succeeded in blocking most *Luftwaffe* reconnaissance and strike efforts. They also cooperated effectively with the convoys' surface escorts to drive off or sink attacking U–boats. Eighteen more convoys sailed from Loch Ewe to Soviet Arctic ports after 1943. The Allies lost only nine of 537 vessels making the passage.

Luftwaffe interdiction of Allied convoys to the Soviet Arctic illustrated several principles for successful use of land-based air power in maritime operations that became evident in other campaigns. These principles demanded: (1) concentration of forces, for a single strong air attack was more effect that a series of weak attacks; (2) aerial forces trained and equipped for maritime operations; (3) coordination between air and naval forces. Since little more than twenty years had passed between the November 11, 1918, Armistice that ended World War I and the German invasion of Poland that inaugurated World War II, it is surprising that these same principles required some time to be put into practice by British aviators who, at the end of the 1914-1918 war, had directed strong land-based aerial maritime forces. Although part of the RAF's unreadiness for maritime war can be attributed to the Royal Navy's prewar belief that sonar would eliminate the U–boat menace, the leaders of the aerial forces of a great seafaring nation should have devoted more thought and effort to the requirements of naval warfare during the 1920s and 1930s. As it was, the Allies won the critical struggle for control of trans-Atlantic sea lanes by the narrowest of margins. Effective air attacks on the German Navy's capital ships at the onset of the war might have

freed many of the battleships and cruisers of Britain's Home Fleet for duty elsewhere with resulting significant effects in the Far East.

Endnotes to Chapter II

1. Horst Boog, "*Luftwaffe* Support of the German Navy," in *The Battle of the Atlantic 1939-1945*, Stephen Howarth and Derek Law, eds. (Annapolis, Md.: Naval Institute Press, 1994), pp. 306.
2. Adm Karl Dönitz, quoted in Horst Boog, "*Luftwaffe* Support of the German Navy," p. 317.
3. Quoted in Eberhard Rössler, "U–boat Development and Building," in Howard and Law, *The Battle of the Atlantic 1939-1945*, and David Syrett, *The Defeat of the German U–Boats: The Battle of the Atlantic* (Columbia: University of South Carolina Press, 1994), p. 13.
4. Boog, "*Luftwaffe* Support of the German Navy," pp. 306-11.
5. John Terraine, *A Time for Courage: The Royal Air Force in the European War, 1939-1945* (New York: Macmillan Publishing Company, 1985), p. 225.
6. *Ibid*., p. 713.
7. Terraine, *A Time for Courage: The Royal Air Force in the European War, 1939-1945*, p. 239; Deighton, Len, *Blood, Tears, and Folly: An Objective Look at World War II* (New York: Harper Perennial, 1994), p. 73.
8. Deighton, *Blood, Tears, and Folly: An Objective Look at World War II*, p. 67.
9. *Ibid*.; Capt S. W. Roskill, RN, *The War at Sea 1939-1945, Volume I, The Defensive* (London: Her Majesty's Stationery Office, 1954), p. 599.
10. Terry Hughes and John Costello, *The Battle of the Atlantic* (New York: Dial Press, 1977), p. 48, p. 133.
11. J. Rohwer and G. Hummelchen, *Chronology of the War at Sea 1939-1945, The Naval History of World War Two* (Annapolis, Md.: Naval Institute Press, 1992), p. 11.
12. John Herington, *Air War Against Germany and Italy 1939-1945* (Canberra: Australian War Memorial, 1954), pp. 25-26.
13. Hughes and Costello, *The Battle of the Atlantic*, p. 130-31; Roskill, *The War at Sea 1939-1945, Volume I, The Defensive*, pp. 615-16.
14. Deighton, *Blood, Tears, and Folly: An Objective Look at World War II*, pp. 104-5.
15. Cdr Jerry C. Russell, USN, *Ultra and the Campaign Against The U–Boats in World War II*, Studies in Cryptology, NSA [National Security Agency], Document SRH-142 (Carlisle Barracks, Pa.: U.S. Army War College, May 1980), p. 8; John Winton, *Ultra at Sea* (New York: William Morrow and Company, Inc., 1988), pp. 94-95.
16. Roskill, *The War at Sea, Volume I, The Defensive*, p. 602; Terraine, *A Time for Courage: The Royal Air Force in the European War, 1939-1945*, p. 403.
17. Headquarters First Air Force, *Antisubmarine Command, 7 December 1941 to 15 October 1942*, Vol. I: *Text*, Microfilm 00199294, AFHRA, Maxwell AFB, Ala.
18. Henry L. Stimson, *On Active Service in Peace and War* (New York: Harper & Brothers, 1948), pp. 511-13.
19. Syrett, *The Defeat of the German U–Boats: The Battle of the Atlantic*, p. 13.
20. Hughes and Costello, *The Battle of the Atlantic*, p. 167.
21. Roskill, *The War at Sea, Volume I, The Defensive*, p. 601.
22. *Ibid*., pp. 599-601, p. 614, p. 618.
23. Headquarters First Air Force, *Antisubmarine Command, 7 December 1941 to 15 October 1942*, Vol. I: *Text*, p. 58.
24. *Ibid*. p. 59.
25. Samuel Eliot Morison, *The Battle of the Atlantic September 1939-May 1943, Volume I* in *History of United States Naval Operations in World War II* (Boston: Little, Brown and Company, 1975), p. 240.

26. Quoted in Hughes and Costello, *The Battle of the Atlantic*, p. 220.
27. *Ibid*., pp. 230-31.
28. Robert W. Love Jr., *History of the U.S. Navy, Volume Two, 1942-1991* (Harrisburg: Stackpole, 1992), pp. 80-82.
29. Roskill, *The War at Sea 1939-1945, Volume II, The Period of Balance*, p. 202.
30. Information in this and the following tables is summarized from Rohwer and Hummelschen, *Chronology of the War at Sea 1939-1945, The Naval History of World War Two*, pp. 155-83.
31. Paul M. Sutcliffe, "Operational Research in the Battle of the Atlantic," in Howard and Law, *The Battle of the Atlantic 1939-1945*, pp. 419-29.
32. Terraine, *A Time for Courage: The Royal Air Force in the European War, 1939-1945*, p. 432.
33. Hughes and Costello, *The Battle of the Atlantic*, p. 231.
34. Syrett, *The Defeat of the German U–Boats*: *The Battle of the Atlantic*, p. 15-16.
35. Henry Probert, "Allied Land-Based Anti-Submarine Warfare," in Howard and Law, *The Battle of the Atlantic 1939-1945*, p. 379.
36. Hughes and Costello, *The Battle of the Atlantic*, p. 240, pp. 260-61.
37. *Ibid*., p. 252.
38. Denis Richards and Hilary St. George Saunders, *Royal Air Force 1939-1945*, *Volume 2, The Fight Avails* (London: Her Majesty's Stationery Office, 1974), p. 373, p. 375.
39. Terraine, *A Time for Courage*: *The Royal Air Force in the European War, 1939-1945*, p. 446; "Antisubmarine Activities of the Army Air Forces Through I Bomber Command and AAFAC," "SADU [Submarine Air Defense Unit]," ms. draft report in File 424.04C.057, AFHRA, Maxwell AFB, Ala.
40. Roskill, *The War at Sea 1939-1945*, *Volume II, The Period of Balance*, pp. 470-71; Terraine, *A Time for Courage: The Royal Air Force in the European War, 1939-1945*, p. 450.
41. Probert, "Allied Land-Based Anti-Submarine Warfare," p. 385.
42. Winston S. Churchill, *The Second World War, The Grand Alliance* (Boston: Houghton Mifflin Company, 1951), p. 150.
43. Winston S. Churchill, *The Second World War, The Gathering Storm* (Boston: Houghton Mifflin Company Books, 1948), p. 412-13.
44. Denis Richards, *Royal Air Force 1939-1945, Volume 1, The Fight at Odds* (London: Her Majesty's Stationery Office, 1974), p. 39.
45. Terraine, *A Time for Courage: The Royal Air Force in the European War, 1939-1945*, pp. 98-100; Clajus Bekker, *Hitler's Naval War*, Frank Zeigler, trans. and ed. (New York: Doubleday & Company, Inc., 1974), pp. 35-36.
46. Terraine, *A Time for Courage: The Royal Air Force in the European War, 1939-1945*, pp. 101-3.
47. Information extracted from Rohwer and Hummelchen, *Chronology of the War at Sea 1939-1945*, pp. 28-317.
48. Vice Adm. Sir Arthur Hezlet, RN, *Aircraft and Seapower* (New York: Stein and Day, 1970), p. 186.
49. Bekker, *Hitler's Naval War*, pp. 384-85.
50. Colin S. Gray, *The Leverage of Sea Power* (New York: The Free Press, 1992), pp. 242-43.
51. Quoted in Horst Boog,"*Luftwaffe* Support of the German Navy," p. 314.
52. Bekker, *The Luftwaffe Diaries: The German Air Force in World War II*, p. 267.

53. Air Ministry [U.K.], *The Rise and Fall of the German Air Force (1939-1945)*, Air Ministry Pamphlet No. 248 (New York: St. Martin's Press, 1983), reprint of 1948 edition issued in London, p. 113.
54. Capt S. W. Roskill, RN, *The War at Sea 1939-1945, Volume II, The Period of Balance* (London: Her Majesty's Stationery Office, 1956), pp. 135-37.
55. Air Ministry, *The Rise and Fall of the German Air Force (1939-1945)*, p. 114.
56. See Roskill, *The War at Sea, 1939-1945, Volume II, The Period of Balance*, pp. 139-42, on the decision to scatter Convoy PQ.17.
57. Bekker, *The Luftwaffe Diaries: The German Air Force in World War II*, p. 270.

CHAPTER III

COASTAL AND MEDITERRANEAN OPERATIONS

During World War II land-based air power not only reached out into the vast Atlantic in the naval battles of the Western hemisphere. It also became a vital element in the destruction of coastwise trade, fishing fleets, and warships. Even before the war, these were integral parts of the economic and naval strength of Allied and Axis countries, and the onset of the conflict emphasized the significance of coastal waters. Vessels ranging from small patrol boats to cruisers patrolled their own coasts and conducted offensive operations in enemy waters. Coastal shipping assumed greater importance as wartime requirements pushed road and rail transport to their limits. During the war western Europeans imported less food and the harvests from coastal fisheries became more valuable to them.

Both sides identified the destruction or protection of coastwise maritime traffic as military objectives of air and naval power. In addition to bombing and strafing, air forces joined surface ships and submarines in mining coastal waters. Throughout the war, opposing air arms also raided enemy air and naval bases.

Coastal Operations

The Royal Air Force (RAF) and Luftwaffe were the air arms most heavily engaged in the coastal fight after hostilities began in 1939. British and German air roles reversed as the war continued. During the first three years of the war RAF squadrons frequently found themselves fully occupied elsewhere. Beginning in 1941, ever-smaller Luftwaffe resources went from maritime operations to higher priority assignments.

Land-based air forces found it hard to fit smoothly into the fighting in restricted seas. When they did participate, aviators on both sides often mistook their own ships for enemy craft. Some in Britain and Germany questioned whether the cost in highly trained aircrews and specially modified aircraft engaged in this campaign was not too high. Pilots and navigators skilled in ocean navigation and critically needed elsewhere often died within sight of land. Enemy action often destroyed scarce long-range aircraft capable of operating hundreds of miles from land sometimes only an hour or two from their home airfields.

The coastal air campaign started almost as soon as the war broke out. Hermann Göring, Commander-in-Chief of the German Air Force, established the 10th Fliegerdivison on September 3, 1939. The new formation's purpose was to attack British shipping. That same day the RAF sent fifty-four twin-engine Blenheim and single-engine Wellington bombers over the North Sea in an unsuccessful effort to attack German shipping. The British launched four more, much smaller, daylight bombing raids against the German fleet at Kiel and Wilhelmshaven in 1939. They achieved little, suffered immense losses between 25 and 50 percent, and at first operated with political restrictions that denied any attacks German ships if they were tied up to a dock. British leaders feared that if their bombs fell on German soil it would provoke retaliatory terror bombing. Luftwaffe attacks on the British fleet at its Forsyth and Scapa Flow anchorages likewise accomplished little.[1] Aerial mining and counter-air attacks began in November 1939. On the twentieth of that month, German sea planes dropped forty-one mines off Britain's East Coast. The RAF retaliated a week later by sending twelve Blenheim bombers against the sea planes' base Borkum Island, twenty-six miles off German's North Sea coast. A similar sequence of events took place in early December. December also saw the first intensive raids on small merchant vessels sailing in

coastal waters. Fliegerkorps X grew out of an expanded 10th Fliegerdivision. Its bombers attacked and sank ten small vessels, mostly trawlers, east of Britain between December 17 and 19. Raids between January 9 and 30 accounted for twelve freighters and one more trawler. The first month of 1940 concluded with a large sweep of thirty-five twin-engine He (Heinkel) 111s sinking two ships and damaging eight in a January 30 shipping strike over the North Sea off Britain's east coast.[2]

Land-based aircraft, actual and threatened, checked proposals for naval operations in restricted waters. Concentrated Allied naval strength could easily overwhelm German surface combatants. Winston Churchill, then First Lord of the British Admiralty, suggested naval intervention in the Baltic, but the threat of German air attacks caused rejection of the plan.[3]

The Luftwaffe first attacked Allied shipping in the narrow English Channel in March 1940. A KG (Kampfgruppe) 26 aircraft set the 8,441-ton passenger steamer *Domala* on fire off the Isle of Wight on the night of March first. A subsequent attack on March 20 sank the 5,439-ton freighter *Barn Hill* near Beachy Head. In the *Domala* sinking, the RAF failed to respond to repeated naval requests for assistance during and after the attack.[4]

Increased German Air Force activity over the Channel included airdropping sea mines. Sea planes dropped twenty-four mines in Edinburgh Channel and the Downs on April 17. They sank the 5,380-ton *Hawnby* and 1,037-ton *Mersey*. Sixty more aerial mines dropped on April 21 and 22 sent five ships to the bottom.

When mine-dropping aircraft got the opportunity, they also attacked convoys. A destroyer escorting Convoy FN52 engaged an He 115 twin-engine sea plane on its way to lay mines. Three hours later the same aircraft returned to strafe the convoy but did not inflict serious damage. Antiaircraft fire from the convoy failed to down the plane, although one destroyer skipper thought his ship might have killed the sea plane's gunner.[5]

On May 10, 1940, Germany's blitzkrieg against Belgium, France, and Holland ended the quiet which had settled over Western Europe that had lasted since September 1939. Luftwaffe mining of Dutch ports supplemented ongoing mining of British and French harbors. Nearly 600 airdropped mines threatened by mid-May to halt Allied shipping in the English Channel and the North Sea. Air attacks on ships also increased. KG 4 He 111s sank a Dutch destroyer plus the passenger ships *Van Galen* (28,291 tons) and *Veendam* (15,450 tons) at Rotterdam.[6]

As the war in Western Europe intensified, air attacks did too. On May 10, the destroyer *Whitshed* steamed out of Dover carrying a demolition party and explosives intended to destroy Belgian and Dutch port facilities. Coordinated German medium altitude and dive-bombing hit the destroyer three miles off the Dutch coast. After several near misses, one bomb exploded in midair near a gun mount. This detonated a second bomb also still in the air. Blast and shrapnel killed or wounded many of the ship's crew and damaged the gun mount, bridge, and superstructure. The bombs also ignited cordite stacked around the gun mount which burned surviving crew members in the vicinity. Despite the damage and casualties, the *Whitshed* completed her mission. After temporary repairs at Dover she sailed again carrying munitions for Allied ships operating near Dunkirk.[7]

The *Whitshed* was lucky. Further Luftwaffe activity over the English Channel underscored the vulnerability of ships operating without air cover. Six British destroyers sent to aid the French at Dunkirk specifically because of their antiaircraft batteries demonstrated this as they operated near the French coast between May 10 and May 19. The *Valentine*, escorting a passenger ferry in the Scheldt on May 15, fell victim to two direct hits from German dive bombers. One bomb penetrated to the boiler room. Its denotation caused one boiler to explode. The combination of bomb and boiler blast killed twenty of the crew,

wounded twenty more, tore a large hole in the hull, and broke the ship's back.[8] A second destroyer, the *Winchester*, suffered extensive damage from near misses during bombing and had to return to England for repairs. Near misses often caused casualties, damaged ships and sometimes sank them. In many cases near misses were more destructive than direct hits.

On May 19 gull-winged single-engine Junkers Ju 87 Stukas re-attacked the *Whitley*. With her boilers flooded and back broken, the destroyer ended up beached on the French coast. Air attacks accounted for 50 percent of the destroyers sent to operate off the Continent's coast because of their anti-air armament, although two would rejoin the war at sea after repairs.[9]

The Ju 87s proved to be excellent ship busters. When sufficient aircraft were available, the number of dive bombers used in an attack depended on the type of target. German air tacticians preferred a Staffel of nine planes for bombing warships up to the size of a light cruiser. For larger ships they preferred a three-Staffel Gruppe of thirty aircraft. The Stukas usually approached merchant ships from port or starboard, and attacked heavy warships from several different directions at once. But they came at destroyers from astern so that they could follow their high-speed evasive actions. Dives ideally began at 13,000-feet, with bomb release at 1,600-feet and pull-out at 700 feet. Staffel attack formation was based on the Luftwaffe's basic Kette formation of a leader and two wingmen astern. In Staffel-level assaults, Kettes took the place of individual aircraft in a three-plane formation.[10]

The Battle of Dunkirk, May-June 1940

Luftwaffe sorties seriously hindered the reinforcement and resupply of the British Expeditionary Force in France and Belgium. Constant raids forced the French Navy to withdraw its large ships from Dunkirk and hampered British ships clearing mines and patrolling sea lanes. A second group of French vessels leaving Dunkirk on May 20 experienced heavy casualties. Ju 87s flying from east of St. Quetin brushed aside a small RAF patrol and their strikes forced abandonment of the tanker *Salomé*. The *Pavon*, carrying 1,500 Dutch soldiers, had to be beached after bombing. The minesweeper *Niger* burned and went to the bottom. The destroyer *L'Adroit* also sank.[11]

British ships attacked by German aircraft included the trawler *Rifsness*, sunk; and the destroyer *Malcom*, which was damaged and suffered casualties. Enemy air operations interfered with other Allied vessels, driving them from their ports and operations areas. Five French destroyers took refuge in English waters after days of dodging the relentless bombing at Dunkirk.[12]

The air threat intensified when German army forces fought their way through to the French coast. Luftwaffe planes operating from captured airfields were now only minutes away from Channel waters. When Allied naval forces began to evacuate soldiers from Boulogne on May 23-24, 1940, Ju 87s damaged the British destroyer *Keith* at the quay with a near miss. At the same time, a near miss on the destroyer *Whitshed* outside the harbor damaged the ship's gun mounts, killed her gunnery officer, and wounded another officer and several sailors. During this attack other aircraft damaged the French destroyer *Frondeur* and sank her sister ship, the *Orage*. The Luftwaffe did not interfere in a subsequent attempt to evacuate troops that was covered by fifty of Britain's premier fighter plane, the single-engine Spitfire.[13]

Ju 87s also took a heavy toll of ships when the British decided to evacuate their forces at Calais on May 24. Twenty-one dive bombers attacked the destroyers *Wessex*, *Vimiera*, and *Burza* as the moved close to shore to provide covering bombardment. The third in a series of

passes put three bombs into the *Wessex*. They wrecked both of the destroyer's boilers, caused engine room flooding, and blasted away her boats and forward funnel. She sank quickly. Two other bombs hit and damaged the *Burza* and forced her return to Dover. Near misses slowed the *Vimiera* but she was able to rescue *Wessex* survivors.[14]

The German pilots, most attacking ships for the first time, found them difficult targets. "Staircase" dives, in which the pilots dove until they lost sight of their targets, pulled out and re-sighted, then dove again provided an answer. But ships once in bomb sights usually took evasive action at high speed.[15]

Just before 7:00 p.m. on May 26, 1940, the British Admiralty ordered Admiral Ramsay at Dover to begin Operation Dynamo. Taking its name from the former dynamo room tunneled into Dover Cliffs in which Ramsay had his operations center, the undertaking was to evacuate Allied troops from Dunkirk on the other side of the English Channel. By the time he received his orders, Ramsay had already dispatched the first evacuation ships toward France. The most optimistic estimates were than 45,000 of the 338,000 British troops trapped at Dunkirk could be rescued.[16]

To those below, it appeared that the Royal Air Force was unable to provide much air cover. Luftwaffe planes seemed to operate almost at will over Allied war and merchant ships. But the RAF was intercepting formations en route to or returning from Dunkirk and destroying many bombers. All but three of Fighter Command's squadrons joined in the air battle over Dunkirk at one time or another. Approximately 200 sturdy single-engine Hurricanes and the faster, more maneuverable Spitfires were available for the contest. With his forces outnumbered, Fighter Command's chief, Air Marshal Hugh Dowding and No. 11 Group's commander Air Vice Marshal Keith Park elected to provide strong, but not continuous, air cover at Dunkirk. British air's intermittent appearance over the beaches led Army and Navy personnel below to conclude that the RAF was doing little to assist the evacuation.[17]

A few Hurricanes operating from Rouen, seventy-one miles northwest of Paris, helped to cover the Dunkirk evacuation. The bulk of the RAF fighters could remain at Dunkirk for a maximum of forty minutes before having to return to their bases, which were fifty to sixty miles from Dunkirk. In all, Britain had about 200 fighters available to oppose Luftwaffe efforts at Dunkirk. Because no radar information was available, Fighter Command had to maintain standing patrols over the French port and the adjoining ten miles of beaches. It could not do so on a continuous basis. The limited number of aircraft available meant that the RAF could initially mount these air umbrellas only in squadron strength. As a result, German bombers and their escorts usually outnumbered defending fighters by margins of two-to-one or better. Poor intelligence also hindered RAF missions to Dunkirk. Information on both friendly and enemy forces was inadequate. Intelligence that was available was based on debriefing of returning aircrews and intercepted radio traffic. The RAF could obtain no information on the German ground forces investing Dunkirk after the combined RAF/Army Reconnaissance Mission left for England on May 27.[18]

Coastal Command patrolled with its own and borrowed Fleet Air Arm (FAA) aircraft during daylight hours to intercept German ships that might interfere with the evacuation. Coastal Command planes available included RAF Blenheim and twin-engine Hudson bombers and FAA two-seater Skua and Roc attack aircraft. RAF No. 2 Group Blenheims provided daytime close air support for Allied troops fighting a rearguard action while Bomber Command flew at night to destroy German supply lines and communications.[19]

During Operation Dynamo, RAF sorties concerned with the evacuation tallied Fighter Command 2,739; Bomber Command 651; and Coastal Command 171. Fighter Command alone

lost ninety-nine aircraft while Bomber and Coastal Commands lost forty-six more, not including borrowed Fleet Air Arm planes.[20]

To interdict the evacuation ships, the Luftwaffe had 300 bombers and 550 fighters available. The bombers, however, flew from western Germany and Holland while most of the fighters were at forward airfields in France. In general, the Luftwaffe aircraft could remain over Dunkirk for even shorter periods of time than RAF planes. By the time Operation Dynamo began on May 27, 1940 Ju 87s could reach the port from newly captured airfields. Because of their precision, the Stukas were the Luftwaffe's most effective ship-killers. When they were not engaged elsewhere, twin-engine Ju 88 dive bombers, He 111s, and Do (Dornier) 17 twin-engine medium bombers seriously interfered with evacuation operations.[21]

On May 26, 1940, Luftflotte 2 and Luftflotte 3 received orders to mount maximum effort against Dunkirk. Dornier 17s of KGs 1, 2, and 4 arrived from fields in Holland and Germany over the port around dawn on May 27. Horizontal bombing soon wrecked Dunkirk's harbor, set port oil storage tanks ablaze, ruined adjacent rail yards, and sank ships alongside the docks. The largest to sink on May 27 was the 8,000-ton French ship *Aden*, which went down at Dunkirk's eastern breakwater. After 7:00 a.m., Ju 87s began attacking shipping the harbor with 500 and 1,000-pound bombs released from an altitude of 1,500 feet. The dive bombers then destroyed the lock gates leading to the inner harbor. Around 12:00 p.m., British troops began leaving the town for the beaches outside Dunkirk. Simultaneous dive-bombing of ships offshore damaged several and sent the French steamer *Côte d'Azur* to the bottom. German air power made Dunkirk's inner harbor unusable. This forced the evacuation to be made from moles and quays in the outer harbor and over nearby beaches. These were to the east of Dunkirk and in order were Malo, Bray, and La Panne. This more difficult and slower process cost many lives. It also destroyed or forced abandonment of much war matériel.[22]

Ships taking personnel out of Dunkirk and carrying them to England also risked air attack while at sea. The normal, direct, sea passage from Dunkirk to Dover is only thirty-nine miles but it passed close to Calais and exposed ships to fire from German artillery there. On May 27, Allied minesweepers cleared a new, more northerly route of eighty-seven miles that avoided German artillery but left ships exposed to air attack for longer periods. Finally a central route, of only fifty-five miles, went into use.[23]

Mona's Queen, a combined passenger and freight ship that normally plied the waters between the Isle of Man in the English Channel and Dover, was the first ship to evacuate troops from Dover on May 27. Although riddled by shrapnel from German artillery along the coast and strafed by Luftwaffe planes, the packet took 1,420 troops back to Dover. The *Queen of the Channel*, with 200 men aboard, sank after bombing on May 27. Other ships suffered personnel casualties and damage from air raids, but no more sank that day. Up to midnight May 27-28, 7,669 men left Dunkirk on evacuation ships. The Germans lost sixty-four aircrew and twenty-three aircraft over Dunkirk on the first day of Operation Dynamo.[24]

Fortunately for the Allies, weather over Luftwaffe-occupied airfields in France used deteriorated on May 28. This combined with low hanging clouds, dusk, and smoke at Dunkirk to frustrate most Luftwaffe interference with the evacuation on that day. Bombers did sight some ships as they neared England. The destroyer *Windsor*, carrying hundreds of troops, had boiler damage and casualties as a result of near misses by bombs. Another Royal Navy destroyer, the *Grenade*, succumbed to bombs while along Dunkirk's east pier. Abandoned around 6:00 p.m. because of uncontrollable fires, the warship blew up several hours later.[25]

On the evening of May 28 seven passenger ships, three hospital carriers, and two destroyers embarked men from the east breakwater of Dunkirk's Harbor. At the same time, some twenty destroyers, nineteen minesweepers, seventeen fishing boats, from twenty to forty

small Dutch coastal craft of 200 tons each (called “schuts”) five coasting vessels, and a number of small boats took men off the beaches. The difficulty of moving men from the beaches to larger ships in small boats during the night was reflected by the fact that of the more than 17,000 troops evacuated that night, only 6,000 came off the beaches despite the large number of ships and boats involved in the effort.[26]

Good weather allowed German dive bombers to renew their operations over Dunkirk on May 29. They faced more intense, but less frequent opposition from the Royal Air Force. The British Air Ministry changed its previous orders for continuous air coverage and allowed the RAF to concentrate its strength in fewer patrols. This enabled Fighter Command to send sorties of up to four squadrons to Dunkirk at a time. During eleven of seventeen daylight hours the British air umbrella was stronger, but for the six remaining hours of daylight no RAF planes covered the evacuation area at Dunkirk. Despite Royal Air Force claims to have established air superiority over the evacuation, many ships succumbed to air attack or lost many killed and wounded to bombing and strafing by three *Geschwader* (three *Gruppen*) of Ju 87s and one *Geschwader* of Ju 88s.[27] A near miss slowed the destroyer *Gallant* but she was able to reach Dover. The *Jaguar*, laden with troops, took a bomb that left her holed and dead in the water but other ships took off the soldiers and towed the destroyer back to England. A bomb exploding on the quay devastated the nearby French destroyer *Mistral*. Another bomb penetrated the deck of the paddle steamer *Fenella* to kill or wound many of the troops she was attempting to rescue. Then a near miss that caved in her hull sank her. A second paddle steamer, the *Crested Eagle*, took off *Fenella* survivors only to be dive-bombed into a burning wreck herself. Precision bombing also sank three other ships, the minesweeping trawlers *Calvin* and *Polly Johnson* and the transport *King Orry* at this time. Luftwaffe activity continued to exact a toll from evacuation ships until the end of the day. The paddle minesweeper *Gracie Fields* sank while being towed into port after bomb damage. The destroyer *Intrepid* did make it home but sustained serious damage from bombs. Bombs caused the sloop *Bideford* to be beached and sent the destroyer *Saladin* back into Dover. Ju 87s also set the 6,900-ton merchant ship *Clan MacAlister* afire and forced her abandonment. Later on May 29, bombs damaged the transport *St. Julian* and the destroyer *Sabre*. The Luftwaffe then finished off the French destroyer *Sirocco*, which E-boats had previously torpedoed. German surface ships and submarines added to the toll of Allied casualties on May 29. E-boat *S-30* torpedoed the Royal Navy destroyer *Wakeful* as it headed back to Dover with 640 troops embarked. Only those personnel on deck at the time the torpedo struck survived. The Royal Navy trawler *Comfort* was also a casualty of the action. She was close enough to the *Wakeful* to start sinking a result of the *S-30's* torpedoes and then was fired upon by the destroyer *Grafton*, which mistook her for an enemy ship. When *Comfort* survivors tried to climb aboard the *Grafton*, the destroyer's crew shot them down in the belief that they were a German boarding party. When the *Grafton* closed in to rescue *Wakeful* survivors, she fell victim to a torpedo fired by the Nazi submarine *U62*. Loss of so many of the Royal Navy's badly-needed escort ships led First Sea Lord Dudley Pound to withdraw his modern destroyers from the evacuation for two days, until June 1.[28]

Rain and fog prevented Luftwaffe bombers from operating on May 30. Then German air attacks at Dunkirk decreased in intensity on May 31, 1940, as other missions in France drew the Luftwaffe's attention. Allied naval losses to bombing and strafing continued nonetheless. The Luftwaffe raided Dunkirk about every thirty minutes and German artillery fire made use of Dunkirk Harbor even more hazardous. Nevertheless, evacuation continued from the harbor and the beaches. Operation Dynamo lifted more than 22,000 men from the beaches east of Dunkirk and another 45,000 men from Dunkirk harbor. The destroyers

Gallant, *Greyhound*, and *Jaguar* steamed home for repairs necessitated by bombs. Near misses forced another destroyer, the *Harvester*, to withdraw. Bombing also affected the operating capacities of the corvette *Kingfisher* and the destroyer *Anthony*. High-speed evasive action taken by Allied ships in restricted water to avoid bombs also led collisions that damaged several ships. The passenger ships *Brighton Queen* and *Scotia* sank during bombing and the *Prague*, with 3,000 French troops on board, was seriously damaged.[29]

Clear weather on June 1 again brought air-delivered devastation to the Allied ships off Dunkirk. German air attacks sank more than thirty ships on this day alone. In the face of light, sporadic RAF fighter cover, single-engine Luftwaffe Me (Messerschmitt) 109 and twin-engine Me 110 fighters escorted Ju 87s and Ju 88s over the evacuation area. A shortage of antiaircraft ammunition on the ships below also facilitated German dive and level bombing.[30]

Stukas reached the evacuation area at 7:30 a.m. on June 1, between RAF air cover scheduled at 6:00 a.m. and at 9:00 a.m. A bomb from a Ju 87 blew away a boiler room bulkhead and severed steam and fuel supply lines on the destroyer *Basilisk* soon after the ship arrived. This killed all the engine and boiler room personnel and immobilized the ship. Subsequent near misses by dive bombers caused extensive flooding and cracked her upper deck and sides. After an ineffective horizontal bombing attack, more Ju 87s dive bombed and sank the *Basilisk*.[31]

While the Luftwaffe attacked the *Basilisk*, it also made a target of the destroyer *Keith*, down to her last thirty rounds of antiaircraft ammunition. The *Keith* avoided direct hits by taking violent evasive action. Near misses jammed her rudder. A second dive-bombing assault put a bomb down her aft funnel. Its explosion wrecked the destroyer's boiler room and caused severe flooding. Then a third attack delivered a bomb under the destroyer's bridge that caused her to capsize. A small Belgian fishing boat rescued some of the survivors. They died soon after when Ju 88 dive-bombing sank that vessel.[32]

The Luftwaffe destroyed or damaged other Allied ships at Dunkirk in the morning of June 1 including the minesweepers *Skipjack* and *Salamander*, the destroyers *Ivanhoe*, *Vivacious*, and *Havant*, the gunboat *Mosquito*, and the passenger ship *Prague*. Of these the *Havant* and *Mosquito* went to the bottom, the *Prague* had to be beached, and the others sustained serious damage.[33]

Another wave of dive bombers arrived at Dunkirk around noon. These capsized the French destroyer *Foudroyant*. Then they bombed and machine-gunned many of the small craft trying to rescue surviving crew and soldiers the destroyer had been trying to evacuate. Near simultaneous Ju 87 runs at the troop transport *Scotia* scored several hits, including one bomb down her funnel. These blows caused the ship, which had 2,000 French soldiers aboard, to sink quickly. Other troop transports sunk or damaged by this wave of Stukas included the *Brighton Queen* and the *Maid of Orleans*. The Stukas also sank many smaller vessels such as the drifter *Lord Cavan* and the French naval auxiliaries *Denis*, *Papin*, *Venus*, and *Moussaillon*.[34]

The Luftwaffe scored heavily on June 1 and by then the Germans had heavy artillery in place on the French coast to threaten the evacuation routes from the beaches. This forced the Allies to totally abandon daylight evacuation attempts after that date. The Luftwaffe did not attempt night bombing of the evacuation area. Troops waiting to be rescued remained on the beach exposed to bombing, shelling, and machine-gunning during daylight hours. Troops going safely aboard ships at night returned to risk when daylight came. Luftwaffe attacks on ships still at sea on the morning of June 2 accounted for the personnel ship *Mona's Isle* and the hospital ship *Paris*. Bombing damaged the former and forced abandonment of the latter.

Another hospital ship, the *Worthington*, suffered bomb damage en route to Dunkirk and had to return to England.[35]

By the evening of June 2, the Allies had evacuated a major part of the British Expeditionary Force and many French and Polish soldiers from Dunkirk, despite fierce air attacks, E-boat and U-boat activity, and artillery fire. Allied navies then continued their efforts to rescue the French troops who had been fighting a rearguard action against advancing German forces. On the night of June 2-3, the destroyers *Venomous*, *Windsor*, and *Winchester* plus the passenger ships *King George*, *St. Helier*, *Royal Sovereign*, and *Rouen* took more than 50,000 evacuees off the beaches and out of Dunkirk Harbor. Another 26,176 troops left Dunkirk by sea on the night of June 3-4 but when German troops were only three miles from Dunkirk Harbor, evacuation had to be stopped. In all, 338,000 Allied troops made it to England although without their vehicles and heavy weapons. This included almost all of the British soldiers and over 100,000 French troops surrounded at Dunkirk. The Allies lost six British and three French destroyers in Operation Dynamo and had nineteen other of the much-needed light combatants damaged. Of the forty-five personnel ships involved, nine were sunk and eight were so badly damaged they had to be withdrawn from service. The Royal Navy also implemented plans to sink blockships in Dunkirk harbor. Luftwaffe aircraft by this time were preparing to join in fighting further south so there was little air opposition to the last Allied evacuation activity at Dunkirk.[36]

The Luftwaffe significantly helped the German forces interfere with Allied vessels while they extricated another 191,800 troops from other French ports. At LeHavre, continuous bombing forced a halt to evacuation efforts and destroyed the personnel ship *Bruges* and *Train Ferry No. 2*. Also at LeHavre the destroyers *Bulldog* and *Boadicea* ran afoul of Ju 87s. Six Stukas dived at the *Bulldog*, three from either side. Several near misses shook the ship. Then a bomb penetrated the deck to the engine room and bounced out of the hull just above the waterline. Another bomb blew out the side of the *Bulldog's* port boiler while a third bomb lodged in the starboard boiler without exploding. After the crippled ship was towed into Portsmouth for repairs, a demolitions expert defused the bomb. The Ju 87s had released their bombs from such low altitudes that impact had damaged fuzes on the two bombs that did not explode.[37]

Dive bombers also damaged *Boadicea* while she rescued soldiers and refugees from the French coast. Swooping in toward the ship in flights of three aircraft, the Ju 87s dropped some near misses on the ship's starboard side before sending three bombs into her engine room and after boiler room. The explosions killed or wounded most of the engine room and boiler room personnel, caused flooding that threatened the ship, and put her radios out of commission. Only the chance arrival of the British destroyer *Ambuscade*, which gave her a tow, saved the *Boadicea*.[38]

The Luftwaffe did not attack Allied troops evacuating through Biscay ports until June 17. On that day, air raids began on a large number of ships assembled for the evacuation. A Do 17 set the 16,243-ton liner *Lancastria*, which had thousands of troops aboard, afire. At least 5,000 died. [39]

Over 100 Royal Navy warships, a smaller number of French Navy ships, and many naval auxiliaries took troops off Dunkirk's moles, quays, and beaches. Many of the same ships rescued Allied troops from other ports. Bombing and strafing destroyed twenty-two of the warships and a large number of civilian ships involved. Many others suffered damaged that took months to repair.

The evacuation once again demonstrated the vulnerability of ships to air attack. It also proved that the Luftwaffe alone could not completely thwart Allied maritime operations.

Germany's air force did not have enough pilots and planes to do this while concurrently providing close air support for the Wermacht on other battlefields. Luftwaffe losses over Dunkirk totaled 240 aircraft between May 26 and June 3, while the RAF lost 177 planes supporting Operation Dynamo.[40]

Coastal Campaign, Part II

Once the naval forces evacuated all of the Allied troops from the Continent, the fighting in the waters between Britain and Europe entered a new phase. Royal Navy ships and small craft countered German E-boats, destroyers, and minelayers. The RAF, recovering from heavy losses incurred during the fighting in France and rebuilding in anticipation of what became the Battle of Britain, could contribute little. The Luftwaffe, rebuilding after the campaign across France, also had limited resources to devote to the fighting. Colonel Johannes Fink, Channel-zone bomber commander, received orders to close the English Channel to enemy shipping. For this he could use KG 2's bombers, two Stuka Gruppen, and the fighters of JG (Jagdeschwader) 51.[41]

Ten days after the evacuation was over, Me 109s strafed Dover and an He 111 attacked the destroyer *Codrington* patrolling off the English coast. Then on July 2 the steamer *Aeneas* was abandoned outside Portland with the loss of twenty-one crew members after being hit by two bombs. These incidents preceded strong raids that established German air mastery over the English Channel during daylight hours.

On July 4 Convoy OA178, with fourteen merchant ships and two escorting destroyers was on its way to the Atlantic when the Germans subjected it to heavy air assault. Two Gruppen of Stukas, each carrying one 550-pound and two 110-pound bombs, attacked after radar tracked the convoy and determined it was without air cover. Four freighters: the 5,255-ton *Britsum*, the 4,952-tons *Dallas City*, 1,796-ton *Deucalion*, and the 3,526-ton *Kalga* from Convoy OA178 went to the bottom, as did the auxiliary Antiaircraft ship *Foyle Bank*. Six other vessels in the convoy took heavy damage. Other ships assembled in Portland Harbor and waiting to join the convoy then became targets for the dive bombers. This cost the Allies the anti-aircraft ship *Foyle Bank* and one tug sunk plus three merchantmen damaged. The devastation of British shipping led Winston Churchill to order that all Channel convoys should have six-plane escorts. He additionally directed that no more big ships should be risked in the restricted waters between England and the continent. This forced serious difficulty in the loading and unloading of convoys bringing supplies into Britain or moving them to other theaters of the war.[42]

Coastwise convoys of smaller ships carrying coal which was critical to Britain's war effort continued to provide lucrative targets for the Luftwaffe. In addition to destruction wreaked on the convoy's valuable cargoes, threats to them drew RAF fighters and Royal Navy escorts into a war of attrition with the Luftwaffe.

Twenty Do 17s escorted by twenty fighters drew out the RAF to defend a coastal convoy traveling west on July 10, 1940. The air defense caused hasty, high altitude bombing that sank only one small coaster. The next day, Ju 87s raided Portland Harbor. They sank the patrol ship *Warrior II*, the tanker *Kylemount*, and the steamer *Eleanor Brooke*. The dive bombers also damaged the *City of Melbourne* and the *Peru* while He 111s bombed Portsmouth itself. This began a series of air raids that ranged along England's eastern coast over the next several days.

On July 19, Do 17s sank the oiler *War Sepoy* at Dover, sent the destroyer *Griffin* into dock for repairs, and badly damaged the drifter *Golden Gift* and the tug *Simla*. On July 20

a force of about thirty Stukas and thirty fighters assaulted Convoy CW7. Despite substantial RAF air cover, the convoy lost the destroyer *Brazen* and the coaster *Pulborough*. Another destroyer and another freighter had damage. On July 21 Stukas sank two more steamers in a westbound channel convoy.[43]

Hermann Göring boasted to Hitler that he could make possible a cross-channel invasion. On July 22 he ordered the Luftwaffe to close England's channel ports with mine-laying and bombing. Three days later Convoy CW8 received one of the heaviest air assaults to date. Ninety Ju 87s and Ju 88s with a fighter escort brushed aside an RAF patrol to sink five and damage five of the twenty-one ships in the convoy while it was at sea. Later attacks sank more of the convoy's ships once they had anchored in Dover's harbor. When British destroyers sortied to intercept E-boats sent to finish off the convoy's stragglers, Luftwaffe planes sent the *Boreas* and *Brillant* back to Dover under tow.[44]

The Stukas plus bomb-carrying Me 109s that could launch high-speed low-level attacks quickly drove the Royal Navy's destroyers from Dover, which was the most likely point for a cross-channel invasion. Me 109s carrying a single 550-pound bomb first appeared on July 27 flying low enough to prevent radar warning of their approach. Speeding over Dover harbor from the landward side early in the afternoon, four of the German fighters dropped two near misses that wrecked the destroyer *Walpole's* propulsion plant. Late in the afternoon eight Me 109s plus twelve Me 110s carrying 500 and 1,000-pound bombs broke the destroyer *Codrington's* back and sank the depot ship *Sandhurst*. On the same day, bombs sent the destroyer *Wren* to the bottom off the Suffolk coast. Luftwaffe bombers returned on July 29 to finish off the ships remaining at Dover while the destroyer *Delight* was caught at sea and sunk.

Göring's air force had cleared the way for a daylight invasion at Dover, but the invasion force was not ready. The Luftwaffe continued for a short while to create heavy losses in Britain's coastwise convoys but at increasing cost. Convoy CW9 of twenty-five ships received heavy E-boat and Stuka attacks. Bombing sank or damaged several of the convoy's ships but the Germans lost thirty-one aircraft to RAF interceptors and antiaircraft fire.[45]

German fighter squadrons found it impossible to protect the Stukas during their dives and reassembly. The Me 109s, without dive brakes, could not follow the Ju 87s down and it was not possible to provide fighter protection at all levels between the start of a Stuka's dive and its pull-out. The same problems prevented RAF fighters from attacking the Ju 87s during their dives, but they found them easy targets as the individual aircraft pulled up to reassemble.[46]

Attacking the coastal convoys, the Luftwaffe sank or damaged one ship in three in the coastal convoys and sent about 24,000 tons of shipping to the bottom during the summer of 1940. But on August 13, Göring began to divert Germany's bombers to targeting naval bases, airfields, and radar stations. He believed it was time to move on to the next stage of aerial preparation of the invasion: destruction of Britain's defensive facilities.[47]

Germany almost won this second phase of the Battle of Britain. Other sources describe that battle fully. The Luftwaffe's diversion to terror bombing of Britain's cities cut short a near successful campaign to destroy the Royal Air Force. Allied vessels risked air attack in waters east of the British Isles for sometime to come but the Luftwaffe never reestablished its air superiority there. Increasing RAF opposition plus dispersion of German air strength precluded a return to the conditions prevailing in the early summer of 1940.

The Germans redirected some of their aircraft flying maritime missions to the bombing of British population centers. Many of the Stukas withdrew from shipping attacks and prepared to support German army troop assembling for the invasion of England. Others

assaulted Britain's airfields, incurring heavy losses. When the invasion did not take place, the surviving dive-bomber units went to the Russian front or to the Mediterranean.

The Mediterranean Maritime Air Campaign

For Italy, the Mediterranean Sea was the only link to the African colonies which its leaders saw as her natural right. For Germany, the Mediterranean was a peripheral concern until Mussolini's activities there provoked a British reaction that endangered its weaker ally. For Britain, the Mediterranean provided access to its Egyptian protectorate, to Middle Eastern oil fields, and to the Suez Canal. The canal cut 3,500 miles from the sea route to the British empire's colonies in India and the Far East. It was also the avenue to what Winston Churchill described as Nazi-conquered Europe's "soft underbelly."

The British-dominated Straits of Gibraltar separated the Mediterranean Sea from the Atlantic Ocean. The sea's eastern and western basins of are demarked by the boot of Italy, Sicily, and Malta in the north and by Tunisia in the south. Stretching from east to west for a maximum of 2,300 miles, the Mediterranean never exceeds 500 miles on a north-to-south axis. It is studded with islands suitable for airfields. In World War II, land-based air power changed forever the sea's centuries-old tradition of sea warfare.

Mussolini, anxious to take advantage of Hitler's conquest of France and likely defeat of Great Britain, declared Italy at war with those two countries on June 11, 1940. He stated his intent to be a parallel war, alongside Germany but for Italy.

Land-based air made its first significant contribution in the Mediterranean in late June and early July 1940. Aircraft on both sides began to inflict losses and influence sea battles. As was the case in the Battle of the Atlantic, interception and decryption of enemy radio traffic played an important part. The opposing sides often knew the schedules of their enemies' convoys, when their fleets were at sea, and what missions their aircraft were on.[48] Radio traffic analysis and code-breaking between 1941 and 1943 provided the Allies with almost daily notice about routes and sailing times of Axis ships setting out to supply German and Italian forces fighting in North Africa.[49]

RAF maritime patrols from Malta soon demonstrated the island's significance as an air base. RAF No. 230 Squadron Sunderlands four-engine flying boats based there sank the Italian submarines *Anfrite, Argonauta*, *Rubino,* and *Sirena,* all in the last days of June.[50] Britain's war cabinet approved placing more air and sea strike forces on the island, but planners said that not until April 1941 could these become fully operational.[51] Italian naval authorities had recommended occupation of the island in the event of war with Britain. Fortunately, Italy's supreme command dismissed the idea, believing that the Italian Air Force (Regia Aeronautica) could neutralize Malta without the cost of a sea-borne invasion.[52]

On June 28, 1940, another RAF Sunderland located an Italian force of three destroyers and two torpedo boats, which were making an experimental supply run between Taranto and Tobruk. The latter port was much closer to the front between British and Italian armies fighting in North Africa. One Italian destroyer fell victim to British salvoes but the remaining ships reached Tobruk. On July 5, nine of the Royal Navy's Fleet Air Arm Swordfish biplanes took off from an airfield at Sidi Barrani on Egypt's northwest coast to make a torpedo attack on the Italian ships at Tobruk. They sank the destroyer *Zeffro* and caused her sister ship, the *Euro,* heavy damage. The Swordfish also damaged the 15,000-ton Italian liner *Liguria*, finished off the 3,955-ton freighter *Manzoni,* and damaged another merchant ship they found in the port. During the raid RAF fighters prevented defending Italian aircraft at Tobruk from interfering.[53]

Two days later, large British and Italian naval formations put to sea. Admiral Sir Andrew Cunningham, commander-in-chief of Britain's Mediterranean Fleet, led the British ships out of Alexandria harbor on July 7. His force, composed of three battleships, an old carrier, five cruisers, and fifteen destroyers sailed in three elements. Its mission was to protect two convoys evacuating servicemen and dependents from Malta to Egypt. The Italian fleet simultaneously and coincidentally sent two battleships and five cruiser divisions out to protect a five-ship convoy en route from Naples to Benghazi. When air reconnaissance from Malta discovered the Italian warships, the British convoys were delayed while the British fleet moved to intercept the Italian vessels on their return from Benghazi.[54]

Using more than 200 aircraft, the Italian Air Force subjected the British ships to continuous high altitude daylight bombing. A Fleet Air Arm pilot later commented that the Italian pilots always flew at the same altitude and maintained perfect formation despite fighter opposition.[55] In this particular attack the Italians scored only one hit, on the cruiser *Gloucester*. That bomb, exploding on the bridge, killed the ship's captain and seventeen crew members. Italian planes also occasionally attacked their own ships during the engagement but caused no losses. Neither Fleet Air Arm fighters from the carrier *Eagle* nor antiaircraft fire from Cunningham's other ships harmed the bombers. The surface engagement that followed, called Punta Stilo by the Italians and Calabria by the British, off the boot of Italy ended inconclusively. The Italians retired into Messina Strait. The British ships turned toward Malta to pick up the convoys[56]

Cunningham took the convoys safely to Alexandria despite a renewal of high-level bombing. Over two-thousand 100 and 250kg bombs splattered among the British ships, doing some damage with near misses. The Italian air raids reinforced Cunningham's concern for the threat of land-based air attack. He requested two or three of the newer Queen Elizabeth battleships with high-angle armament and an armored deck carrier. While ineffective, the Regia Aeronautica's participation in the sea battle forced the British to consider sending major warships badly needed elsewhere into the Mediterranean. The meager results of this air assault and others like it led the Italians between 1941 and 1943 to convert most of their high-altitude bomber groups to torpedo-bomber conversions of S 79 (Savoia-Marchetti) three-engine bombers, or to adopt Ju 87s provided by Germany.[57]

In late September 1940 Britain urgently began building up Malta's defenses. Escorts of two convoys easily dealt with torpedo boat and submarine attacks. An air-launched torpedo blew the bow off the cruiser *Liverpool* as she returned to Alexandria on October 14.[58]

When Mussolini invaded Greece on October 28, 1940, British troops landed the next day to assist the Greeks. Efforts to support them further exposed British naval forces to land-based air attack. Mussolini's rash action did give the British access to Greek airfields from which they might have threatened Germany's access to Romanian oil or bombed Italy.

This infuriated Hitler and he sent Fliegerkorps X from Norway to the Mediterranean. The angry Führer predicted that the formation, specially trained in maritime work, would make the Mediterranean "the grave of the British Fleet."

General der Fleiger Geisler's Fleigerkorps X reported directly to the German Air Ministry. Geisler controlled 120 Ju 88 and He 111s, 150 Ju 87s, twenty reconnaissance aircraft, and forty Me 110 long-range fighters. His pilots trained intensively in the tactics necessary to sink an armored deck aircraft carrier. They practiced on a floating simulation of a carrier such as the ones the British operated in the Mediterranean. German aerial tacticians estimated that four direct hits could sink one of the British flattops.[59]

The Luftwaffe force could harass the British fleet from bases in southern Italy, Sicily, and Tripoli. In addition its maritime mission, Hitler charged Fleigerkorps X with support of

German armored units sent to North Africa to aid the Italians. The German dictator also told Mussolini to return Italy's bomber squadrons, which were raiding England from Belgian airfields, to the Mediterranean.[60]

Another inconclusive surface engagement between the British and Italians in late November 1940 generated more high-level bombing by the Regia Aeronautica. It did little harm. But it reinforced the Italian Navy's lack of faith in its air support. Despite a lack of aggressiveness, the Italian Navy nevertheless managed to deliver 50,000 to 80,000 tons of supplies to Axis forces in Africa each month with a loss of only 3 to 8 percent of the ships involved. The RAF laid many of the mines that accounted for a quarter of the ships Italy ships lost in this effort.[61]

Axis land-based aircraft also contributed to the fight for the Mediterranean. Two S 79s from the Regia Aeronautica put torpedoes into the cruiser *Glasgow* on December 3 as she lay in Suda Bay off Crete. Then on January 8, 1941, Italian aircraft attacked a British force at sea on convoy escort duty only to be driven off by fighters from the carrier *Ark Royal*.

Two days later, on January 10, some of Fleigerkorps X's Stukas flying from Sicily dove at the convoy while it fended off Italian torpedo planes. The Italians brought the carrier *Illustrious'* Fulmar fighters down low over the sea. The fighters' descent to low altitude left the carrier exposed to the Ju 87s above. Forty-three Stukas attacked in the first wave. Ten attacked other ships to divert their antiaircraft fire. The remaining dive bombers hit the flattop with six bombs while three near misses also damaged the ship. One bomb struck a port side antiaircraft position and plunged through the ship's hull before exploding at water level. Splinters flew through the hull. A second bomb ignited the carrier's paint locker. Controlled flooding put out the fire. Then a third bomb blew up over a starboard antiaircraft gun and caused many casualties. A 1,100-pound armored-piercing projectile followed. It toppled over the aft aircraft elevator as it descended with a two-seater Fulmar fighter and crew. This created a large number of killed and wounded and destroyed thirteen fighters in the hangar. A second large bomb plunged after the first in the hangar. Its explosion killed most of the damage control party and set off stored ammunition and aviation fuel. About the same time yet another bomb exploded near the forward elevator and sent it upward, while adding to the inferno below decks. One plane in a second wave of Stukas dropped a 1,000-pound bomb on the after flight deck. The bomb penetrated the armored deck to wipe out off-duty officers in the wardroom before wrecking the carrier's ammunition conveyor. New fires started but heroic efforts got them under control. Temporary repairs at Malta enabled the stricken ship to reach Alexandria. Although subjected to incessant bombing there, the carrier eventually got underway for an American shipyard where she remained out of the war for a year.[62]

On July 11 a small British force that had been detached to see a crippled destroyer into port received a twelve-plane Stuka attack. The aircraft involved were those that had earlier bombed the *Illustrious*. Since the Ju 87s were operating at the extreme limit of their range, an He 111 served as their pathfinder. One of the Stuka's bombs hit the cruiser *Gloucester's* fire control tower and wrecked the bridge. Two others severely damaged the cruiser *Southampton*. The first bomb hit the wardroom and the second exploded in the petty officers' mess, killing and wounding many of the crew. Uncontrollable fires started in the engine room and the *Southampton* went dead in the water. The British deemed her unsalvageable and sank her with their own gunfire. The Luftwaffe, it was clear, presented a new and real danger to Allied ships in the Mediterranean.[63]

On January 20, 1941, the Luftwaffe's II/KG 26 reinforced Rhodes with seventeen He 111s. A few Ju 88s configured for reconnaissance and Ju 52 corrugated-metal twin-engine

transports supported the bombers. By February 8, when German units designated as the Afrika Korps sailed from Naples for North Africa, the Luftwaffe had driven the Royal Navy's surface ships from Malta to Alexandria. Only a few submarines remained to interfere with German tanks and troops rushing to aid the Italians.

The Afrika Korps quickly isolated the British garrison at Tobruk, which depended on the city's port for re-supply and for evacuation of casualties. Luftwaffe and Regia Aeronautica interdiction made destroyers and fast minesweepers the preferred ships for this effort. They alone had speed to sail under cover of winter darkness; reach Tobruk, unload and load; and steam to safety before daylight brought Stukas over the harbor again. Larger ships necessary to bring fuel and vehicles into Tobruk had to remain throughout the day and survived with difficulty.[64]

One of Italy's newly-converted Ju 87 units, 239 Squadriagle, moved to North Africa in May 1941. The ten-aircraft squadron concentrated on disrupting British shipping going into Tobruk. On May 25 its dive-bombers sank the 3,470-ton transport *Hekla* in Tobruk harbor and the Royal Navy sloop *Grimsby* outside. Thirty days later the 239th destroyed the antiaircraft sloop *Auckland* off Tobruk. Then on June 29, seven Ju 87s from the Squadriagle hit the destroyer *Waterhen* as she carried troops to Tobruk. Most of the troops survived, but the 1918-vintage ship sank early on June 30. Less than two weeks passed before the Italian unit's bombers managed to sink the destroyer *Defender*, which had rescued the *Waterhen's* crew and passengers.[65]

Each side in the Mediterranean air-sea fight now focused on safely escorting supplies and reinforcements to its own forces fighting in North Africa and in Greece. At the same time, the opposing navies and air forces worked to deny similar opportunity to their opponents. Island and coastal bases from which to do this were of vital importance to both sides.

A typical engagement took place on February 21, 1941. The old carrier *Eagle* with Fulmar and Sea Gladiator biplane fighters aboard met the merchant ships *Clan Macauley* and *Breconshsire* en route to Alexandria. When five He 111s from II/KG 26 on Rhodes attacked late in the afternoon, the fighters took off to intercept them. They shot down one Heinkel and damaged another. Despite the fighters one German plane sent a bomb down the *Clan Macaulay's* funnel but it went out through the ship's hull without exploding.[66]

Malta remained a major concern to Italy and Germany. Increased bombing in early March 1941 forced a temporary withdrawal of the RAF's few remaining bombers and flying boats to Egypt. This left British air strength on the island down to less than ten Hurricanes.[67]

Allied aircraft operating from Crete likewise impinged on Axis naval operations. Fleet Air Arm Swordfish (“Stringbag”) biplane torpedo planes plus Fulmar and Buffalo monoplane fighters from No. 805 and 806 Squadrons constituted British air strength on the island. RAF photo reconnaissance and bomber aircraft also staged from the island for particular missions. On April 5, 1941, six Blenheims of RAF No. 30 Squadron were added to the island's air strength.[68]

When a strong Italian force sortied to intercept a British convoy in late March, British warships from Alexandria steamed out to meet it. In the resulting engagement, the Italian ships retired when Fleigerkorps X air cover failed to materialize. As the Mussolini's warships retreated, Fleet Air Arm Swordfish and RAF Blenheims based on Crete attacked. Planes from the Royal Navy carrier *Formidable* joined them.

A series of sorties against the Italian fleet during the afternoon of March 28, 1941 climaxed just after three o'clock. Five torpedo planes flew low over the water to approach the battleship *Vittorio Veneto* from astern. As they neared the ship, the British aircraft separated

to make torpedo runs from different directions. At the same time Fulmar fighters strafed the battleship's bridge and gun mounts. The *Veneto's* guns sent one plane into the sea, but another's torpedo hit the ship's port side. The explosion disabled the battleship's port screws, shut down its engines temporarily, and caused extensive flooding. The *Veneto* regained power with a few minutes and limped home at nineteen knots. Two hours later, the Luftwaffe gave its answer to what had been a frantic Italian call for air cover. Because location of the British naval force was unknown, said the German aviators, they might attack Italian rather than Allied ships. The Italian fleet suffered a last blow from the air when one of nine carrier aircraft attacking put a torpedo into the heavy cruiser *Pola* at dusk.[69]

A surface engagement waged at night, the Battle of Matapan, followed. Italy lost three heavy cruisers, two destroyers, and 2,400 naval personnel. The Luftwaffe arrived over the scene only on the following day in the form of a Ju 88 reconnaissance aircraft. It came just in time to discourage Royal Navy ships from rescuing Italian survivors.

Fleigerkorps X's late appearance led to bitter recriminations between the Italians and Germans. It also made the Mussolini's navy skeptical of support from either the Italian or German air forces. Italian naval commanders became increasingly reluctant to challenge the British fleet. Shortly after the battle, the Italian Supreme Command directed Italy's battleships not to operate beyond the range of fighter protection. Matapan also led Mussolini to reverse a previous decision. He permitted the Italian Navy to begin building aircraft carriers. Construction began on two, although neither reached completion before Italy capitulated in 1943.[70]

The Luftwaffe, while failing in this instance to give adequate support to Italy's navy, had better success in interdicting British convoys en route to Greek harbors. Even before Germany officially entered the war against Greece on April 6, 1941, her air attacks had destroyed twenty-five badly needed Allied merchant ships.

On March 18 the British dispatched the thirteen ships of Convoy AN-21 from Alexandria to Greece. A four-ship convoy (MW-6) bound for Malta left Alexandria two days later. Ju 88s attacked both convoys. Fighter cover drove one bomber away from MW-6 and sent the other into the sea. Four more Ju 88s, from II/LG 1 raided Convoy AN-21. One placed a bomb on the bridge of the Danish tanker *Marie Maersk*, which caught fire and had to be abandoned. The next day II/KG 26 He 111 torpedo bombers left the 3,798-ton Greek freighter *Embiricos Nicolaos* and Norwegian tanker *Solheim* sinking.

Other typical convoy actions occurred on April 2 and 3 with Convoys AN/ANF-22 and ANF-24 bound from Alexandria to Greece. On April 2 II/KG 26 He 111s damaged the freighter *Cyprian Prince* in Convoy ANF-24. On the following day, nine Ju 88s made two hits on the ammunition-laden *Northern Prince*. They started fires that eventually set off the ship's cargo.

During the same period AN/ANF-22, consisting of seven empty troopships and nine empty freighters, came under attack by Italian bombers and torpedo aircraft on the afternoon of April 2 but remained undamaged. Late in the day to the east of Crete, six Ju 88s dive-bombed the convoy. Bombs hit the *Koulouros Xenos* and *Homefield*, forcing their crews to abandon ship. A near miss shook the *Teti* so badly that she had to anchor near the coast of Crete. Thirty minutes after the Ju 88s, three Italian S 81s set the 6,054-ton *Devis* afire and caused a number of casualties.[71]

A subsequent combined high-level bombing and torpedo assault on Convoy AN-27 resulted in torpedo damage to the oiler *British Science*. Two S 79 torpedo-bombers from the Italian Air Force's 281 Squadriglia participated with three S 79 level-bombers from 34

Gruppo. An RAF No. 30 Squadron Blenheim countered the Italian attack, shooting down one torpedo plane and damaging three bombers.[72]

On April 6, 1941, Hitler declared war on Greece and Fleigerkorps X quickly destroyed the port of Piraeus. Air attacks blew up the ammunition ship *Clan Fraser* and another 42,000-tons of shipping in the process.[73]

The weight of German land and air forces, added to that of Italy, overwhelmed the Greeks and their allies. Greece surrendered to the Axis on April 24. This left the British with the problem of evacuating their expeditionary force from the Greek mainland. As at Dunkirk and Tobruk, Luftwaffe bombing meant that British ships had to arrive at beaches and ports after dark and leave before dawn.

At Piraeus, Luftwaffe bombing destroyed Allied twenty-three ships in two days. Ju 87s quickly demolished the Greek battleship *Kilkis* and destroyers *Psara* and *Ydra*, the hospital ship *Ellenis*, and a number of small freighters and tankers.[74]

The Luftwaffe caught three ships carrying ammunition, explosives, and mules at the Greek port of Naupila during the day on April 24. The 4,665-ton *Santa Clara Valley*, carrying 500 of the unfortunate animals, went down with most of her cargo aboard after four direct hits during an 11:00 a.m. air raid. The 2,269-ton *Cavallo* followed her to the bottom an hour later while the 4,108-ton *Nicolaou Georgiios* blew up at three o'clock. Other ships lost elsewhere to air attack on April 24 included the hospital ships *Andros* and *Policos*, the lighter *A-1*, and the yacht *Hellas*.[75]

On the night of April 24-25, the evacuation ship *Ulster Prince* ran aground at Nauplia. When bomb-carrying Me 109s, Ju 87s, and Ju 88s found the ship at daylight, they destroyed her. Daylight also caught two passenger ships, the *Slamat* and *Khedive Ismail*, in port because of slow loading. Four bombs set the *Slamat* afire. Two destroyers, the *Diamond* and *Wrybeck*, rescued her crew and passengers. Then they too suffered bombing and strafing by Ju 88s and Me 109s. In the end, all three ships were destroyed and most of their crews and passengers died.[76]

In mid-afternoon on April 28, 1941, Ju 88s spotted an evacuation convoy made up of the antiaircraft cruiser *Conventry*, three destroyers, and the merchant ships *Pennland* and *Thurland Castle*. An initial attack put the *Pennland's* bridge, wheelhouse, and steering out of commission. At half-past four, another bomb run sank her. This forced the Royal Navy to allocate five more destroyers to evacuation assignments in place of the 16,082-ton liner.[77]

The Luftwaffe continued to sink and damage ships until British authorities called off the evacuation on April 28. Despite the German Air Force's opposition, the Royal Navy managed to extricate over 50,000 British troops from Greece although they had to abandon 8,000 vehicles and the force's heavy weapons. After the campaign in Greece, the Luftwaffe's Deputy Chief of Staff visited and evaluated German air efforts in the Mediterranean. His recommendations led to substantial Luftwaffe reinforcement in the theater. Fleigerkorps IV arrived just in time to support an airborne invasion of Crete. The Luftwaffe's capture of Crete was not in itself a maritime air operation. But some Royal Navy ships opposing the invasion fell victim to German land-based air power as did many of the ships carrying supplies to the island.

During May 1941 the German Air Force launched counter-air sorties against RAF fields on Crete while simultaneously conducting shipping strikes. When British cruisers and destroyers aided Crete's defenders by bombarding an Axis airfield on the island of Scarpanto east of Crete, high-level bombing at dawn on May 21 damaged the cruiser *Ajax* and sank the destroyer *Juno*. Two bombs destroyed the destroyer's engine room and a third bomb reached her aft magazine. The resulting explosion sent the *Juno* down in less than two minutes.

British ships tried to intercept part of a sea-borne invasion headed for Crete, but two Luftwaffe groups attacked and drove them to retire on May 21. Luftwaffe pilots damaged two cruisers. They also sank the cruisers *Fiji* and *Gloucester* and the destroyer *Greyhound* northwest of Crete.

The *Greyhound*, detached to destroy a small craft, came to grief first. Eight Ju 87s made several runs at the destroyer as she returned to the main body of the British fleet. They finally planted a 550-pound bomb and two 100-pound bombs despite the ship's evasive action. Four minutes after the bombs struck, the *Greyhound* was under water. Vice Admiral E.L.S. King, commanding *Greyhound's* main force, ordered two other destroyers to rescue its survivors. He sent two cruisers, the *Fiji* and *Gloucester*, to support the *Kandahar* and *Kingston*. Only after they left did he learn that the two cruisers were low on antiaircraft ammunition.

Masses of German aircraft rushed to demolish the four ships. The *Gloucester* went dead in the water, with fierce fires raging, around three-thirty in the afternoon. Her companions turned back toward the main force, the *Fiji* out of antiaircraft ammunition and the destroyers low on fuel. Less than two hours after the *Gloucester* was put out of action, the *Fiji*, immobilized by a bomb from a Me 109, succumbed to another bomb. The *Khandhar* and *Kingston*, themselves under attack, tossed off rafts for the cruiser's survivors and raced back to King's force.[78]

On May 23 bombs sank the destroyers *Kelly* and *Kashmir* as they were steaming about forty miles south of Crete. They, like the *Greyhound*, *Gloucester*, and *Fiji*, had departed the main force on detached duty. The destroyers were returning from bombarding an airfield on the northern coast of Crete that was being used by the Luftwaffe. Do 17s attacked at dawn but scored no hits. Twenty-four Stukas followed the Dorniers. The *Kashmir* went to the bottom two minutes after being struck by a heavy bomb. The *Kelly* capsized when struck by a 1,100-pound bomb while making a turn at thirty knots. The destroyer *Kipling*, which had arrived at the scene during the attack, rescued nearly 300 survivors from the two ships despite high-level bombing over the next three hours. She then headed for Alexandria, arriving safely although she had to be towed in the last fifty miles after running out of fuel.[79]

The high losses of warships led Admiral Cunningham to inform the British Chiefs of Staff that his ships could no longer operate near Crete or in the Aegean Sea during daylight hours. The Chiefs replied that both the Royal Navy and the Royal Air Force should accept "any risk" to defend Crete.[80] Chastened, Cunningham sent the carrier *Formidable* to launch a counter-air strike against the Luftwaffe's Ju 87 base on Scarpanto, an island about fifty miles northeast of Crete. A feeble raid on May 26 by four single-engine Albacore torpedo bombers and five Fulmars destroyed two bombers on the ground, but otherwise did little damage. As the carrier and her escorts returned to Alexandria they encountered twenty Ju 87s that had sortied from Libya. The *Formidable's* two remaining Fulmar fighters didn't get off before the Germans attacked. Nine Stuka's exacted a high toll for the two bombers the carrier strike had destroyed. Two 550-pound bombs blew out several watertight bulkheads, destroyed a gun turret, and damaged the carrier's launching apparatus. Although the *Formidable* was able to recover her strike aircraft, she was no longer operational. Cunningham had to send her to the United States for repair, where she was out of the war for six months.

The other eleven dive bombers had flown down against the two battleships and eight destroyers escorting the carrier. They did no damage to the battleships, but nearly sank the destroyer *Nubian*. A bomb landed on her depth charges. An immense explosion blew off her after gun mounts but she managed to limp back to Alexandria.[81]

The combined air and sea assault drove the British from Crete on May 27, 1941. The Royal Navy engineered yet another evacuation, but suffered heavy losses to air attack in the process. Operating from Scarpanto, the Luftwaffe bombed three cruisers and six destroyers on their way to rescue troops at Heraklion. Most of the ships arrived safely at Crete, but rattled by near misses. These did enough harm to force the cruiser *Ajax* to turn back and probably led to mechanical difficulties that forced abandonment of the destroyer *Imperial*. As the British ships withdrew on May 28 laden with troops, an Italian torpedo plane sank the destroyer *Hereward* while Stukas heavily damaged the cruisers *Dido* and *Orion*. The air attacks also inflicted high casualties on the ships' crews and passengers.[82]

During the invasion, the Luftwaffe mistakenly struck Axis ships. Stukas attacked the Italian destroyer *Sagittario* as it escorted ships carrying German troops bound for Crete. They also bombed five other Italian destroyers loaded with Nazi soldiers. Of the five, the destroyer *Q. Sella* suffered heavy damage. Göring's aviators also bombed two Italian torpedo boats, which they mistook for British submarines. Fleigerkorps IV had warned that its air crews had never flown missions over the sea. They could not, the commanding officer said, tell the difference between friend and foe. This may also have been why Luftwaffe pilots, despite their ubiquitous presence over the waters near Crete, failed to warn German and Italian naval units when they sighted British ships.[83]

On the last day of the evacuation of Crete, the RAF sent fighters with long-range fuel tanks to provide air cover. No major naval units were lost. The Royal Navy had managed to evacuate over half of the British troops on the island. It did so at a cost of three cruisers and six destroyers. His majesty's fleet also temporarily lost use of several major combatants, such as the *Formidable*. German air activity had cost the Royal Navy 2,000 casualties, nearly half of whom were killed.[84]

The conquest of Crete left only Malta to be occupied or suppressed by Axis forces. High casualties to the Luftwaffe's parachute and glider assault troops precluded an airborne invasion. The German Air Force's bombers received the assignment to make the island unusable as an Allied air or naval base.

The German invasion of Russia on June 22, 1941 diverted Luftwaffe resources to that theater. The Axis supply situation in North Africa quickly became critical due to Allied air and naval interdiction. Admiral Erich Raeder, Commander-in-Chief of the German Navy, and the German Army staff in Rome convinced Hitler to return the Luftwaffe to the Mediterranean in strength.[85]

In November Field Marshal Albert Kesselring arrived in Italy with Luftflotte 2 to control German air operations in the Mediterranean. Kesselring assigned Fleigerkorps II in Sicily responsibility for the central Mediterranean and Fleigerkorps X in North Africa responsibility for the eastern Mediterranean. By the end of 1941 Kesselring had 425 aircraft positioned to devastate Malta.[86]

Meanwhile, Allied air power continued to interdict enemy shipping. Wellington and Blenheim bombers had been withdrawn from Malta to Egypt because of heavy losses. But in early 1942 No. 39 Squadron became operational at Alexandria with Beaufort torpedo-bombers. When reconnaissance located a large Italian convoy steaming from Italy to Libya on January 23, Blenheims, twin-engine Beaufort torpedo bombers, and Albacore biplane torpedo bombers assembled at Benghazi. Albacores from Malta also prepared to strike the Italian ships. A torpedo from one of the three Beauforts crippled the 14,000-ton liner *Victoria*. Albacores then finished off the ship, drowning 300 of the 400 troops aboard.[87]

A few months later, another Axis convoy encountered the torpedo-carrying Beauforts in mid-April 1942. Italian naval authorities decided that it was safe to run the convoy past

Malta to Benghazi. Malta, they knew, had no strike aircraft left and the convoy route should be out of range of Allied aircraft in North Africa. The Beauforts, however, could take off from an airfield near Tobruk, attack the convoy, and go on to Malta.

A reconnaissance aircraft from RAF No. 22 Squadron located the convoy, reported its location, and flew on to Malta. As it landed, an Me 109 followed it in and killed the pilot and navigator with machine gun fire. At noon a strike formation left Bu Amud airfield in Egypt. A twin-engine Maryland light bomber preceded to provide up-to-date information on convoy location. Four Beaufighters escorted nine torpedo-carrying Beauforts.

The Maryland located the convoy, reported its position, but was shot down by a Ju 88. The torpedo planes' fighter escort eliminated two Ju 88s that crossed their path before heading to Malta because of low fuel. The Beauforts continued, locating the enemy ships and their escort of Me 109s, Me 110s, and Ju 88s. The convoy was steaming north, away from the Beauforts.

More than twenty aircraft threw an umbrella over the Axis ships and prevented the torpedo planes from circling the convoy to obtain a better position. The Beauforts made their torpedo runs from astern of the convoy under German air attack. The RAF aircrews observed three torpedo hits on two vessels as they fled from the swarming German interceptors. One Beaufort went down near the convoy, a second on its way to Malta. Another of the British torpedo bombers hit the water six miles from Malta. Me 109s splashed a fourth as it lined up on a Malta runway. The RAF lost seventeen of thirty-six aircrew and four of nine Beauforts plus the Maryland and its crew. It was true that over water, as over land, bombers needed fighter escort to function successfully.[88]

German air raids quickly made Malta unsafe for surface ships, although at a significant cost in Luftwaffe aircraft. Between early April and May 10, Luftflotte 2, based in Sicily, sent 11,000 sorties against the island. On April 5 alone Kesselring's bombers sank three British destroyers at Malta. Axis convoy losses fell from a high of 77 percent in November 1941 to a rate of 20 to 30 percent in early 1942.[89]

The Royal Navy persisted in supplying the island, which continued as an air and submarine base. In mid-June 1942 two critical and heavily escorted convoys approached the island: Convoy Harpoon from Gibraltar and Convoy Vigorous from Alexandria. They triggered running air-sea battles. Axis air and naval forces attacked the convoys and their escorts. Allied air and naval forces countered the attackers.

Harpoon consisted of six ships escorted by the battleship *Malaya*, the carriers *Eagle* and *Argus*, three cruisers, and eight destroyers. Vigorous consisted of eleven freighters escorted by eight cruisers and twenty-seven destroyers.

Counter-air strikes against the Luftwaffe by RAF bombers from Malta and Egypt preceded the convoys. Two torpedo Beauforts and six twin-engine Wellington long-range bombers adapted to carry and launch torpedoes remained on alert at Malta in case the Italian fleet sailed to intercept the convoys. When a Royal Navy submarine reported two Italian cruisers and three destroyers northwest of Sicily, four Wellingtons took off from Malta at night on the night of June 13-14. They found the Italian ships but returned with their weapons when plans to illuminate the enemy vessels with flares or moonlight had failed.[90]

Regia Aeronautica aircraft based on the island of Sardinia attacked Harpoon on June 14. Fighter-escorted fighter-bombers plus torpedo and medium bombers joined in the assault. The scores of Italian aircraft quickly overwhelmed the convoy's ten air defense fighters. Despite their strength, the Axis planes managed only to torpedo and seriously damage the cruiser *Liverpool* and to bomb and sink the freighter *Tanimbar*. Subsequent air raids when the convoy came within range of Stukas based in Sicily, surface ship attacks, and mines

airdropped in the convoy's path accounted for three more of the convoy's freighters. Only two merchant ships of Convoy Harpoon survived to reach Malta.[91]

The Vigorous convoy, which had sailed from Alexandria on the evening of June 13, received attacks by Luftwaffe units from Crete, Greece, and Libya. The freighter *Aagtekirk* and her escorting destroyer *Tetcott* got caught off Tobruk after detaching from the convoy. Forty Stukas quickly accounted for the merchantman but the destroyer survived. On June 15 and 16, German air units attacked the main element of Convoy Vigorous, as did E-boats and submarines. Bombs sank the cruiser *Hermione* and destroyer *Nestor*, badly damaged the cruiser *Birmingham*, and demolished two more freighters. The Luftwaffe lost only one Ju 87 and one Ju 88. The Axis' combined air, surface, and sub-surface efforts prevented any of the convoy's ships from reaching Malta. Allied land-based aerial forces had, however, strived to counter them.[92]

RAF No. 217 Squadron, flying torpedo Beauforts, arrived at Malta a few days earlier on June 10. Planners intended the unit to be the RAF's main strike force threatening the Italian fleet. When intelligence indicated that the fleet was out to intercept Convoys Harpoon and Vigorous, No. 217 quickly mounted a mission, although only one man in the squadron had ever dropped a torpedo in combat. Few of the pilots had night operations experience.

Nine Beauforts, just declared operational after a flight from the United Kingdom, took off before dawn on June 15. Their target was the Italian naval force 200 miles distant. Only five of the Beauforts managed to rendezvous after takeoff, so four of the nine aircraft proceeded independently. One of these found the Italian ships 200 miles due east of Malta at dawn.

The first aircraft to find the Italian fleet successfully torpedoed the lead cruiser *Trento*, after circling to get ahead and west of the formation of ships. The other Beauforts, thirty-five miles away, sighted the smoke from the injured cruiser and sped to the scene. Three of the RAF planes ran in at the second ship in the formation from her port side. Two others came in from the starboard. None of their torpedoes struck home, but the Italian ships broke out of formation in violent evasive actions. A final Beaufort, one of those that had not made the rendezvous, then arrived and dropped a torpedo toward the stricken *Trento*. This too missed. The pilot had used a half a ship's length deflection, not knowing that the cruiser was no longer underway. The *Trento* was doomed, however. Within minutes the British submarine *Umbra*, which had watched the entire air-sea action, finished her off with a torpedo.[93]

Undeterred, the Italian fleet pressed on toward Convoys Harpoon and Vigorous while additional Allied aircraft prepared to attack it. Rommel's recapture of the Bu Amud airfield had forced No. 39 Squadron back to Sidi Barrani. Its Beauforts had barely enough range to fly from there to Malta, attacking the Italians en route. American four-engine Liberator heavy bombers based at the Suez Canal, new to the theater, also scheduled a mission against Mussolini's ships.

Twelve Beauforts took off from Sidi Barrani just after six in the morning. The squadron commander had briefed his pilots to target the Italian battleships rather than the accompanying cruisers and destroyers. Ships in the target group included the battleships *Vittorio Veneto* and *Littorio*, the cruisers *Gorizia*, *Garibaldi* and *Aosta*, and ten destroyers. They had sailed from Sardinia, stopped at Palermo in Sicily, and were between Sicily and Tunisia on the morning of June 15.[94]

The RAF planes paralleled the North African coast until reaching northernmost Cyrenaica. There they turned north out over the Mediterranean. A Maryland flew ahead of them to relocate the Italian ships. At this point the Beauforts encountered five Me 109s on

their way to provide fighter cover for German bombers headed toward Convoy Vigorous. The German fighters surprised the Beauforts. The other RAF fliers first became aware of their danger when the Beaufort on the extreme left of their formation fell into the sea in flames. Then the Beaufort on the extreme right of the formation went down. The No. 39 Squadron formation, a mix of Mark I and Mark II Beauforts, returned fire but the Mark II aircrafts' waist and tail guns quickly jammed. Finally the Me 109s, their ammunition exhausted, turned away. One damaged Beaufort headed inland to crash behind German lines. Another turned back to Sidi Barrani. Two more had jettisoned their torpedoes to facilitate evasive action. Others, with their fuel depleted in the engagement, also aborted. Only five of the strike aircraft continued.

The Maryland located the Italian fleet fifty miles ahead of the approaching strike aircraft and radioed its location back to the remaining Beauforts. As the remaining strike aircraft approached, the reconnaissance aircraft fired a flare in the direction of the enemy. The reduced formation of Beauforts approached the nearest battleship bows on. Their intention was that three planes would run in from port and two from starboard. Just as they separated, the battleship started a sharp turn that presented its length. Instead of separating, all five aircraft targeted the battleship's broad side. Two aircraft hit by flak from escorting destroyers dropped their torpedoes too soon. The other pilots also dropped their weapons from more than a mile away and the battleship steamed away unharmed.[95]

Seven American and two British Liberators had arrived over the enemy fleet as the torpedo planes attacked. One placed a 500-pound bomb on the forward turret of the *Littorio*. It exploded on impact but did no damage.[96] The Italian fleet took minimal damage but, led by an easily discouraged admiral, headed north toward its base at Taranto, inside the “heel” of the boot of Italy. Convoy Vigorous, with its escorts short of fuel and antiaircraft ammunition, returned to Alexandria.

The RAF still sought to injure the Italian naval force. The Wellingtons involved in the unsuccessful raid on the night of June 14 took off from Malta on the next day. Radar directed the five aircraft through night and low cloud to the Italian ships. One pilot managed a torpedo run. Flying through murk, he suddenly found the *Littorio* straight ahead. Pilot Officer Hawes quickly dropped both his torpedoes. One missed while the other struck home. But the heavily armored ship shrugged off the hit and steamed home and the Wellingtons returned safely to their base.[97]

As opposing ships and planes parried over the westbound British Convoy Vigorous, Italian warships threatened the eastbound Convoy Harpoon, which also became engaged in an air-sea struggle. Discovery of two Italian cruisers and two destroyers headed toward the convoy generated calls for an air strike on June 15. Only Malta-based aircraft could reach them. When the call came, the British forces on the island had only two Beauforts and four Fleet Air Arm Albacores available. They took off at nine-thirty in the morning with an escort of sixteen Spitfires. While the Spitfires engaged Me 109s from Pantellaria, the strike aircraft descended on the Italian ships. The two Beauforts dropped their torpedoes toward the leading cruiser at ranges of 800 and 300 yards. The first appeared to hit while the second, launched too late, passed under the ship. The four Albacores followed with their torpedoes but did no damage.[98]

The Pedestal convoy in August 1942, like Harpoon and Vigorous, also received thorough attention from Kesselring's air fleet. The convoy's two battleships, three carriers, seven cruisers, and thirty-plus destroyers and fourteen merchant ships entered the Mediterranean through the Straits of Gibraltar on the night of August 9, 1942.

From August 10 on the convoy and its escorts steamed east under air attack. Italian planes based on the island of Pantelleria and German planes in Sicily and Sardinia launched coordinated dive-bomber, bomber, and torpedo bomber sorties against the convoy. The first attacks on the 10 and 11th achieved little, but late in the afternoon of August 12, forty Ju 87s and Ju 88s dive-bombed the convoy while Regia Aeronautica planes initiated torpedo runs. One torpedo sank a destroyer in return for two aircraft shot down. As the Italian Air Force planes completed their attack, the German bombers focused on the carrier *Indomitable*. Two direct hits and three near misses forced the flattop to turn back, no longer able to fly her aircraft. Air attacks on the 12th also damaged one merchant ship and sank two others.[99]

The following morning, after the convoy had lost several ships to submarine and E-boat attacks, Italian aircraft returned. The tanker *Ohio* survived a 550-pound bomb and a stricken Ju 87 crashing on board to eventually reach Malta. She numbered among only five of the original fourteen supply ships to make it into port.[100]

The assault on Convoy Pedestal during August 1942 marked the apex of Axis anti-shipping missions in the Mediterranean. Aircraft and personnel losses in Luftflotte 2's anti-shipping squadrons were not replaced as casualties mounted. Units supporting the Wermacht in Russia and North Africa received higher priority allocation of air assets. By the time the Allies invaded French North Africa with Operation Torch in November 1942, both the Luftwaffe and Regia Aeronautica were on the defensive.

Reinforced British air forces on Malta allowed the RAF to respond to a final series of Luftwaffe raids in strength. Radar-guided Spitfires achieved a two-to-one loss rate with Kesselring's bombers and their escort. By the beginning of 1943, newly-captured airfields in North Africa and the Malta bases enabled the Allies to dominate shipping routes between Italy and the few ports remaining available to the Afrika Korps. The early phases of major maritime operations in the Mediterranean involving land-based aircraft were at an end.

The employment of land-based aircraft significantly influenced maritime operations of all belligerents in the Mediterranean and demonstrated the effectiveness of such forces in a maritime role. Those forces had only to be properly equipped and in sufficient strength to accomplish their missions. Germany's Ju 87s and Ju 88s proved to be excellent ship-killers. The Regia Aeronautica had quickly adopted the dive bomber to compliment its torpedo-carrying aircraft. This was something the RAF never attempted, while the Royal Navy's Fleet Air Arm was too weak at this stage of the war to make much of a contribution. Allied fighters were also inadequate with regard to number and range in most instances to protect strike aircraft engaged in maritime air missions. This meant that British strike aircraft suffered such high losses that they were often ineffective.

British air and naval forces proved unable to stop the flow of supplies from Italy to Axis ground and air forces fighting in North Africa. Axis land-based air and naval forces in opposition could not prevent the Allies from evacuating their defeated armies in Greece and on Crete, but they did succeed in making Malta temporarily unusable. If the Germans and Italians had not been forced to send their air assets to other theaters, this temporary success probably would have become permanent.

Endnotes to Chapter III

1. Sir Arthur Tedder, Marshal of the Royal Air Force, *Air Power in War* (London: Hodder and Stoughton, [1947?]), p. 33.
2. J. Rohwer and G. Hummelchen, *Chronology of the War at Sea 1939-1945* (Annapolis: Naval Institute Press, 1992), pp. 7-12.
3. Winston S. Churchill, *The Second World War: The Gathering Storm* (Boston: Houghton Mifflin Company, 1948), pp. 580-581.
4. Peter C. Smith, *Hold the Narrow Sea: Naval Warfare in the English Channel 1939-1945* (Annapolis: Naval Institute Press, 1984), pp. 14-15.
5. *Ibid*., pp. 19-20.
6. *Ibid*., p. 23.
7. *Ibid*., p. 26.
8. *Ibid*., p. 27.
9. *Ibid*., p. 27.
10. Peter C. Smith, *The Stuka at War* (New York: Arco Publishing Company, 1971), p. 66.
11. *Ibid*., p. 30.
12. Smith, *Hold the Narrow Sea: Naval Warfare in the English Channel 1939-1945*, p. 29.
13. Capt S. W. Roskill, RN, *The War at Sea, Volume I, The Defensive* (London: Her Majesty's Stationery Office, 1954), pp. 213-214; Smith, *Hold the Narrow Sea: Naval Warfare in the English Channel 1939-1945*, p. 33.
14. Smith, *Hold the Narrow Sea: Naval Warfare in the English Channel 1939-1945*, p. 36.
15. Cajus Bekker, *The Luftwaffe War Diaries: The German Air Force in World War II* (New York: Da Capo Press, 1994), p. 124.
16. Nathan Miller, *War at Sea: A Naval History of World War II* (Annapolis: Naval Institute Press, 1995), p. 83.
17. John Terraine, *A Time for Courage: The Royal Air Force in the European War, 1939-1945* (New York: Macmillan Publishing Company, 1985), p. 156.
18. Walter J. Boyne, *Clash of Wings: World War II in the Air* (New York: Simon & Schuster, 1994), p. 64; Denis Richards, *Royal Air Force 1939-1945, Volume I, The Fight at Odds* (London: Her Majesty's Stationery Office, 1974), p. 131, pp. 135-136.
19. Terraine, *A Time for Courage: The Royal Air Force in the European War, 1939-1945* p. 154.
20. *Ibid*., p. 157.
21. Boyne, *Clash of Wings: World War II in the Air,* p. 64.
22. Bekker, *The Luftwaffe War Diaries: The German Air Force in World War II,* p. 127; Smith, *Hold the Narrow Sea: Naval Warfare in the English Channel 1939-1945,* p. 43.
23. Stephen W. Roskill, *The War at Sea 1939-1945, Volume I, The Defensive* (London: Her Majesty's Stationery Office, 1954), p. 219.
24. Bekker, The *Luftwaffe War Diaries: The German Air Force in World War II,* p. 128; Roskill, *The War at Sea 1939-1945, Volume I, The Defensive,* p. 84.
25. Smith, *Hold the Narrow Sea: Naval Warfare in the English Channel 1939-1945,* p. 44; David Brown, *Warship Losses of World War Two* (Annapolis: Naval Institute Press, 1990), p. 33.
26. Roskill, *The War at Sea, Volume I, The Defensive,* p. 222.
27. Richards, *Royal Air Force 1939-1945, Volume I, The Fight at Odds,* p. 138.

28. Miller, *War at Sea: A Naval History of World War II*, pp. 86-87; Smith, *Hold the Narrow Sea: Naval Warfare in the English Channel 1939-1945*, pp. 47-48; p. 51; Smith, *Stuka at War*, p. 33.
29. Smith, *Hold the Narrow Sea: Naval Warfare in the English Channel 1939-1945*, 1984, p. 53; Roskill, *The War at Sea 1939-1945, Volume I, The Defensive*, p. 225.
30. Smith, *Hold the Narrow Sea: Naval Warfare in the English Channel 1939-1945*, pp. 55-56.
31. *Ibid*., pp. 56-57.
32. *Ibid*., p. 58.
33. *Ibid*., pp. 58-59.
34. *Ibid*., p. 60.
35. *Ibid*., p. 62.
36. Roskill, *The War at Sea, 1939-1945, Volume I, The Defensive*, pp. 226-228.
37. Smith, *Hold the Narrow Sea: Naval Warfare in the English Channel 1939-1945*, p. 69, p. 71.
38. *Ibid*., pp. 73-74.
39. *Ibid*., p. 77.
40. Williamson Murray, *Luftwaffe* (Baltimore: The Nautical & Aviation Publishing Company of America, 1993), p. 42.
41. Bekker, *The Luftwaffe War Diaries: The German Air Force in World War II*, p. 133.
42. Rohwer and Hummelchen, *Chronology of the War at Sea 1939-1945*, p. 27; Smith, *Hold the Narrow Sea: Naval Warfare in the English Channel 1939-1945* pp. 84-85.
43. *Ibid*., p. 94.
44. *Ibid*., pp. 95-96.
45. *Ibid*., 1984, p. 103.
46. Adolf Galland, *The First and the Last* (London: Methuen, ?), quoted in Smith, *Stuka at War*, p. 42, and Smith, *Stuka at War*, p. 42.
47. Smith, *Hold the Narrow Sea: Naval Warfare in the English Channel 1939-1945*, p. 103.
48. John L. Winton, *Ultra at Sea* (New York: William Morrow and Company, 1988), pp. 164-180, summarizes Allied use of radio intercept, cryptanalysis, and radio traffic analysis in the Mediterranean in 1941 and 1942.
49. Ralph Bennett, *Ultra and Mediterranean Strategy* (New York: William Morrow and Company, Inc., 1989), p. 24.
50. Rohwer and Hummelchen, *Chronology of the War at Sea 1939-1945*, p. 26.
51. Bernard Ireland, *The War in the Mediterranean 1940-1943* (London: Arms & Armour Press, 1993), p. 39.
52. Marc' Antonio Bragadin, *The Italian Navy in World War II* (Annapolis: United States Naval Institute, 1957), p. 20.
53. Ireland, *The War in the Mediterranean 1940-1943*, p. 34.
54. *Ibid*., pp. 35-36.
55. Smith, *Stuka at War*, p. 46.
56. Ireland, *The War in the Mediterranean 1940-1943*, p. 37.
57. *Ibid*., p. 37.
58. *Ibid*., p. 48.
59. Smith, *Stuka at War*, p. 47.
60. Ireland, *The War in the Mediterranean 1940-1943*, pp. 48-49, 55.
61. *Ibid*., p. 55.

62. Roskill, *The War at Sea, Volume I, The Defensive*, pp. 421-422; Christopher Shores with Brian Cull and Nicola Malzia, *Air War for Yugoslavia, Greece and Crete 1940-41* (London: Grubb Street, 1987), p. 130; Ireland, *The War in the Mediterranean 1940-1943*, p. 63; Smith, *Stuka at War*, pp. 49-50.
63. Smith, *Stuka at War*, pp. 51-53.
64. Shores *et al*., *Air War for Yugoslavia, Greece and Crete 1940-41*, p. 131; Ireland, *The War in the Mediterranean 1940-1943*, p. 68.
65. Smith, *Stuka at War*, p. 79.
66. Shores *et al*., *Air War for Yugoslavia, Greece and Crete 1940-41*, pp. 136-137.
67. Ireland, *The War in the Mediterranean 1940-1943*, p. 74.
68. Shores *et al*., *Air War for Yugoslavia, Greece and Crete 1940-41*, p. 145.
69. Bragadin, *The Italian Navy in World War II*, pp. 89-91, 99.
70. Ireland, *The War in the Mediterranean 1940-1943*, pp. 78-79.
71. Rohwer and Hummelchen, *Chronology of the War at Sea 1939-1945*, p. 57; Shores *et al*., *Air War for Yugoslavia, Greece and Crete 1940-41*, pp. 164-165.
72. *Ibid*., pp. 137-138.
73. Ireland, *The War in the Mediterranean 1940-1943*, p. 80.
74. Shores *et al*., *Air War for Yugoslavia, Greece and Crete 1940-41*, p. 277.
75. *Ibid*., p. 289.
76. Ireland, *The War in the Mediterranean 1940-1943*, pp. 81-82.
77. Roskill, *The War at Sea, Volume I, The Defensive*, p. 236; Shores *et al*., *Air War for Yugoslavia, Greece and Crete 1940-41*, p. 294.
78. Bekker, *Luftwaffe War Diaries*, pp. 198-199; Roskill, *The War at Sea, Volume I, The Defensive*, p. 442; Smith, *Stuka at War*, p. 57-58.
79. Bekker, *Luftwaffe War Diaries*, p. 199; Roskill, *The War at Sea, Volume I, The Defensive*, p. 442; Smith, *Stuka at War*, pp. 58-59.
80. Ireland, *The War in the Mediterranean 1940-1943*, p. 84-86.
81. Ireland, *The War in the Mediterranean 1940-1943*, p. 86; Smith, *Stuka at War*, p. 60.
82. Ireland, *The War in the Mediterranean 1940-1943*, pp. 87-88.
83. Bragadin, *The Italian Navy in World War II*, pp. 105-108.
84. Ireland, *The War in the Mediterranean 1940-1943*, p. 88.
85. Ralph Barker, *The Ship Busters: the Story of the R.A.F. Torpedo-Bombers* (London: Chatto & Windus, 1957), p. 94.
86. Smith, *Stuka at War*, p. 80.
87. Barker, *The Ship Busters: the Story of the R.A.F. Torpedo-Bombers* p. 169.
88. *Ibid*., pp. 174-175.
89. Murray, *Luftwaffe*, p. 124.
90. Barker, *The Ship Busters: the Story of the R.A.F. Torpedo-Bombers* p. 177.
91. Air Ministry [Great Britain], *The Rise and Fall of the German Air Force* (New York: St. Martin's Press, 1983) [reissue with new introduction of 1948 publication], p. 136; Roskill, *The War at Sea, Volume II, The Period of Balance* (London: Her Majesty's Stationery Office, 1956), pp. 63-65.
92. Roskill, *The War at Sea, Volume II, The Period of Balance*, pp. 69-70; Smith, *Stuka at War*, p. 84.
93. Barker, *The Ship Busters: the Story of the R.A.F. Torpedo-Bombers*, pp. 180-181; Denis Richards and Hilary St. George Saunders, *Royal Air Force 1939-1945, Volume 2, The Fight Avails* (London: Her Majesty's Stationery Office, 1953), p. 205; Roskill, *The War at Sea, Volume II, The Period of Balance*, pp. 68-70.

94. Roskill, *The War at Sea, Volume II, The Period of Balance*, Map 9 (between pp. 64-65).
95. John Herington, *Air War Against Germany and Italy 1939-1943* (Canberra: Australian War Memorial, 1954), pp. 238-239; Richards and Saunders, *Royal Air Force 1939-1945, Volume II, The Period of Balance*, pp. 205-206.
96. Barker, *The Ship Busters: the Story of the R.A.F. Torpedo-Bombers*, pp. 185-187; Bragadin, *The Italian Navy in World War II*, p. 175.
97. Barker, *The Ship Busters: the Story of the R.A.F. Torpedo-Bombers*, p. 189; Bragadin, *The Italian Navy in World War II*, p. 176.
98. Barker, *The Ship Busters: the Story of the R.A.F. Torpedo-Bombers* pp. 191-192.
99. Air Ministry, *The Rise and Fall of the German Air Force*, p. 137.
100. Smith, *Stuka at War*, pp. 84-85.

CHAPTER IV

THE NORTH PACIFIC

The North Pacific campaign of World War II took place in a remote corner of the world, ill-suited to any type of military operation and historians have concluded that the theater would have been better left alone by both sides.[1] Warranted or not, many Aleutian battles were air-sea fights. Because the Navy usually had higher priority uses for its aircraft carriers, American aerial forces used in the North Pacific were mostly Army and Navy land-based aircraft. Navy aircraft consisted mostly of patrol bombers; those that were amphibians operated occasionally and for short periods from sea plane tenders. This North Pacific campaign, which involved joint service application of land-based aerial forces in maritime operations, took place in three phases: defense of Alaska; elimination of Japanese outposts in the Aleutians; and strikes from the Aleutians against shipping in Japan's northern waters.

Prewar Army and Navy planners examined the Aleutian Islands stretching almost from North America to Asia and the Great Circle route that paralleled them as a possible avenue between the two continents. Their remoteness, rugged terrain, and fog and cloud shrouded environment made them a difficult route. Strategists in both Japan and the United States concluded that mainland Alaska and the Aleutian Islands themselves would be of little military use.[2]

Despite this conclusion, the United States could not leave its northernmost territory entirely undefended. Army Air Corps staffers requested funds for air bases at Anchorage, on the coast, and, far inland, at Fairbanks. Naval authorities envisioned flying boat, submarine, and patrol craft bases at Amaknak and Kodiak Islands. These were to supplement a sea plane facility developed in 1937 in Southeast Alaska at Sitka on the site of a defunct naval coaling and radio station. The Navy's plans also called for some of its amphibious patrol bombers to operate from tenders sheltered in Aleutian harbors.[3]

The Aleutian chain is made up of some 120 islands of volcanic origin that stretch nearly 1,000 miles from the Alaska Peninsula, which is the westernmost projection of the Alaska mainland, to within 750 miles of Japan's Kurile Islands. Unimak Island is the easternmost and largest of the Aleutians, just off the tip of the Alaska Peninsula. Southwest of Unimak, 155 air miles away, lies Unalaska Island. Adjacent to Unalaska is Amaknak Island with a small port called Dutch Harbor. The United States Navy had operated a radio station there since early in the twentieth century. Some of the islands west of Unalaska and Amaknak islands that became important in World War II are, in order, Umnak, Adak, Amchitka, Kiska, Shemya, and Attu.

With the frigid Bering Sea to their north and the warmer Pacific Ocean to their south, the Aleutian Islands are one of the world's worst flying areas. Winds and fogs occur simultaneously for days at a time. Low-lying clouds are the rule rather than the exception. Dry, flat landing areas are rare. Sharp localized gusts of wind called "willawaws," which are characterized by simultaneous counter-rotating air currents, occur frequently. They can reach velocities in excess of 100 miles per hour and easily slam aircraft into the ground.[4]

Preparing for War

When the Japanese raided Pearl Harbor in December 1941, the American military air facilities projected for Alaska were well underway. An Army aviation advance party arrived at Anchorage on August 12, 1940. It started preparing for combat units scheduled to land at

Elmendorf Field at Fort Richardson outside Anchorage. Two B–17s, intended for cold weather testing, arrived at Ladd Air Base outside Fairbanks. In early 1941 two bomb squadrons and one pursuit squadron arrived at Elmendorf Field. The 18th Pursuit Squadron, equipped with obsolete P–36 "Hawk" fighters, arrived first. The bombing units, the 36th and 73d Bombardment Squadrons, arrived with twin-engine B–18 bombers. Like the P–36s, the B–18s were 1930s technology that wartime requirements soon proved obsolete. After the Japanese attack on Pearl Harbor on December 7, 1941, the Air Corps re-equipped the pursuit squadron with P–40 Warhawk fighters, the 73rd with twin-engine B–26 Marauder medium bombers, and the 36th with four-engine B–17 Flying Fortresses. The P–40s, which mounted an in-line liquid-cooled engine without turbo charger, started the war as fighter-interceptors but were outclassed by German and Japanese fighters. They remained in service in Alaska throughout the war, as did the high-winged B–26s. The Flying Fortresses were gradually withdrawn in favor of four-engine B–24 Liberator heavy bombers.[5] The B–24s had a range almost twice that of the B–17s although they could not cruise at as great an altitude. They had an operational range of 2,100 miles, could carry up to 5,000-pounds of bombs, and achieve a top speed of 290 miles-per-hour. The B–26s had an operational range of 1,100-plus miles, could carry up to 3,000-pounds of bombs, and achieved a top speed of 305 mph.[6]

Also early in 1941, twin-engine Consolidated PBY-5A Catalina flying boats of Patrol Squadrons VP–41 and VP–42 from Sand Point Naval Air Station, Seattle, began broader Alaskan operations. The bulbous-nosed amphibians could carry either bombs or torpedoes. The PBYs cruised at about 100 mph but had an operational range of 3,100 miles. In rotation, the Catalina squadrons operated from Sitka, Kodiak, and Dutch Harbor to fly missions over the Gulf of Alaska and as far west over the Aleutians as Attu Island, 740 miles from Dutch Harbor.[7]

From these beginnings, substantial Army and Navy land-based aerial forces played important roles in the defense of Alaska. Later, they cut off sea routes to Japanese outposts in the Aleutians and assisted in the recapture of Japanese-occupied islands in the Aleutian chain. Afterward, they harassed shipping in waters off northern Japan.

During World War II the North Pacific fell within Admiral Chester W. Nimitz's Pacific Ocean Areas command. In May of 1942 Nimitz sent Rear Admiral Robert A. Theobald to Alaska to assume command of the North Pacific Force (sometimes called Task Force 8). Nimitz knew from intercepts of Japanese radio traffic that the Japanese would make a diversionary raid in Alaska while attempting to provoke a fleet engagement with the American Navy near Midway Island.[8]

Theobald's new command included Alaskan Army Air Forces and Navy air, surface, and submarine units. Lead Army air elements had arrived earlier, in 1940, while Patrol Wing 4 moved its headquarters from Seattle to Kodiak Island late in May 1942 to become a part of the North Pacific Force.[9] Theobald went north with instructions to place the air component of his joint service force under the command of Brigadier General William O. Butler, commander of the Army's Eleventh Air Force. He chose not to do so until Admiral Ernest J. King, Chief of Naval Operations, and Nimitz reminded him of his orders.

If the Japanese attacked the Aleutians, a "State of Fleet Opposed Invasion" would be declared, with the Navy in charge of defense. Army Air Corps Brigadier General William O. Butler, at the Navy's direction, would command the air task group in the North Pacific Force. He concurrently reported as commander of Alaskan Defense Command air elements to Major General Simon Bolivar Buckner, the commanding officer of that Army formation. Navy directives setting up the air task group said that, under Butler, Captain Lewis E. Gehres would command Patrol Wing 4, the Navy air element of the North Pacific Force. Colonel

William O. Eareckson, also under Butler, would command the Army air element of the joint air formation. In theory, Nimitz had in place all the requirements for a unified air command in the North Pacific.[10]

Communications intelligence revealed Japanese plans to attack Midway Island and the Aleutian Islands in May or June of 1942. Admiral King declared a "State of Fleet Opposed Invasion" to exist in the North Pacific Ocean on May 21, 1942. This meant that Theobald had responsibility for directing the defense of Alaska and that Buckner was to play a supporting role.[11]

Theobald started for Alaska on May 22, 1942. He had been at sea only two days when he radioed Nimitz that air power was the key to the defense of Alaska. Theobald called for "maximum concentration of available mainland-based Navy planes and large concentration of similar Army planes."[12]

Immediately after arriving at the newly-established Kodiak Naval Base on May 27, Theobald conferred with Buckner, Butler, and Gehres. The four officers discussed Theobald's "estimate of the situation, functions of command, and material matters." Theobald later recorded that during the meeting Buckner and Butler thought the main Japanese attack would be on Anchorage. Because of this, and because Butler did not want to concentrate his aircraft at Cold Bay, on the southwest tip of the Alaska Peninsula, and on Umnak Island where there were no revetments, the Army commanders resisted Theobald's wish to locate his air striking force as far to the west as possible. The admiral agreed with them about the inadequacy of the westward airfields. But he still considered it preferable that the Army aircraft be sent to Cold Bay and Umnak.[13]

Although it was clear in the State of Fleet Opposed Invasion that Theobald could order disposition of the Army aircraft, he remained reluctant to do so. An assertion of his authority at this point, he believed, might prejudice Butler's cooperation in the future.[14]

This meeting was Theobald's first with the Army commander with whom he was to cooperate and with the air officers who were to command the North Pacific Force's air components. After the meeting he again advised Nimitz (and also Admiral King) that air power was the key to the defense of Alaska and the Aleutians. "In absence of a naval force," Theobald radioed, "adequate in all types the answer to Alaska defense is adequate land-based air."[15]

Theobald still chose not to follow the instructions given to him by King and Nimitz regarding consolidation of the Army and Navy air elements of his task force. Queried later by King and Nimitz as to why he failed to follow instructions, Theobald cited three justifications: (1) that a single air manager would have served no useful purpose; (2) that the Army airmen had pushed for a single air manager so that they could claim credit for actions attributable to naval aviation; (3) that Butler and Gehres would not have been able to work together.

Theobald's high level quibbling probably encouraged some staff subordinates in both services to continue inter-service bickering, even in the face of imminent contact with the enemy. Army aircraft were moved onto the naval air station at Kodiak as part of the program to defend the station. They also flew patrols from the Kodiak station over the Gulf of Alaska. Control of the aircraft remained with Headquarters Eleventh Air Force at Elmendorf Field outside Anchorage. While this was in accordance with Army Air Forces doctrine, it created the potential for delay in responding to enemy contacts.[16]

Conferences among General Buckner, Captain Parker (Commander of the Alaskan Sea Frontier), and Commander Perry (naval air base commander at Kodiak) resulted in the Navy being given operational control of Army bombers for sea search and as a strike force.

Complete unity of command apparently did not result because there was no specific removal of the limitations on Navy control of Army aircraft.[17]

At the operational level, Army-Navy cooperation worked better. As early as February 26, 1942, Lieutenant Commander James S. Russell, commanding officer of VP–42, Captain Russell A. Cone, commanding officer of the 36th Bomb Squadron, and First Lieutenant J. C. Bowen, commanding officer of the 18th Pursuit Squadron, worked out a detailed agreement for joint operations. Commander J. Perry, the senior naval aviator present approved the agreement.[18] It stated that when one or more enemy ships were sighted, all available aircraft would take off for attack. It further specified separate directions of attack, altitude separations, communications channels, and called for concentrated attack. In the event of attack by carrier aircraft the agreement said that interceptor aircraft would concentrate on destroying enemy aircraft. Army and Navy bombers would concentrate on destruction of the enemy carriers.[19]

Aleutian Invasion and Recapture

The first critical test of land-based Army and Navy air elements in Alaska came on June 2, 1942. Although expected and searched for, an attacking Japanese force approached Dutch Harbor under the cover of weather. The raiding ships included the carriers *Junyo* and *Ryujo* plus escorting cruisers and destroyers. Garbled transmissions from one Navy patrol aircraft that sighted them prevented any warning at all. Zeros, the monoplane Japanese naval fighters, riddled Lieutenant Lucius Campbell's PBY with machine gun bullets just after his radio operator got out a sighting report. When empty fuel tanks caused Campbell to make a forced landing at sea fifty miles from Akutan, he had the contact report re-transmitted. Problems in encryption or decryption kept it from being fully deciphered both at Kodiak and Dutch Harbor. Japanese fighters shot down three other searching PBYs before they could report enemy carrier aircraft.[20]

On the morning of June 3, Japanese aircraft from the carriers *Junyo* and *Ryujo*, which were about 180 miles southwest of the American installations, bombed Dutch Harbor and Unalaska. Fourteen single-engine Kate horizontal bombers and six Zero fighters from the *Ryujo* and thirteen two-seat single-engine Val dive bombers and thirteen Zero fighters from the *Junyo* made the raid.[21] The Americans had little warning. A U.S. Army air search radar set sent to Unalaska was not yet operating. A radar operator on the Navy seaplane tender *Gillis*, tied up at Dutch Harbor, spotted the attacking aircraft five minutes before the Japanese planes began bombing and strafing. When Dutch Harbor reported the bombing, Army P–40s and B–26s at Cold Bay to the east scrambled. Army fighters at Otter Point airfield on Umnak Island , about fifty miles southwest of Dutch Harbor and Unalaska, did not receive word of the attack in progress owing to poor communications.

A second raid of seventeen horizontal bombers, fifteen dive bombers, and fifteen fighters launched later on June 3 targeted five American destroyers lurking in Makushin Bay on the other side of Unalaska Island, about twenty miles west of Dutch Harbor. Theobald had positioned the ships there for an attack on the stronger Japanese fleet if it could be weakened by land-based air strikes. Theobald himself was at sea with a force of two heavy cruisers, three light cruisers, and four destroyers. His task force was 400 miles southeast of Kodiak Island, which lies to the south of the Alaska Peninsula, and nearly 500 miles from the Japanese fleet. Radio silence put him out of radio contact with the rest of his command. But his ships were positioned to intercept the Japanese if they headed toward Kodiak or the Alaskan mainland.[22]

Worsening weather turned back the pilots of the thirty-two Japanese strike aircraft and their escort of fifteen Zero fighters before they reached Makushin Bay on Unalaska Island. Four float planes launched from two Japanese cruisers, which had been flying with the carrier planes, continued on a reconnaissance mission. Two of the reconnoitering two-seater float planes ran into an American air patrol from Otter Point. One of the Japanese aircraft escaped into a cloud. Two P–40s sent the other into the ocean at the end of the Otter Point runway.[23]

The Japanese renewed their attack on Dutch Harbor in the evening on June 4. Twenty strike aircraft, a mix of dive and horizontal bombers, accompanied by eleven Zeros took off from the carriers just after six o'clock. Again, falling bombs were the first warning of a raid. The attack, like the one on June 3, did minor damage, though it killed and wounded a number of Americans.[24]

Japanese strike planners were ignorant of the American airfield at Otter Point and had chosen a post-attack rendezvous point for the carrier aircraft about three miles east of it. P–40s on combat air patrol sighted and attacked the Japanese planes as they approached their assembly point. Other P–40s still on the ground took off hurriedly to join in the fight. Some of the Zeros simultaneously sighted and went after a B–17 returning to the American airfield after fruitlessly searching for the Japanese fleet. In the ensuing melee, the eight American fighters involved shot down two Val dive bombers. They so severely damaged two others that they did not make it back to their carrier. The experienced Japanese Navy pilots, flying the more agile Zeros, splashed two of the American fighters. As they headed toward their carrier they chanced upon and strafed the Navy sea plane tender *Williamson*, causing light casualties.[25]

While the Japanese were raiding Dutch Harbor, Navy PBYs from Cold Bay and Dutch Harbor and Army bombers from Cold Bay and Umnak attempted to find and attack the Japanese carriers. A VP–42 PBY located and trailed the Japanese task force early on the morning of June 4. The pilot of the lumbering amphibian attempted to bomb the Japanese ships before returning to base but was driven off by antiaircraft fire. Then a combat air patrol from the enemy carriers shot down a second PBY that arrived after the first had left. Two additional PBYs, one from VP–41 and one from VP–42, located the carriers about eleven o'clock. The first radioed a position report to American authorities at Cold Bay before making an abortive torpedo run. Antiaircraft fire damaged one of the amphibian's two engines so it headed toward Dutch Harbor. The second PBY, from VP–41, which remained in contact with the Japanese ships, was never heard from again.[26]

When the PBY's sighting report reached American forces at Cold Bay and Otter Point, Colonel Thad V. Foster, the senior Air Corps officer at the latter field, refused to allow the Army and Navy strike aircraft there to attack the Japanese without orders from Headquarters Eleventh Air Force at Anchorage. According to Lieutenant Junior Grade J. E. Breeding of Patrol Squadron 41, Foster told him "to stay where he was." Breeding then radioed Lieutenant Commander Paul J. Foley, skipper of VP–41 that "Six B–26s loaded with torpedoes here awaiting your orders for take off. PBYs are now loading torpedoes." Foley immediately ordered the B–26s to take off.[27] The PBYs then followed. Breeding later commented that Foster repeatedly said during conversations that he was taking orders from the Navy from a person fourteen years his junior.[28]

The six 77th Bombardment Squadron B–26s from Otter Point could not find the Japanese fleet and returned to base at 1:55 p.m. Another five B–26s from Cold Bay also failed to find the Japanese ships and were ordered to land at Otter Point. Two B–26s, each armed on a makeshift basis with one 2,000-pound torpedo, ignored or missed the direction to land

and continued. They found the Japanese. One B–26, flown by Captain Harry S. Taylor, attempted three torpedo runs. Damage from antiaircraft weapons forced Taylor to head back to base after jettisoning his torpedo. The second B–26, flown by Captain George Thornborough, also tried torpedo runs. After the Japanese carriers' evasive actions frustrated two attacks, he decided to drop his torpedo like a bomb. He knew that the torpedo was designed to run a certain distance through water before it would arm itself. But Thornborough hoped that wind would turn the impeller enough to arm his torpedo. This didn't work. The torpedo hit the deck of the carrier *Ryujo* and plunged over the side without exploding. Remarkably, the B–26 escaped unharmed and returned to Cold Bay. On his return to Cold Bay Thornborough directed ground crews to reload his aircraft with 500-pound armor-piercing bombs. He took off in worsening weather. A Cold Bay radio operator heard him reporting a position over the socked-in airfield late that night. Attempts to guide Thornborough into a landing failed. A month later his radio operator's body was found on a beach north of Cold Bay. No trace was ever found of the B–26 or the rest of the crew.[29]

While Thornborough made his second attempt to attack the Japanese fleet, five B–17s and an LB–30, a variant of the B–24, took off from Cold Bay for the same purpose. They too failed to find the enemy ships but returned safely to Cold Bay after three hours in the air. A sixth B–17, delayed in takeoff, departed later and joined up with another B–17 that launched from Otter Point. These two aircraft located the enemy ships.

The Otter Point B–17, which had no radar, made a bomb run at 900 feet and dropped one 2,000-pound and one 1,000-pound bomb. The Cold Bay B–17 used radar to drop its bombs through the clouds. The pilot, Lieutenant Thomas F. Mansfield, then took his aircraft down for a bomb damage assessment. He reported a carrier and cruiser burning before being shot down by antiaircraft fire from the cruiser *Takao.*

Three torpedo-carrying B–26s from Otter Point sortied at 8:30 p.m. They found the Japanese carriers and their escorts about ninety miles south of the airfield just before nine o'clock. Two of the medium bombers ran in at the Japanese ships one after the other. They claimed hits on a cruiser. Despite the aircrews' claims, the American air strikes achieved only near misses that did no damage.[30]

One historian has concluded that the ineffective American air opposition to the Japanese raids occurred for three reasons. These were that: (1) the Cold Bay and Otter Point fields were too far away from Dutch Harbor to permit effective defense; (2) the absence of early warning radar compounded the problem created by the distance from the air fields to Dutch Harbor; and (3) inadequate communications, weather forecasting, and ground service hampered the American aviators.[31]

After their unsuccessful attacks on the Japanese fleet on June 4, Army and Navy aircraft continued to search for the enemy fleet. One of the carrier's fighters chased away a PBY that made contact on June 6. After that the Japanese ships evaded surveillance and moved to a position 400 miles south of Kiska, an island 600 miles west of the nearest American air field at Otter Point and 165 miles southeast of Attu.[32]

As the search for the Japanese task force continued, American air strength in the western Aleutians increased. The 54th Fighter Squadron, flying P–38 "Lightnings," joined the P–40s at Cold Bay and Otter Point. The P–38s, with their distinctive twin booms and gondola, were better suited than the P–40s to the long flights required in the Aleutians. Five B–24s from the 30th Bombardment Group at March Field, California, headed north. So too did six PBYs from VP–43 at San Diego. They were to make up for the six amphibians lost in combat and operations.

On June 8 an Eleventh Air Force LB–30 discovered unidentified ships in Kiska harbor. The ships, at first thought to be American, returned recognition signals with antiaircraft fire. The LB–30 had discovered a total of twenty Japanese vessels including two light cruisers, three destroyers, three corvettes, three minesweepers, and four cargo vessels. A VP–41 PBY then confirmed the finding. The patrol bomber also spotted Japanese at Attu Island, more than 150 miles further west, and unsuccessfully bombed a cruiser and destroyer steaming between the two islands.[33]

Nimitz directed Theobald to drive the Japanese off the islands with air strikes before they entrenched. A bombing campaign began on June 11. Interdiction of enemy supply ships en route to Kiska and Attu plus destruction of shipping found in the islands' harbors were important parts of the campaign. Captain Gehres is said to have ordered his pilots to raid Kiska until no ships were left in the harbor or until all the ships there were sunk.[34]

Bomber pilots on the first sorties to Kiska and Attu encountered heavy antiaircraft fire but claimed hits on several ships. These later proved erroneous. As was true in other theaters, ships proved difficult targets for horizontal bombing even when conducted from low altitudes. Three B–17s and four B–24s exposed themselves to heavy gunfire to drop their bombs from 700 feet, but without result, on June 14.[35]

The Navy patrol bomber squadrons joined the effort to bomb the Japanese off the two small islands at the end of the Aleutian chain. Captain Gehres sent the seaplane tender *Gillis* into Nazan Bay on Atka Island, 360 miles east of Kiska, to support the operations of about twenty amphibians. The PBY crews conducted normal maritime reconnaissance patrols. At the end of each they raided Kiska before returning to their temporary base. P–38s from the 54th Fighter Squadron flew the more than 400 miles from Otter Point to Atka Island in relays to provide a combat air patrol over the seaplane tender servicing the PBYs. A bomber accompanied each fighter mission to provide navigational assistance. While providing air cover for the tender, the P–38s shot down two four-engine Mavis flying boats. The slow American amphibians also proved extremely vulnerable. Over Kiska they suffered extensively from Japanese flak but did heavily damage the destroyer *Hibiki* with near bomb misses off the bow. This removed the destroyer from the campaign, and she went back to Japan escorted by another destroyer, the *Akatsuki*. After three days of bombing, the loss of one aircraft, and a lot of damage to many others, use of the lumbering PBYs as strike aircraft stopped on June 14, 1942.[36]

This combined Army-Navy air assault on Kiska sank no ships. It did interfere to some extent with Japanese efforts to fortify Kiska and forced them to withdraw their ships from Kiska Harbor. Henceforth Japanese warships stayed outside the harbor while transports remained at Kiska only long enough to discharge cargo. In addition, the appearance of the long-range P–38s caused the Japanese to stop using their flying boat bombers in offensive air operations.

The air strip at Otter Point on Umnak Island, named Cape Field in honor of an Army pilot who had gone down, became the principal base for raids on Kiska. Army engineers expanded the runways and facilities. On July 20, Eleventh Air Force headquarters moved from Elmendorf Army air base outside Anchorage to Cape Field. From there, B–17s and B–24s escorted by P–38s could make the 1,234-mile round trip to Kiska but carry only half their maximum bomb load.[37]

Colonel Eareckson, commanding officer of the 28th Composite Group, sent the first bombing raid to Kiska from Cape Field on June 18. An LB–30 scouted ahead to report weather conditions. Three B–17s and four B–24s followed. Aiming from 14,000 feet, one of the B–17 bombardiers managed to hit the freighter *Nissan Maru*. His bomb set the 6,537-ton

ship, laden with coal, fuel oil, and gasoline, afire. She burned for several days before sinking. The B–24s then made a low-level attack without result. As the raiders returned to Cape Field one of the B–24s ran out of gas and had to ditch in the Bering Sea.[38]

The first American raid on Attu took place on July 2, 1942. A B–17 weather reconnaissance aircraft preceded seven B–24s. It reported Japanese ships at Attu and at Aggatu Island, thirty miles southeast of Attu. The B–24s could find no targets at Attu and diverted to the smaller island. Near misses damaged two freighters and an oil tanker. The bombers did no harm to six Japanese destroyers also sheltering at the smaller island.[39]

American air strength in the Aleutians increased with the arrival of additional bomber and fighter squadrons, but miserable weather allowed only eleven missions to Kiska and Attu throughout July 1942. Increasingly heavy antiaircraft fire, Rufe fighters that were float-plane versions of the Zero, and terrible flying conditions cost the Americans a number of personnel casualties, one B–17, and one RB–17.[40]

General Henry H. "Hap" Arnold, Commanding General of the United States Army Air Forces, believed the Aleutians were unsuitable for air operations. It was, he wrote in July of 1942, "a primary theater for surface naval craft, supported when weather permits by long range bombers." He decided against any additions to American air strength in Alaska beyond an initial allocation of two heavy bomber squadrons, two medium bomber squadrons, a fighter group, a transport squadron, and a few observation planes.[41] Arnold was pressed by needs for aircraft in other theaters and right about the difficulty of air operations in the Aleutians. But the Navy too was pressed by requirements for its forces in other theaters. All but two cruisers and four destroyers departed for other theaters by November 1943. Submarines and aircraft bore the principal burden of offensive operations in the Aleutians.[42]

The Japanese, who had originally intended to withdraw from their Aleutians feint after a temporary occupation, decided to remain. They concluded that an Aleutian outpost diverted American forces at small cost to themselves. It might also prevent Aleutian bases from being used as launch points for raids on the home islands and would boost morale at home. The Japanese flag, they could say, now flew on North American soil. Kiska became their principal Aleutian garrison with more than 5,000 Army and Navy personnel there by the end of 1942. Attu, which the Japanese abandoned in mid-September, was re-occupied late October because they feared United States' construction of an air base there. They knew from experience in the South Pacific that American engineers could quickly build an air strip despite the roughest terrain.[43]

With the additional personnel came an increase in Japanese air strength on Kiska. They began but never completed air strips on Kiska and on Attu. American reconnaissance flights discovered them on January 19, 1943. While waiting for completion of an air field, the Japanese Navy brought in more float-plane fighters and reconnaissance-bomber aircraft to join the Rufes and Mavis flying boats already there. The mix of single-engine monoplanes and biplanes took off from sheltered lagoons. Tractors dragged them ashore for maintenance and during storms. Six Mavis patrol bombers were serviced by the seaplane tender *Kamikawa Maru* until it was ordered back to Japan at the end of July. Shore bombardment from an American Navy surface task force accounted for three more Mavises on August 7. Weather destroyed another. The surviving ungainly but effective Japanese counterparts to the PBYs left the Aleutians in mid-August. Despite the difficulties of operating from an advanced base in the stormy Aleutians, the Japanese float-plane fighters accounted for six American bombers during the summer of 1942.[44]

That same season the Americans had six B–17s, fifteen B–24s, two LB–30s, and twenty-one P–38s available to attack the Japanese outposts in the Aleutians and the shipping

that supplied them. Although the Eleventh Air Force had nearly 200 additional aircraft, they were transports, short-range fighters, and medium bombers useless for long-range bombing and escort missions.

On August 30, 1942, American forces landed on Adak, a forty-mile-long by twenty-mile-wide island 400 miles west of Dutch Harbor, to begin building an air strip. Kiska lay only 250-Miles further west. The Eleventh Air Force now organized into the XI Bomber Command and XI Fighter Command, could step up the pace of bombing and strafing the enemy island garrisons. B–26s, P–39s, and P–40s would be able to join the longer-range aircraft previously engaged when the Adak airfield became operational. The P–39 Aircobras had already demonstrated their ineffectiveness as fighters, but enjoyed some success in a close air support role.

The first raid launched from Adak went to Kiska on September 14. Twelve B–24s and a B–17 equipped to photograph bomb damage took off first. Half of the B–24s carried 1,000-pound general purpose bombs with eleven-second delay fuzes for shipping attacks. The others carried demolition and incendiary bombs for use against ground installations and the Japanese submarine base on the island. Fourteen P–39s and fourteen P–38s followed. They arrived at the target first to suppress flak and fighter opposition. This permitted the bombers to make low-altitude bomb runs.[45]

The low-altitude approach to Kiska prevented an early warning by Japanese radar and made for more accurate bombing. American claims for the raid were extensive. Fighter pilots reported three Japanese submarines damaged and a flying boat destroyed. Post-strike assessment of bomber accomplishments recorded a transport and several barges damaged, and a number of small craft sunk.[46]

Wide-ranging maritime patrols by Gehres' PBYs, and Eareckson's capability for intensive air strikes, now made it dangerous for Japanese ships to approach Kiska and Attu. On September 1, 1942, two patrol planes, one from VP–41 and one from VP–42, strafed and bombed the submarine *RO-61*. The U.S. Navy destroyer *Reid* then depth-charged the submarine, forced it to the surface, and sank it with gunfire. Those Japanese ships that did reach the islands faced almost certain attack once they anchored to off-load supplies, if weather permitted American air operations. Miserable flying weather in late September allowed relocation of the Attu garrison to Kiska without losses.[47]

On September 25, 1942, a mix of bombers and fighters struck at Kiska. One of the bombers hit the 7,190-ton transport *Nozima Maru*, which had to be beached. A few days later American planes damaged the submarine *RO-65* severely enough so that she later sank. On October 6 another raid set the 3,110-ton transport *Borneo Maru* afire. Subsequent attempts to sink the damaged ship with torpedoes from B–26s failed. After two missions Eareckson canceled efforts to adapt the medium bombers as torpedo planes.[48]

An October 15 mission against the *Borneo Maru* by three B–26s resulted in several near misses. The planes made their bomb runs at 100 to 150 feet to drop twenty 300-pound bombs. One of the unescorted bombers crashed after anti-aircraft fire tore off its right wing. The following day the Japanese destroyers *Oboro* and *Hatsuharu* approached Kiska with supplies for the garrison. A PBY attack was unsuccessful, but the Navy plane alerted XI Bomber Command about the destroyers. Six B–26s armed with 300-pound bombs arrived from Adak at 5:40 p.m. Captain Richard Salter planted bombs from stern to bow on the *Oboro* that quickly sank the ship, leaving only seventeen survivors. Direct hits and near misses from the other B–26s destroyed the *Hatsuharu's* rudder, killed four of the ship's crew, and injured fourteen more Japanese sailors. The destroyer was able to return to Japan under

its own power. Gunfire from the ships shot down one B–26 and inflicted damage and personnel casualties on some of the others.[49]

November brought winter storms to the western Aleutians, grounding both American and Japanese aircraft for most of November and December. They also frustrated naval operations. Two Japanese attempts to land troops on Shemya Island, 137 miles northwest of Kiska, were prevented by a fierce storm. The island's relatively flat terrain would have facilitated air field construction.

On November 27 the weather cleared enough for an Eleventh Air Force reconnaissance flight to see the *Cherryboune Maru* being unloaded at Attu. Four B–26s and four P–38s headed west after Adak received the report of the ship's presence. Using 500-pound armor-piercing bombs with delayed fuzes, the bombers started the freighter burning. It continued burning over the next month as it settled to the bottom of Holtz Bay.[50]

Weather conditions allowed only intermittent missions against Kiska in the last month of 1942. Most that did occur produced few results. In the meantime, Theobald's relations with the officer commanding the air component of the North Pacific Force worsened. The admiral tended to give minute instructions even on matters in which he was not expert.

Theobald ordered Butler to send bombers to attack two Japanese freighters reported at Attu. When Butler responded that weather conditions made it impossible to attack on December 7 as ordered, Theobald ordered a second attack to take off at 10:00 a.m. on December 8. Butler answered this by advising that an 11:00 a.m. take off would permit reports from a weather reconnaissance aircraft that would be in the Attu area at 10:00 a.m. A ten o'clock departure time, he added, would be too dark for a large formation of aircraft to take off and assemble.[51]

What ensued was a series of messages in which Butler indicated he had scheduled an attack mission as ordered, but pointing out icing and other weather difficulties. Theobald consolidated the various exchanges, added comments, and may have intended them as support for relieving Butler.[52] Theobald's comments justified the change to a 10:00 a.m. departure to fool the Japanese, who were accustomed to bombers arriving from Adak after an 11:00 a.m. departure from Adak. He dismissed Butler's advice regarding weather. In the comments Theobald elaborated on theories of unity of command and concluded that Butler's recommendations for changes in his orders were due to the Air Corps general's desire to "conduct *his* operation and not that of the Task Force Commander."[53]

The December attack proved the last that Theobald ordered. On December 8, 1942, Admiral Chester Nimitz, CINCPAC, relieved him of command. From Alaska Theobald went to the Boston Navy Yard where, beached, he served as Commandant, First Naval District. Admiral Thomas C. Kinkaid, who had experience fighting the Japanese in the Solomon Islands, arrived to replace Theobald. Kinkaid got along well with his Army counterpart, General Buckner, and with the Army officers under his command.[54]

On December 30, 1942, a mission with a mix of five B–24s, four B–25s, four B–26s, and eight P–38s set out for Kiska from Adak. The twin-engine B–25 Mitchell medium bombers had arrived in Alaska with the 406th Bombardment Squadron. They had a top speed of 315 mph and could carry up to 3,000-pounds of bombs. Modified to carry as many as six forward-firing machine guns, they also demonstrated their lethality in an anti-shipping role. The B–24s, which had taken off a few minutes before the medium bombers, dropped their 500-pound general purpose bombs from an altitude of 7,000 to 8,500 feet over Kiska Harbor two hours after leaving Adak. Two of the bomber pilots claimed hits on transports below. The medium bombers followed, using 300-pound bombs in a low-level attack. One of the enemy

ships, the *Urajio Maru*, received so much damage that the Japanese beached her at Kiska. The second ship, the *Nichiyu Maru*, escaped serious injury and was able to return to Japan.[55]

Kiska and Attu remained beyond comfortable reach of single-engine fighters located 250 miles away on Adak. In the frequently cloudy and foggy Aleutians that distance was also sometimes a stretch even for two-engine fighters and medium bombers. In mid-December the Joint Chiefs of Staff ordered construction of an air base on Amchitka Island, only sixty miles east of Kiska and 178 miles from Attu. The chiefs also authorized planning for amphibious assaults to recapture Kiska and Attu.

In the meantime, Eleventh Air Force bombers kept after Japanese shipping which either was spotted by Fleet Air Wing Four patrols or was encountered by chance. On January 5, 1943, three B–25s responded to a Navy reconnaissance report. They sank the 6,500-ton *Kotohira Maru* off Attu, as it attempted to deliver ashore a cargo of food, fuel, and building materials. The same day a B–24 flying west on weather reconnaissance spotted the *Montreal Maru*. One bomb on the ship's deck and two near-misses sank the freighter. Infantry and engineers on board who were bound for Kiska drowned. This deprived the Japanese of badly-needed airfield construction workers and materials.[56]

Between November 1942 and January 1943, eighteen of twenty-one vessels, however, successfully made voyages to resupply the Japanese garrisons in the Aleutians. In some cases they were able to evade air interdiction because Japanese radio units intercepted American air-to-ground traffic and could advise the ships as to which patrol sectors were not covered by aerial surveillance. When the ships steamed into Attu or Kiska they did so during evening hours, unloaded, and departed before daylight. Japanese radar units on Attu and Kiska suggested departure routes designed to avoid aerial surveillance of the waters surrounding the islands.[57]

Two-thousand-one hundred Americans landed on Amchitka Island on the morning of January 12, 1943. The 813th Engineer Aviation Battalion began construction of a 10,000-foot runway and other airfield facilities. As soon as P–40 and P–38 fighter-bombers could operate from the island, Japanese re-supply of Kiska with surface ships would become extremely hazardous. Only a few minutes had to elapse between the spotting of supply ships and the dispatch of an anti-shipping strike. Only convoys with heavy naval and air escorts or sailing in weather that precluded air operations could make it through.[58]

A bombing mission launched from Adak on the same day that the engineers landed on Amchitka demonstrated the hazards of Aleutian flying. Six B–24s, four B–26s, and six P–38s headed to Attu on the morning of January 12. Their targets were two Japanese ships reported by a weather reconnaissance aircraft to be in Kiska Harbor. Mechanical difficulties forced two B–26s and one B–24 to abort soon after takeoff. The remaining B–26s and P–38s decided to return to Adak because of bad weather. One B–24 also managed to return to base before the weather closed in and a second flew safely back to Cold Bay to land. A third crash landed on a small island near Adak with only one serious injury to its crew. The three remaining B–24s disappeared.[59]

On March 26, 1943, American surface ships encountered a heavily escorted Japanese convoy en route to Attu. The U.S. Navy task force of one heavy cruiser, one light cruiser, and four destroyers took on two Japanese heavy cruisers, one light cruiser, and four destroyers 180 miles west of Attu. Despite a running battle that began at 8:00 a.m. and lasted more than three hours, the ships inflicted little damage on each other. Finally the Japanese admiral, his ships low on ammunition and fuel, retired when the Japanese radar station on Kiska sent an alarming, but false, report that an American air strike was headed toward his ships.[60]

Although Eleventh Air Force bombers at Adak and Amchitka began preparing for an air strike against the Japanese warships, they never made it. At Amchitka, mechanics had to install bomb bay fuel tanks on B–25s so the planes didn't get off the ground until the surface action was over. Even with the bomb bay tanks, eight B–25s accompanied by eight P–38s that sortied at 1:30 p.m. had to turn back before reaching the last reported position of the Japanese ships. A B–24 mission from Adak came to nothing when ground crews attempted to replace general purpose bombs with armor-piercing bombs. They discovered the latter frozen to the ground. The ensuing delay, compounded by worsening weather, caused six hours to elapse before the B–24s were airborne. By then the Japanese task force was well beyond their reach. The only American aircraft to spot the Japanese ships were two Fleet Air Wing Four PBYs diverted from routine patrol. But they carried no bombs and could only report the position of the retreating Japanese ships. The Battle of the Komandorski Islands ended without air support from either side.

After the difficulties experienced in attempting to intervene in the sea fight, the Eleventh Air Force kept six B–25s on anti-shipping alert. The combined threat from American air, surface, and submarine forces did persuade the Japanese to abandon efforts to supply and reinforce their Aleutian garrisons except by submarine. Among other effects, this ended Japanese ability to replace float-plane fighters at Attu and Kiska lost in combat and to operational accidents. By mid-March there was no Japanese air opposition to stepped-up Eleventh Air Force raids on the Attu and Kiska garrisons.[61]

Admiral Kinkaid commanded the North Pacific Force as it supported an amphibious operation to retake Attu that began on May 11, 1943. An assault force under Rear Admiral F. W. Rockwell, USN, delivered a landing force under Major General Albert Brown, USA, and later Major General Eugene M. Landrum, USA, to Attu beaches that recaptured the island.[62]

In preparation for increased activity in the Aleutians, the Navy added two squadrons of its PV-1 Ventura patrol bombers to Fleet Air Wing Four. The Ventura, a twin-engine land plane developed from the civilian Lockheed Vega, had a range of 1,600 miles and could carry a 3,000-pound bomb load. The twin-tailed aircraft had a top speed in excess of 322 mph. Defensive machine guns mounted in a top turret and firing aft from a ventral tunnel supplemented forward-firing .50 caliber machine guns in the nose. Its radar could sweep an area 240 degrees wide ahead of the plane. When the landings on Attu took place, the Navy had three PBY squadrons and one PV-1 squadron at Adak and one PBY squadron and one PV-1 squadron at Amchitka.[63]

Eleventh Air Force, Fleet Air Wing Four, and Navy fighter bombers from the carrier *Nassau* helped to suppress Japanese surface opposition to American forces assaulting Attu. Recapture of the island took from May 11 to May 30, 1943. On May 12 a PBY from VP–61 alerted the battleship *Pennsylvania* to the presence of a Japanese submarine. The amphibian then assisted two destroyers driving *I-61* away from Attu.

Despite the presence of American land-based and carrier fighters, twelve Japanese Navy twin-engine Betty medium bombers flying 750 miles from the island of Paramushiro, raided the American invasion fleet on May 22. Paramushiro, just south of the tip of the Kamchatka Peninsula, and other islands in the Kurile group were home to Japanese naval and air bases. The Bettys' torpedo attacks on the destroyer *Phelps* and gunboat *Charleston* were unsuccessful, but they did drop some supplies to the beleaguered Japanese ground troops before heading home unscathed. Sixteen Bettys attempting to hit the American ships at Attu the following day were not so lucky. They encountered a P–38 combat air patrol. The Lightnings shot down five of the Japanese bombers and damaged seven others. This was the last attempt by Japanese aerial forces to oppose the American recapture of Attu.[64]

Once Attu was in American hands again, Eleventh Air Force and Fleet Air Wing Four cooperated in bombing attacks against nearby Kiska. Even before the Japanese on Attu had been finally eliminated on May 29, work had begun on building air strips on the island. The Americans also began construction of another field on Shemya Island. By mid-August, in addition to fighters at all of the Aleutian fields, B–24s operated from Shemya and PV-1s from Attu.[65]

In June 1943, the American aerial forces initiated an intensive bombing campaign against Kiska, supplemented by naval gunfire bombardments. At the same time, a Kiska invasion force assembled. Consisting of more than 100 warships and nearly 35,000 ground troops, the force assaulted Kiska on August 15, 1943, only to find that Japan had covertly evacuated its forces from the island.[66]

American planes watched Kiska Island and surrounding waters, through all but the worst weather. But heavy fog prevented surveillance of Kiska for many consecutive days. During June and July the Japanese ran submarines and finally surface ships into Kiska to withdraw their troops there. After three submarines fell victim to American patrol vessels, a task force of two cruisers and ten destroyers accompanied by an oiler started final rescue efforts from Paramushiro. Several sorties made in June and early July ended without result. In each case improving weather conditions forced the Japanese to return to harbor rather than face American bombers.[67]

On July 10 the weather cleared enough for a PBY to spot Japanese transports south of Kiska. Five B–25s on anti-shipping alert at Amchitka sortied and were joined by eight B–24s that had been prepared for a raid on the Kurile Islands. The B–25s arrived first to sink two enemy transports with low-level attacks. The B–24s then appeared. Two could not find the remaining Japanese ships. The other six heavy bombers flew in under low clouds to make bomb runs but the Japanese evaded them. The surviving transports did not continue toward Kiska.[68]

In late July a heavy fog foiled American aerial surveillance and, combined with misinterpreted radar images, allowed the Japanese to slip through the forces surrounding Kiska. On July 23 a Fleet Air Wing 4 PBY erroneously reported radar contact with seven ships 200 nautical miles southwest of Kiska. American battleships and cruisers dispatched to intercept the enemy ships expended almost 1,000 rounds of large-caliber ammunition due to another misinterpreted radar identification. In fact, there had been no enemy ships sighted or engaged.[69]

As the American ships retired to refuel and rearm, the Japanese rescue fleet slipped into Kiska Harbor. In a mere fifty-five minutes all 5,183 troops of the remaining garrison got aboard the Japanese destroyers, which then slipped away into the fog.[70]

The aerial forces that drove the Japanese from the Aleutians were land-based, except for the carrier fighters that supported the amphibious landings on Attu and Kiska. Even Fleet Air Wing Four's amphibian PBYs operated from shore bases whenever possible. The Army and Navy land-based aircraft had mounted a year-long campaign that included increasingly successful interdiction of ships used to resupply and reinforce the Japanese outposts on the Aleutians. Construction of advanced air bases closed the distances and permitted American surveillance of surrounding waters and attacks on shipping to intensify. During the campaign, air attacks by the Eleventh Air Force and Fleet Air Wing Four sank nine transports, one destroyer, and two submarines. They also damaged several other warships and transports. Although not statistically impressive when compared to actions in European and other Pacific waters, these land-based air achievements were vital elements

of the war in the North Pacific. Only the Aleutians' notorious clouds and fog saved the final Japanese effort to rescue its surviving troops.

Attacking Northern Japan

Even before the Japanese were driven from the Aleutians, the land-based aerial forces had begun their final contribution to the war in the North Pacific. Once bases on Attu, Amchitka, and Shemya were in place, the northern Japanese home islands and the waters around them were within reach of long-range American bombers. It was 750-miles one way between Attu and Japan's Kurile Islands. In addition to military facilities, the islands were also the base for substantial fishing activity important to the Japanese economy.

North Pacific Force orders arrived in early July 1943, for the first bombing mission from an Aleutian base against Japanese army and navy facilities in the Kuriles. One mission by eight B–25s on July 10 used radar to drop its bombs through heavy clouds. Three PBYs from VP–45 also bombed the Kuriles on the same day and in the same manner. This was the first bombing of the Japanese home islands since the Doolittle raid of April 1942. A second mission by six B–24s loaded with 500-pound bombs on July 18 met better conditions. Half of the heavy bombers targeted the Kataoka naval base on Shimushu Island, about 300 miles south of Paramushiro. The other half of the mission bombed shipping off Paramushiro Island. They reported near misses but no direct hits. A third mission against the Kuriles on August 10 again went to the Kataoka naval base. The nine B–24s involved also added the Kashiwabara army staging area adjacent to the naval facility as a target. An estimated forty opposing fighters and intense flak shot down two of the heavy bombers and damaged three more.[71]

Subsequent raids on the Kuriles were postponed until September 1943, after the Kiska campaign was finished. On the third of the month, twelve B–25s from Attu caused slight damage to the 2,742-ton *Teisho Shima Maru* and a larger freighter of about 4,000 tons near Paramushiro. Eight days later seven B–24s and 12 B–25s took off from Attu for the Kuriles. The B–24s targeted Japanese land installations while the B–25s went after shipping. The latter attacked vessels in the strait between Paramushiro and nearby Shumushu Island. The pilots claimed one large transport sunk and two smaller ships damaged. Japanese fighters caught the B–25s coming out of their bomb run and made the mission disastrous. They shot down two B–25s and damaged five others so severely that they landed on Russian territory. The Russians, who had not yet joined the war against Japan, interned the crews and confiscated the aircraft. The Japanese fighters also sent one B–24 down and inflicted enough injury to cause two more of the heavy bombers to head toward the nearest Russian air field. This was the last Eleventh Air Force mission against the Kuriles in 1943.[72]

Fleet Air Wing Four, whose PBYs and PV-1s had previously flown reconnaissance near the Japanese islands, sent PBYs on bombing missions against shipping there on December 20, 1943. PV-1s made offensive sweeps west of Attu searching for Japanese naval bombers. Bettys usually fled from the heavily-armed high-speed Venturas.[73]

Eleventh Air Force B–25s resumed shipping strikes near the Kuriles in January and February of 1944, before PV-1s supplanted the PBYs. Army Air Forces heavy bombers and some of the Navy PV-1s took on the job of attacking Japanese shore installations on the Kuriles. The 73rd Bomber Squadron, flying B–25s, and other PV-1s focused on anti-shipping. In May of 1944 the B–25s went after picket boats that alerted the Japanese to approaching air raids. On the 18th and 19th, the medium bombers sank two picket boats west of Attu. On May 22 they blew apart another picket boat off the Kurile Islands. They then destroyed the

Japanese patrol boats *Shinyo Maru* and *No. 3 Showa Maru* at sea east of the Kuriles on May 29.[74]

Weather conditions prevented a regular schedule of missions to Kurile Island waters until August. In the interim, a PV-1 weather reconnaissance on June 11, 1944, discovered a new airfield on Shimushu. Twin-engine Mitsubishi Betty torpedo bombers were there in strength. Since an American shore bombardment task force was in the area, a counter-air strike against the newly-discovered air strip was critical. The next day a six-plane mission raided the Shimushu field. A high-speed, extremely low-level approach allowed the Venturas to bore in from the ocean undetected. They devastated the Japanese aircraft on the ground. Two of the PV-1s also found a second new airfield, which they strafed. This mission removed a significant threat to the American surface ships nearby. In addition, it demonstrated the feasibility of daylight raids on Kurile Islands installations that continued until the end of the war.[75]

Thereafter Venturas and B–25s also drove the Japanese fishing fleet out of the Kuriles. Venturas of VPB–131, equipped with rockets and five forward-firing .50 caliber machine guns, joined the 73rd's medium bombers in a campaign to destroy Japan's "Fish Basket." On July 23, 1944, a PV-1 from VPB–135 sank an armed picket boat off Shimushu but had to land at Valdivostok. Subsequent raids resulted in a B–25 sinking one ship sheltering in a Paramushiro Island harbor on September 1. On September 9 another B–25 crashed when it ran into the masts of a ship it had targeted.

Fleet Air Wing 4 Operations Order 44-5, dated November 5, 1944, established anti-shipping missions as the first priority of its squadrons in the Aleutians. Land installations became secondary. They were to be attacked only in the absence of shipping targets and only if not heavily defended. To carry out the order, the wing had a mix of attack and patrol aircraft scattered from Kodiak to Attu. Its strike force consisted of two squadrons (VPB–131 and VPB–136) at Attu equipped with PV-1 Venturas. Patrol Squadron 43's PBYs assisted with maritime patrol but did not join strike packages. VS-48, equipped with SBD dive-bombers, did not have aircraft suitable for long-range raids.[76]

The PV-1s flew armed only with machine guns and rockets. Bombs were eliminated from their weapons load to conserve fuel. The Ventura pilots, new to air-to-ground rockets, practiced on a small island near Attu before employing 3.5-inch rockets on a January 24, 1945, mission. Two previous machine gun-only raids on December 16 and January 2 had failed to find any shipping targets. The same was true on January 24. The four-plane missions instead struck maritime support facilities including a lighthouse, radio station, and canneries and fishery buildings. In general the rockets proved incapable of inflicting serious damaged on structures. The lighthouse sustained eighteen rocket hits but remained standing. An air strike on February 2 targeted a Japanese radar on the Kuriles, and put it out of action. This permitted an American naval task force to approach the Kuriles undetected to deliver a shore bombardment. The PV-1s also cooperated with Eleventh Air Force in providing air cover for surface ship bombardments of the Kuriles on January 5 and February 18, 1945.[77]

VPB–139, flying PV-2 Harpoons, relieved VP–136 in March 1945. The PV-2s could carry both bombs and rockets on the long flights between Attu and the Kuriles. Previous attacks had been so effective that enemy naval craft or fishing boats at sea were encountered in only two out of fourteen missions. Those occurred on May 14 and 26. On the former date two Harpoons rocketed and strafed two armed trawlers northwest of Kataoka harbor, scoring hits on one of the boats.[78] VP–131, sortieing with similar objectives, destroyed fishing boats close to shore. On March 17 a four-plane mission started from Attu. Three turned back

because of radio and mechanical problems. The fourth rocketed and strafed fisheries buildings and nearby fishing boats, scoring eight hits with eight rockets. In a similar raid on March 19, all four Venturas dispatched reached their targets.[79]

In 1945, Army and Navy anti-shipping missions quickly cleared the waters around the Kuriles. Missions in early June bombed and strafed a number of trawlers, most of which were armed. Four Harpoons attacked four trawlers on June 9, receiving minor damage. The next day four PV-2s found a Japanese freighter off the east coast of Paramushiro. They left it burning and out of control. On June 5 VP–131 conducted one of its last anti-shipping sweeps. Two PV-1s searching Paramushiro Straits found and strafed a tug towing several barges.[80]

On June 12, 1945, four B–25s on an anti-shipping sweep damaged two freighters and two barges, at a cost of one B–25. The anti-shipping mission was hazardous. Some B–25s, operating at the extreme limit of their range, failed to return to base because of bad weather. Others fell victim to antiaircraft fire or Japanese fighters, as did B–24s occasionally pressed into maritime operations. One, after ships off Suribachi Bay, crashed while attacking a small ship. Flak from a ship under attack on July 12 blew the wing off one of the medium bombers. On July 17, 1945, two more B–25s were lost in combat.[81]

North Pacific Force land-based aircraft flew their last mission against the Kuriles on August 12, 1945. Japan surrendered two days later. The war's end brought to a conclusion American operations in the North Pacific that had been conducted primarily with Army and Navy land-based aircraft. Admiral Theobald when assigned to command the North Pacific Force in 1942 had immediately noted that land-based air was critical for the defense of Alaska. As General Arnold said, airplanes may not have been the best weapons possible for use there. They turned out to be the most flexible and available offensive weapon.

When the Japanese began their Aleutian adventure in June of 1942, land-based air power made several contacts with the Japanese task force sent to raid Dutch Harbor. Three factors probably kept these contacts from being effective. These were the newness of the American forces to combat; the lack of later modifications and new equipment that made the planes used effective ship killers; and the relatively undeveloped Army and Navy tactics for air strikes against shipping. In the event, land-based air power was the only American military arm that attacked the Japanese carriers and their escorts. Just the discovery of American land-based air power west of Dutch Harbor at Otter Point was sufficient to keep the Japanese from occupying Adak. With Adak, they might well have driven the Americans from the western Aleutians.

Land-based air power and submarines conducted almost all of the American effort to cut off sea-borne supplies to the Japanese garrisons on Kiska and Attu. In doing so, the United States Army Air Forces dropped 4,000 tons of bombs in 297 missions at a cost of 35 aircraft lost in combat and another 150 lost to other causes. Fleet Air Wing Four lost six aircraft to enemy action and thirty-four to other causes while conducting twelve bombing missions. The 80 percent or more of the total losses assigned to "other causes" can be attributed to the Aleutians' notoriously bad flying weather and the long distances between strike aircraft's bases and their targets. American air attacks in the Aleutians destroyed three Japanese destroyers, five submarines, and nine transports. The Army and Navy air effort also damaged a number of other ships and sank several small craft such as tugs and barges.[82]

The land-based air power campaign to strangle the Japanese on Attu and Kiska proved so successful that these garrisons might have been left to starve. There was no military reason to recapture the islands once American air attacks had eliminated the Japanese ability to replenish their air strength on the islands and destroyed the planes

already there. It was political, rather than military necessity, that led to the invasion of Attu and the fruitless invasion of Kiska.

After Attu's recapture it was used as a base for some of the harassing raids on the Kurile Islands. It could have easily been supplanted for that purpose by Amchitka, from which many land-based aircraft departed to bomb and strafe military and naval installations in the Kuriles and shipping in adjacent waters. Those missions were sporadic but accomplished their chief purposes of tying up Japanese forces. They contributed to a strategic deception campaign designed to convince Japan that the Allies might launch an attack from the north.[83] The Japanese could never be sure that the continuing attacks did not presage an invasion of the home islands via the Aleutians. Between 400 and 500 Japanese aircraft, nearly one-sixth of the empire's total air strength late in the war, were kept on airfields in the Kuriles and northern Japan at one time for this reason as were up to 80,000 troops.[84] In the summer of 1944 these deployments included eighteen single-engine Oscars from the Japanese Army's 54th Fighter Group plus seventy-two Zeros, six Gekko single-engine night fighters, eighteen Bettys, six Emily flying boats, and six Jake floatplanes from the Japanese Navy's Twelfth Air Fleet.[85] Deployment of troops in the northern islands and their resupply offered opportunities for American submarines, which sank thirteen of the ships involved and killed about ten percent of the personnel being deployed to the islands.[86] Raids on the Kuriles by American land-based aerial forces also struck at northern fishing fleet and related facilities important in feeding Japan's civilian and military population. Postwar analysis indicated that although American air forces in the North Pacific dropped only sixty-eight tons of bombs on shipping targets between 1943 and 1945, the destruction that bombs, rockets, and machine gun fire wrought was significant at a time when Japanese food supplies and shipping were in short supply. It pales, however, in comparison to the daily pounding that the Japanese home islands received in the spring of 1945 from both carrier and land-based American aerial forces.[87]

United States submarines sank their share of ships in the effort to interdict Japan's sea lanes to the Aleutians. Allied ground forces and surface combatants that assaulted Attu fought a tough battle to obliterate the enemy units there. It does not detract from the contributions of other arms to conclude that land-based air power, both Army and Navy, proved the decisive American weapon in the North Pacific.

Endnotes to Chapter IV

1. Samuel Eliot Morison, *History of United States Naval Operations in World War II*, Vol. VII, *Aleutians, Gilberts and Marshalls June 1942-April 1944* (Boston: Little, Brown and Company, 1951), p. 1; John Haile Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4* (Anchorage: Anchorage Chapter-Air Force Association and Pictorial Histories Publishing Company, Inc., 1990), p. 323.
2. Edward S. Miller, *War Plan Orange* (Annapolis, Md.: Naval Institute Press, 1991), pp. 92-93; Hisashi Takahashi, "The Japanese Campaign in Alaska as Seen from the Strategic Perspective," in Fern Chandonnet, ed., *Alaska at War, 1941-1945, The Forgotten War Remembered* (Anchorage: Alaska at War Committee, 1995), p. 33.
3. Rear Adm. Arthur J. Hepburn, USN, "Report of the Board to Investigate and Report Upon the Need, for Purposes of National Defense, for the Establishment of Additional Submarine, Destroyer, Mine, and Naval Air Bases on the Coasts of the United States, its Territories and Possessions," United States Congress, House of Representatives, 76th Cong., 1st Sess., Document No. 65, pp. 20-22; Stetson Conn, Rose C. Engelman, Bryon Fairchild, *U.S. Army in World War II-Western Hemisphere, Guarding the United States and Its Outposts* (Washington, D.C.: Office of the Chief of Military History, Department of the Army, 1964), pp. 228-29.
4. Lt. Cmdr. John Tatom, *Summer Fogs and Winter Winds of The Aleutian Islands*, reprinted as Appendix A in Naval Historical Center, *U.S. Naval Experience in the North Pacific During World War II, Selected Documents* (Washington, D.C.: Naval Historical Center, 1989), pp. 76-94.
5. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, pp. 19-23, 67.
6. Peter Young, ed., *The World Almanac of World War II* (New York: World Almanac, 1981), pp. 492-94.
7. Young, *The World Almanac of World War II*, p. 508; Rear Adm. Julius Augustus Furer, USN, *U.S. Navy Administrative History of World War II, Volume 156, North Pacific Force and Area* (Washington, D.C.: Department of the Navy, 1959)p. 52; Adm. James S. Rusell, USN-Ret, "World War in the Aleutians, 1942," June 1980, script for slide program, provided to author by Adm. Russell. Distances cited between the Aleutian bases are from U.S. Navy, *Building the Navy's Bases in World War II, Volume II,*
History of the Bureau of Yards and Docks and the Civil Engineer Corps 1940-1946 (Washington, D.C.: Government Printing Office, 1947).
8. Ronald H. Spector, *Eagle Against the Sun* (New York: Vintage Books, 1985), p. 68, pp. 450-51.
9. Conn, Engleman, and Fairchild, *U.S. Army in World War II-Western Hemisphere, Guarding the United States and Its Outposts*, pp. 247-48.
10. Msg, COMINCH (Commander-in-Chief United States Fleet) to Commander-in-Chief Pacific), no subject, May 21, 1942, copy in files of the Office of History, 11th Air Force, Elmendorf AFB, AK.
11. George McGinnis, "COMNORPAC Radio Intelligence Unit (RIU) Support," *Cryptolog* 12(5) (Special Edition 1991), p. 12; COMINCH, May 21, 1942.
12. War Diary, Commander North Pacific Force, Task Force Eight, United States Pacific Fleet, May 22-May 31, 1942, in Box 7, Theobald Papers.
13. War Diary, May 27, 1942; Ltr, June 16, 1942, Theobald to Nimitz, in Theobald Papers.
14. Theobald to Nimitz, June 16, 1942.

15. Radio to CINCUSPACFLT, information copy to CINCUSFLT, quoted in War Diary, May 30, 1942.
16. Furer, *North Pacific Force and Area*, p. 62, citing a report from Lt Col Robert O. Cork to Commanding General, Fort Greely, Alaska, "Employment of Air Forces Based at Kodiak," May 11, 1942.
17. Cork, "Employment of Air Forces Based at Kodiak," May 11, 1942.
18. Notes for Joint Employment of Army and Navy Aviation at Naval Air Station, Kodiak, Feb. 26, 1942, in files of the Office of History, 11th Air Force, Elmendorf AFB, AK.
19. *Ibid*.
20. Elmer A. Freeman, *Those Navy Guys and Their PBYs: The Aleutian Solution* (Spokane, Wash.: Kedging Publishing Company, 1992), p. xi.
21. Ltr, Rear Adm. Hirochi Samejima, Japanese Maritime Self Defense Force, March 5, 1969, to Adm James S. Russel, USN-Ret, copy provided to author by Adm. Russell. Samejima participated in the Dutch Harbor raid, leading a flight of bombers from the *Ryujo*.
22. Paul S. Dull, *A Battle History of The Imperial Japanese Navy (1941-1945)* (Annapolis, Md.: United States Naval Institute, 1978), p. 170; Office of Naval Intelligence, *The Aleutians Campaign June 1942-August 1943* (Washington, D.C.: Naval Historical Center, 1993), p. 9. This is the republication of a "Combat Narrative" first issued in 1945 by the Navy Department; Samejima, March 5, 1969.
23. Capt. Mitsuo Fuchida, IJN, and Cmdr Masatake Okumiya, IJN, *Midway: The Battle That Doomed Japan's Navy* (Annapolis, Md.: Naval Institute Press, 1955), pp. 137-41. Okumiya, who retired as a Lieutenant General from Japan's Air Self Defense Force, was a staff officer on the *Ryujo* during the raid on Dutch Harbor. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, p. 119.
24. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, pp. 120-26.
25. *Ibid*., pp. 126-27.
26. *Ibid*., pp. 130-31.
27. Foley was also "Staff Advanced Operations Officer," assigned to coordinate forward operations of PBYs and their tenders. Commanding officers in the aviation units were directed "to take their orders from Foley." (see Rear Adm Paul Foley Jr., USN-Ret, "VP Squadron Forty-One in the Aleutians (1941-1942)," in Amme, Carl H., ed., *Aleutian Airdales* (Plains, Mont.: Patrol Wing Four Reunion Committee), 1987, p. 76. Reported to be highly eccentric, Foster carried an infantry field pack, canteen, .45 caliber pistol, Thompson submachine gun, and live grenades as he went about his garrison duties first at Anchorage and then at Umnak according to a pilot who was there (Maj. William O. Butler), USAF-Ret., letter to author, Feb. 24, 1993).
28. "Report from HQ 11th Air Force Striking Group File," in Box 10, Theobald Papers.
29. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, p. 132.
30. *Ibid*., pp. 132-133; Dull, *A Battle History of the Imperial Japanese Navy (1941-1945)*, p. 171.
31. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, p. 133.
32. United States Strategic Bombing Survey, *The Campaigns of the Pacific War* (Washington, D.C.: United States Government Printing Office, 1946), p. 79.
33. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, p. 152; Office of Naval Intelligence, *The Aleutians Campaign June 1942-August 1943*, p. 18.
34. Amme, *Aleutian Airdales*, p. 90.
35. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, p. 156.

36. *Ibid*., pp. 159-60; 199-201; Adm. James S. Russell, USN-Ret, "Floatplanes and Flying Boats, *Naval Aviation Museum Foundation Quarterly* 5(2) (Fall 1984), p. 28; United States Strategic Bombing Survey, *The Campaigns of the Pacific War*, p. 92.
37. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, p. 162.
38. *Ibid*., p. 163.
39. *Ibid*., p. 164.
40. *Ibid*., p. 169.
41. Quoted in Craven, Wesley Frank and James Lea Cate, eds., *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan August 1942 to July 1944*, 1950 (Washington, D.C.: Office of Air Force History, 1983, reprint ed.), p. 368.
42. Office of Naval Intelligence, *The Aleutians Campaign June 1942-August 1943*, p. 30. See Theodore Roscoe, *U.S. Submarine Operations in World War II* (Annapolis, Md.: United States Naval Institute, 1949) Chapter 12, "The Aleutian Malestrom," pp. 134-43 and Chapter 19, Chapter 19, "Aleutian Conclusion and Atlantic Tidal Turn," pp. 243-45 for information on operation of U.S. Navy submarines in Aleutian waters.
43. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, pp. 169-70; Masatake Chihaya, "Mysterious Withdrawal from Kiska," *Proceedings of the United States Naval Institute* 84(2)(February 1958), p. 52.
44. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4* , pp. 173-76.
45. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan August 1942 to July 1944*, p. 370.
46. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, p. 214-16.
47. United States Strategic Bombing Survey, *The Campaigns of the Pacific War*, pp. 80, 92.
48. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, p. 234; United States Strategic Bombing Survey, *The Campaigns of the Pacific War*, p. 90.
49. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, p. 237; United States Strategic Bombing Survey, *The Campaigns of the Pacific War*, p. 93.
50. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, pp. 243-44.
51. Theobald to Butler, radio, 080100 December 1942; Butler to Theobald, radio, 080215 December 1942; Theobald to Butler, radio, 071825 December 1942, in Box 9, Theobald Papers.
52. Radios are quoted from, summarized, and commented on in a December 1942 memo signed by Theobald and found in Box 9, Theobald Papers.
53. Theobald, December 14, 1942, comments on radios between himself and Butler, in Box 10, Theobald Papers.
54. Naval History Division, "Rear Admiral Robert A. Theobald, U.S. Navy, Deceased," June 6, 1957, biography in files of Biographies Branch.
55. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4 The Aleutian Warriors*, pp. 248-49.
56. *Ibid*., p. 253.
57. James McIntire, "Radio Intelligence in North Pacific Naval and Air Operations," *Cryptolog* 12(5) (Special Edition 1991), p. 29.
58. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan August 1942 to July 1944*, p. 376.
59. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, p. 257.

60. John A. Lorelli, *The Battle of the Komandorski Islands, March 1943* (Annapolis, Md.: Naval Institute Press, 1984), pp. 138-139.
61. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, pp. 259-60.
62. *Ibid*., pp. 276-93.
63. Charles L. Scrivner, *The Empire Express* (Temple City, Calif.: Historical Aviation Album, 1976), pp. 6-7.
64. Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, p. 287.
65. *Ibid*., pp. 296-97.
66. *Ibid*., pp. 296, 320.
67. Masataka Chihaya, "Mysterious Withdrawal from Kiska," *United States Naval Institute Proceedings* 84(2) (February 1958): 38-40.
68. *Ibid*., pp. 41-44, Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, pp. 303-4.
69. Rear Adm. Bruce McCandless, USN-Ret, "The Battle of the Pips," *United States Naval Institute Proceedings* Vol. 84, No. 2 (February 1958): 49-56.
70. Dull, *A Battle History of The Imperial Japanese Navy (1941-1945)* p. 265; Cloe, *The Aleutian Warriors: A History of the 11th Air Force & Fleet Air Wing 4*, pp. 313-14.
71. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan August 1942 to July 1944*, pp. 389, 390; Freeman, *Those Navy Guys and Their PBYs: The Aleutian Solution*, p. 241.
72. John Haile Cloe with Michael F. Monaghan, *Top Cover for America: The Air Force in Alaska 1920-1983* (Anchorage: Anchorage Chapter, Air Force Association and Pictorial Histories Publishing Company, 1984), pp. 125-26; United States Strategic Bombing Survey, *The Campaigns of the Pacific War*, p 95.
73. Scrivner, *The Empire Express*, 1976), p. 22.
74. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan August 1942 to July 1944*, p. 398; Cloe and Monaghan, *Top Cover for America: The Air Force in Alaska 1920-1983*, p. 131.
75. Scrivner, *The Empire Express*, p. 9.
76. Naval Historical Center, *U.S. Naval Experience in the North Pacific During World War II: Selected Documents*, p. 62.
77. *Ibid*., pp. 62-63.
78. Naval Historical Center, *U.S. Naval Experience in the North Pacific During World War II: Selected Documents*, p. 64; Scrivner, *The Empire Express*, p. 32.
79. Scrivner, *The Empire Express*, p. 38.
80. *Ibid*., p. 32, p. 40.
81. Cloe and Monaghan, *Top Cover for America: The Air Force in Alaska 1920-1983*, pp. 137-38.
82. *Ibid*., 1984, pp. 118-19.
83. The Joint Chiefs of Staff, "Cake Before Breakfast," ms., August 30, 1949, Declassified October 1, 1963, pp. 107-19, copy in author's files.
84. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan August 1942 to July 1944*, p. 401; Katherine L. Herbig, "American Strategic Deception in the Pacific, 1942-1944," in Michael I. Handel, ed., *Strategic and Deception Operations in the Second World War* (London: Frank Cass and Co., 1987), pp. 264-481; Adm. James S. Russell, USN-Ret., "The Aleutian Campaign," in Ferndonnet, *Alaska at War*, p. 72, states that Japanese air strength in Hokkaido and the Kuriles rose from 263 airplanes in

1943 to about 500 in the summer of 1944, then declined a mere thirty in the Kuriles themselves in 1945. Russel gives Army troop strength in the Kuriles as 14,200 in 1943, 41,000 in 1944, and 27,000 in 1945. Military Analysis
Division, *The Seventh and Eleventh Air Forces in the War Against Japan* (United States Strategic Bombing Survey, May 1947), p. 45.
85. James McIntire, "Radio Intelligence in North Pacific Naval and Air Operations: Japanese and American," p. 32.
86. Russell, "The Aleutian Campaign," p. 72; United States Strategic Bombing Survey, *The Campaigns of the Pacific War*, p. 97.
87. Military Analysis Division, *The Seventh and Eleventh Air Forces in the War Against Japan*, p. 49.

CHAPTER V

INDIAN OCEAN AND SOUTHWEST PACIFIC OPERATIONS

The Indian Ocean and Southwest Pacific areas of operations during World War II, like the North Pacific area discussed in Chapter IV, afford opportunities to examine extensive use of land-based aerial forces in maritime operations. The Indian Ocean area included the seas from the east coast of Africa to Indochina (now Vietnam). The Southwestern Pacific area ran from the west coast of Indochina west to an artificial line dividing the Solomon Islands. It included Australia, the islands north of that continent necessary to secure a route for the recapture of the Philippine Islands, and those islands.

The Japanese relied on land-based air to cover their December 1941 invasion of British Malaya, which fell within in the Indian Ocean area and to defend sea lanes necessary for supply of territories they had conquered in the Southwest Pacific. Allied commanders in that region counted mostly on land planes to interrupt those sea supply lanes and cover amphibious invasions to recapture the conquered territories. The Japanese, likewise, employed land-based aerial forces to cover amphibious invasions and sink allied shipping.

The Sinking of the *Prince of Wales* and the *Repulse*

The Japanese attacked Malaya on December 7-8, 1941, with simultaneous assaults on the Hawaiian Islands and the Philippines. While one Japanese fleet including aircraft carriers steamed undetected across the North Pacific toward Pearl Harbor, British authorities in Singapore reported another Japanese fleet including battleships, cruisers, and transports in Southeast Asia waters. Naval historian Frank Uhlig Jr. has judged the accomplishment of this fleet, "carried out chiefly by soldiers borne in troops ships under the protection of shore-based naval aircraft," as a "conquest, throughout the history of warfare unmatched in speed and scope."[1] Successive landings that secured air bases from which shore-based naval air fleets could cover further advances afloat and ashore characterized the conquest Malaya.

The Japanese Navy, which had committed its aircraft carriers elsewhere, opened three air bases in French Indochina in November 1941. The 22d Air Flotilla divided a force of six reconnaissance aircraft, thirty-nine fighters, and ninety-nine twin-engine long-range Nell bombers among the bases. More than 350 planes from the Japanese Army's Third Air Division joined them. From them, these aircraft could easily support Japanese ships operating in waters off the east coast of the Malayan Peninsula. The radial-engine monoplane fighters and Japanese Army and Navy land-based bombers operated from air bases in French Indochina with the acquiescence of the French Vichy government.[2]

The Japanese troop transports assembled at a former French naval base on Cam Rahn Bay, on the east coast of what is now Vietnam. British and American flying boats located the Japanese ships there on December 2, 1941. Additional aerial reconnaissance on December 4 revealed that the transports had put to sea. On December 6, an RAF No. 205 Squadron Catalina reported the ships' position off the Malayan coast before being shot down. The flying boat fell victim to an Indochina-based Japanese Army Nakajima-Ki 27 Nate fighter.[3]

Japanese amphibious forces made seven landings throughout the Malaya Peninsula at midnight local time on the night of December 6-7. Six went ashore at various points in Thailand. A seventh assaulted Khota Bharu, on the east coast of Malaya, about 300 miles north of Singapore. Japanese Army Air Force planes covered the landings while Japanese

Naval Air Force bombers flew from Indochina to strike British military installations in Singapore.[4]

Then a British colony, Malaya produced 35 percent of the world's tin supply and 38 percent of its rubber. In 1941, the 250-square-mile island of Singapore, separated from the Malaya Peninsula by the narrow Johore Strait, was home to the British Navy's largest Far Eastern base and an essential target.

Britain tasked its Royal Air Force (RAF) to defend Malaya against attacks from the air and sea. The British Chiefs of Staff in London decided that a force of 336 aircraft could accomplish this mission. Air planners in Malaya produced a considerably higher estimate of 582 aircraft. Overwhelmed by demands for aircraft in the European theater, however, the British sent a division of Australian troops to Singapore to make up for the needed aircraft they were unable to send.[5]

When war came, the RAF Command in Malaya and Singapore included Royal Air Force and Royal Australian Air Force (RAAF) squadrons. They had a total of 164 first-line aircraft with an additional 88, many unserviceable, in reserve. The first-line aircraft included 62 Brewster Buffalo fighters, 35 Blenheim bombers plus 12 additional Blenheims configured as night fighters, 24 Hudsons, 24 Vildebeeste biplane torpedo bombers, and 34 Catalinas. The reserve aircraft included 15 Blenheim bombers, 52 Buffaloes (21 unserviceable), 7 Hudsons, 12 Vildebeestes, and 2 Catalinas.[6]

The stubby-winged, short-range Buffaloes, originally designed as United States Navy carrier aircraft, had entered service in 1938. The Royal Air Force replaced the Buffalo's original .50-caliber machine guns with .303 caliber weapons in an effort to lighten the aircraft and increase its performance. Even so, the Buffalo could only attain a speed of 270 miles-per-hour at 10,000 feet versus the Japanese Zero's 315 mph at the same altitude. The Blenheims, twin-engine aircraft designed as tactical bombers with a top speed of about 260-mph, could carry a bomb load of 1,000-pounds but mounted only two defensive small-caliber machine guns. The Hudsons, also twin-engine, were modifications of the Lockheed Model 14 airliner. Able to carry a 1,500-pound bomb load and equipped with five defensive machine guns, the Hudsons were among the more effective bombers available to the British in the Far East. The low-speed, vulnerable, twin-engine Catalina flying boats could fly long-range maritime patrols. These assorted British aircraft were not consolidated at one or two air bases, but scattered among nine bases strung out from Malaya's northern border south to Singapore. The island's defense, in turn, rested on fixed coastal artillery facing its ocean approaches. No fortifications protected it against assault from the north should air defense of Malaya fail and the Japanese occupy Malaya.[7]

British air defense failed. The Buffaloes proved inadequate to deal with Nakajima Ki-21 Sally twin-engine bombers that flew from Indochina to raid the RAF bases on the Malaya Peninsula. Japanese bombers destroyed many RAF planes on the ground. RAF Blenheims, sent from Singapore to oppose the invasion fleet, suffered heavy losses but did little damage. A few of the Hudsons, each carrying 250-pound bombs, survived the Japanese air raids to sink one Japanese landing ship and severely damage two others on December 8. The RAAF lost two Hudsons in the encounter.[8]

Japanese Army troops came ashore at Khota Baru and also moved south from Thailand. By the evening of December 8, the Japanese Army's Third Air Division had sixty planes operating from a captured airfield at Singora, Thailand, just above the Thai-Malay border. The Japanese then seized all of the RAF air bases in Malaya as they drove British ground forces south. The one at Khota Baru fell on December 8. The rest of the Third Air Division's 354 planes flew to them from Indochina. They began operating from the captured

fields to provide close air support for the Japanese ground forces advancing down the Malay Peninsula.[9]

To oppose the anticipated Japanese invasion more effectively, the Royal Navy had sent two of its large warships, the modern battleship *Prince of Wales* and the older battlecruiser *Repulse* to Singapore. They arrived only a few days before the outbreak of war. Winston Churchill, despite contrary advice from his senior naval advisors, had insisted on dispatching them in hopes of deterring the Japanese from initiating hostilities. The aircraft carrier *Indomitable,* intended to accompany them, was thousands of miles away at Kingston, Jamaica, undergoing repairs after running aground.

The *Prince of Wales* was one of the newest and most powerful battleships in the Royal Navy. Although heavily armored, it possessed a top speed of twenty-eight knots. Its modern antiaircraft armament included fifteen 5.25" guns, sixty-four 2-pounder pom-poms, ten 40-mm Bofors, and ten 20-mm Okerlikons. The Royal Navy's antiaircraft gun laying system, however, gave the battleship less protection against air attack than the large number of antiaircraft guns indicated. Its archaic "High Angle" method used estimated data regarding aircraft course and speed, unlike the procedures used by the American and German navies, which used measured data. Indeed, in a 1937 combat test, Royal Navy Home Fleet ships equipped with the High Angle system had failed to score a single hit on a radio-controlled target drone that circled the fleet for two and one-half hours.[10]

Ineffective antiaircraft fire control had made no difference on the *Prince of Wales*' first combat mission, in May 1941. Steaming into the North Atlantic, beyond the reach of the Luftwaffe, the newly-commissioned ship's ten 14-inch guns had helped to destroy the German battleship *Bismarck*. Afterward, the battleship had carried British Prime Minister Winston Churchill to his landmark August 1941 Atlantic Charter conference with President Franklin D. Roosevelt at Argentia Bay, Newfoundland. Participation in the sinking of the *Bismarck* and ferrying Churchill to North America had, however, left the ship's antiaircraft gun crews little time to sharpen their skills. Nonetheless, when the *Prince of Wales* sailed from the Atlantic to Singapore in November 1941, Churchill confidently cabled Roosevelt "There is nothing like having something that can catch and kill anything."[11]

The battlecruiser *Repulse* was a hybrid design built in 1916, designed to prey on or protect commerce routes. It carried a battleship's armament in the form of six 15-inch guns but was lightly armored. In theory, the hybrids were able to out-gun cruisers and outrun battleships. In practice, battlecruisers struck by enemy shells exploded and sank with distressing regularity in World War I sea battles. Although given more armor in 1919-20 and more antiaircraft guns in 1934, the *Repulse* mounted only eight 4-inch high-angle antiaircraft guns and two eight-barrel 2-pounder pom-pom batteries and remained vulnerable to air attack.[12]

On the evening of December 8, 1941, shortly after the outbreak of hostilities, the two capital ships steamed out of Singapore accompanied by the destroyers *Electra*, *Express*, *Vampire*, and *Tenedos*. Identified as "Force Z, " its commander, Vice Admiral Tom Spencer Vaughn Phillips, requested land-based air cover that the RAF was unable to provide. Phillips asked for aerial reconnaissance 100 miles to the north of Force Z beginning at dawn on December 9. He also wanted reconnaissance to Singora and beyond ten miles from the coast starting at first light on December 10 and fighter protection off Singora at daylight on December 10.[13]

RAF Air Vice-Marshal C. W. H. Pulford, Air Officer in Command, Far East, tentatively told Phillips that he could provide air reconnaissance on December 9 but not on the next day, nor air cover either. Then Pulford radioed Phillips after he was at sea that the RAF

Command could provide neither air reconnaissance north of Phillip's ships on December 9 nor fighter protection on December 10 when he expected to engage the Japanese. The airfields in northern Malaya were either captured or too damaged for use and the RAF-modified Buffalo fighters too short-ranged to provide air cover from bases to the south.[14] Pulford did keep RAAF No. 453 Squadron's sixteen Buffalo fighters at Sembawang air field, about twelve miles north of the city of Singapore, in readiness to answer a call for help. Warned that a force of Japanese torpedo bombers was assembling near Saigon, in Indochina, Phillips probably assumed that the invasion beaches and his ships were beyond their range.[15]

A more prudent admiral might have withdrawn when it became clear that he would operate in enemy waters without air cover. But Phillips believed that courage, resolution, and seamanship could overcome aerial attacks on warships. He had served as the Deputy, then Vice, Chief of Naval Staff in London since the European war began in 1939. Although he had no seagoing combat experience, in arguments with his staff he insisted that more resolute commanding officers were all warships needed to defeat dive bombers. To be sure, he had been briefed on the Luftwaffe's attacks on Royal Navy ships off Norway but Phillips refused to accept the heretical notion that it was (in the words of the briefing officer), "suicidal to send warships to operate off an enemy-held coast without air cover." After the briefing, Phillips told Winston Churchill that officers of the Royal Navy's "ships were much too frightened of air attack."[16]

The Japanese Navy submarine *I-65* and a float plane from the cruiser *Kumano* spotted Force Z at sea nearly 300 miles east of the Malay coast and about 150 miles south of Poulo Condore Island early on December 9. Thereafter, enemy aircraft and submarines tracked the British. When he became aware that his ships had been discovered by Japanese aircraft, Phillips turned most of his command back toward Singapore on the evening of December 9. He had earlier sent the *Tenedos*, which was low on fuel, into port.

Phillips changed course again, just after midnight on December 10, after when he received a radio report, which later proved erroneous, that Japanese forces were landing at Kuantan, halfway between Khota Baru and Singapore. When Phillips discovered no Japanese ships at Kuantan after sunup, he again turned toward Singapore.[17]

Meanwhile, the Japanese assembled a surface force of two battleships and four cruisers to attack the British ships as they steamed off the coast of Malaya. Japanese Navy bombers and torpedo bombers simultaneously took off from bases at Cam Rahn Bay and Saigon to attack the *Prince of Wales* and *Repulse*. Their night missions on December 9 failed to find the British ships.

While the *Prince of Wales* and the *Repulse* proceeded south toward Singapore, the 22d Air Flotilla launched additional sorties targeting the British ships early on December 10. Five aircraft left Cam Rahn Bay at 2:20 a.m., refueled at Poulo Condore Island south of Saigon in the South China Sea, and took off again at 4:30 a.m. Ninety-three additional aircraft took off from a Saigon airfield between 5:25 a.m. and 7:30 a.m.

Japanese reconnaissance aircraft relocated Force Z about sixty miles east of Kuantan at 11:20 a.m. Shortly afterward, over eighty twin-engine bombers and torpedo bombers converged on Force Z. At this time the British force included the *Prince of Wales*, the *Repulse*, and the destroyers *Electra*, *Express*, and *Vampire*. The two "E" class destroyers, both built in 1934, had four 4.7" guns. The Australian Navy ship *Vampire*, built in 1917, had four 4" guns and one 3" antiaircraft gun. Twenty-six G4M1 Betty bombers and sixty Mitsubishi Type 96 G3M2 Nell torpedo bombers made up the attacking aerial force. Radar on the *Prince of Wales* and the *Repulse* alerted the ships to the impending raid. The bombers attacked first through heavy but inaccurate antiaircraft fire. The British ships did not lay down a smoke

screen, as had the German battleship *Tirpitz* when successfully escaping Royal Navy torpedo-bombers in the North Atlantic. Britain's First Sea Lord, Admiral Sir Dudley Pound, later told Churchill that Phillips probably did not use smoke in order to leave his antiaircraft guns clear fields of fire.

About 11:20 a.m., a stick of bombs straddled the *Repulse*. A 550-pounder landed amidships, starting a small fire. The torpedo bombers followed, boring in less than one-hundred feet above the water to release their torpedoes at ranges of 1,000 to 2,000 yards. Each torpedo carried a warhead packed with 1,760-pounds of explosive. The *Repulse* turned head-on to the attackers to "comb" the torpedo tracks, but other Japanese aircraft approached from other directions. The multiple attacks sent fourteen torpedoes toward the *Repulse*. Ten hit the port side and four hit the starboard side. The ravaged battlecruiser sank less than fifteen minutes after the air attack began. Four-hundred and forty-four of the ship's crew died in the attack and subsequent sinking.[18]

About the time the first bombs fell on the *Repulse*, a torpedo struck the *Prince of Wales* and bent one of the battleship's propeller shafts. Engine room oil and fuel lines cracked and bulkheads gave way, damaging its steering mechanism. The *Prince of Wales* began steaming in circles. Phillips radioed Singapore to send tugs to his assistance, but did not request air support. Five additional torpedoes struck the warship, one forward and five on the starboard side further damaged the battleship. Two 1,100-pound bombs landing aft and a third bomb making a near miss on the starboard side put an end to the helpless vessel, which capsized and sank at 1:20 p.m. with the loss of 215 members of the 1,285-man crew.[19]

Although radar warned of the impending attack, the British ships shot down only three of the Japanese aircraft. Captain William Tennant, skipper of the *Repulse*, requested air support at 11:50 a.m. when he realized Phillips would not do so. Eleven Buffaloes took off from Sembawang in response to Tennant's request, but they arrived on the scene only after the two ships had sunk to find oil slicks and struggling survivors. The 22d Air Flotilla aircraft, low on fuel and needing to return to their bases in Indochina, did not attack the destroyers which had been escorting the *Prince of Wales* and *Repulse*.[20] The *Express* survived the war but the *Electra* went to the bottom after a gun duel with a Japanese destroyer in February 1942. The *Vampire* survived the air attack off Malaya only to be sunk by Japanese dive bombers near Ceylon on April 9, 1942.[21]

Destruction of the *Prince of Wales* and the *Repulse* ended any hope the British had of ejecting the Japanese from Malaya or keeping them from reaching Singapore. It also eliminated any possibility of evacuating the 130,000 British troops from Malaya and Singapore. The Japanese campaign ended a few weeks later with the fall of Singapore on February 15, 1942. That opened the way for the Japanese to invade resource-rich British Borneo and the Dutch East Indies. Destruction of the *Prince of Wales* and the *Repulse* also marked the first time that aircraft, unassisted by other combat arms, sank major combatants at sea. Loss of these two capital ships, General Sir Alan Brooke, Chief of the British Imperial General Staff, exaggeratedly (in view of the American aircraft carriers still extant) declared meant that the Allies had lost control of the sea from "Africa eastwards to America."[22]

The Southwest Pacific

In the Southwest Pacific area, land-based aerial forces frequently participated in World War II maritime operations. First, the area's geography of island chains meant that the nearby seas were within reach of land-based aircraft. Second, on the American side, the United States Navy adamantly refused to place its aircraft carriers under the control of

General Douglas MacArthur, the Allied Supreme Commander in this theater. Consequently, Allied carrier aircraft seldom operated in the Southwest Pacific, and MacArthur relied primarily on land-based aircraft to oppose or cover amphibious invasions and to interdict or protect sea lines of communication. This reliance created several situations in which applications of land-based air power to maritime operations were tactically or strategically decisive.

Japanese forces enjoyed unexpected successes in destroying the battleships of the American Pacific Fleet at Pearl Harbor. The ease with which they demolished Allied opposition in the Dutch East Indies, Malaya, and the Philippines also surprised the Japanese. By January of 1942, Japanese Army and Navy planners could argue the relative merits of invading Australia or occupying Ceylon. At the same time, the Japanese Combined Fleet moved to assure the security of its main fleet anchorage at Truk in the Caroline Islands. To guard Truk from an expected Allied counterattack launched from the southeast, Imperial Japanese Navy (IJN) commanders determined to occupy the island of Rabaul, 450 miles north of Port Moresby, plus Lae and Salamaua on the northern coast of New Guinea. The IJN's South Seas Force commanded by Vice Admiral Shigeyoshi Inoue secured Rabaul on January 23 with the aid of four carriers from the Combined Fleet.[23]

The Japanese allocated two air groups from the IJN's 24th Air Flotilla of the Eleventh Air Fleet to the defense of Rabaul. The intended air strength at Rabaul was at first twenty-four long-range flying boats to be used on reconnaissance patrols plus twenty-seven fighters and thirty-six bombers for defense and attack. In practice, only eighteen Betty bombers were available because of operational losses and lagging aircraft production. Other production problems prevented the delivery of any aerial torpedoes to the naval air groups at Rabaul. While Japan's plan to establish a defensive perimeter of island air bases was theoretically feasible, Japan did not have enough land-based aircraft to concentrate decisive air power at the many island bases.[24]

When the United States Navy launched a series of spoiling carrier strikes against Japanese-held islands in early 1942, Rabaul numbered among the American targets. While the *Enterprise* struck at the Marshall Islands and the *Yorktown* sent its aircraft against the Gilbert Islands, the *Lexington* steamed toward Rabaul. When flying boats from Rabaul discovered the *Lexington* on February 20, 1942, Vice Admiral Wilson Brown in command of the one-carrier task force decided not to risk the ship to air attack and withdrew without launching his strike aircraft.

The IJN air commanders on Rabaul were unwilling to allow the American carrier to escape. Despite being under strength, they sent all of the available eighteen bomb-equipped Betty's against the *Lexington*. Japanese aircrews originally called these bombers "Cigars" because of their slim shape. A few months of combat resulted in a new nickname of "Flying Lighters" because these bombers did not have self-sealing gas tanks and often burst into flames when machine-gunned. Arriving over the *Lexington* on February 20, the plodding Bettys fell victim to the carrier's swarming F4F Wildcats. The single-engine fighters quickly destroyed all but three of the Japanese bombers.[25] This allowed one of only three operational American carriers in the Pacific to escape. This implied that, in the long-term, Japan did not have enough of the right kind of aircraft to support its island perimeter.

The Japanese soon regretted the *Lexington's* survival. Amphibious forces appearing off the northern coast of New Guinea at Lae and Salamaua to occupy Australian outposts there sustained significant losses from air attack. The *Lexington* and *Yorktown* flew eighteen Wildcats, sixty Dauntless dive bombers, and twenty-five Devastator torpedo bombers from the Gulf of Papua across the Owen Stanley Mountains to oppose the invasion fleet. Eight

B–17s from Townsville on Australia's northeast coast followed the carrier aircraft. The combination of carrier and land-based aircraft sank the sea plane tender *Kongomaru*, the auxiliary minesweeper *Tamamaru No. 2*, and the transports *Tenyomaru* and *Yokohamamaru*. They also severely damaged the light cruiser *Yubari*, the destroyer *Asanagi*, the minesweeper *Tsugaru*, the auxiliary minesweeper *Tamamaru*, and the transport *Kokaimaru*. The American raid also slightly damaged three other ships. These vessels were the destroyer *Oite*, the sea plane tender *Kiyokawamaru*, and the transport *Chinamaru*. The most effective attacking aircraft were the dive bombers and the thirteen Devastators armed with torpedoes. The twelve Devastators and the B–17s armed with bombs damaged only one transport from medium and high altitudes. This again showed the ineffectiveness of this method of attack against ships underway at sea.[26]

Their naval losses to the American air raids at Lae and Salamaua on March 10, 1942, constituted one of the most severe blows received by the Japanese thus far in the war. But they did not prevent occupation of the Australian outposts on New Guinea. The airfields the Japanese established there later required considerable attention from Allied air forces. The March 10, 1942, air attacks did preclude Japan's South Seas Force from using the lost and damaged vessels as transports for troops that were to occupy Tulagi Island and Port Moresby, New Guinea. The latter location was important because it was the last Allied foothold in New Guinea. This was the first instances in World War II in which combat losses prevented Japanese forces from continuing with their planned operations.[27]

Reorganization of the Allied command structure in the Pacific in April 1942 established a Southwest Pacific Area with General Douglas MacArthur at its head. Admiral Chester W. Nimitz assumed responsibility for the rest of the Pacific theater. Nimitz's jurisdiction included the South Pacific Area adjacent to MacArthur's command. Within the Southwest Pacific Area, Lieutenant General George H. Brett became Commander of Allied Air Forces. His authority extended to command of all U.S. Army Air Forces (USAAF) elements in Australia plus operational control of RAAF and Royal Netherlands East Indies Army Air Force units in the theater.[28]

After the May 4-8, 1942, Battle of the Coral Sea, which resulted in American loss of the *Lexington* and Japanese loss of the carrier *Shoho*, the United States Joint Chiefs of Staff (JCS) issued a July 2 directive defining three tasks for its Pacific commanders. Task One directed Vice Admiral Robert L. Ghormley, commander of the South Pacific Area under Nimitz, to occupy the islands of Santa Cruz and Tulagi with such air and naval support as could be obtained from MacArthur's Southwest Pacific Area. Task Two directed General MacArthur to seize the Solomon Islands north of Guadalcanal plus Lae and Salamaua and the northeast coast of New Guinea. Task Three, to be implemented later upon instructions from the JCS, required MacArthur to take Rabaul and adjacent areas of New Britain and New Ireland. To clarify responsibilities, the boundary between the South Pacific Area and the Southwest Pacific Area was moved west to the 159th meridian.[29]

The Joint Chiefs' Task Two created two maritime operation missions for the land-based Allied Air Forces under MacArthur. They had to stop Japanese seaborne supply and reinforcement efforts for their northern New Guinea outposts. They also had to cover Allied efforts to seize control of the northern coast of New Guinea and recapture Lae and Salamaua.

The Allied air elements in the Southwest Pacific Area were ill-equipped in mid-1942 to support the maritime operations incidental to Task Two. A-24s (Army Air Forces versions of the Navy's single-engine SBD Dauntless dive bomber), with a range of about 500 miles, could not reach Japanese shipping lanes north of New Guinea from bases in Australia. The A-24s were relatively slow, with a top speed of 245 mph. They were also lightly armed, with

two .50 caliber machines in the nose and two .30 caliber machines in the rear cockpit. As a result, the A-24 required fighter escort to survive when it faced fighter opposition. B–17s of the command had the necessary range to reach Japanese maritime targets, but counter-air and reconnaissance missions left few aircraft available for anti-shipping strikes. In any case, there were not enough of the Flying Fortresses to make up the large formations USAAF doctrine prescribed for high altitude bombing against naval targets. A few aircrews trained in new torpedo-equipped B–26s, but these aircraft never went into combat. Most of the Allied Air Forces B–26 squadrons flew repeated long-range bombing missions from their bases in northern Australia against the Japanese at Rabaul during the summer of 1942. They usually carried 2,000 pounds of bombs on the 1,200-mile round-trip. Each mission required a stop at Port Moresby en route and returning for refueling even though the B–26s had an additional 250-gallon bomb bay fuel tank. The exhausting round trips wore out both aircrew and aircraft. They were soon withdrawn from combat to recuperate.[30]

This was the situation United States Army Air Forces Major General George C. Kenney found when he arrived in Australia in August 1942 to take command of the Allied Air Forces there. Kenney had flown seventy combat missions as a World War I fighter pilot. In the inter-war years he had specialized in attack aviation and technological development of aircraft. A 1943 *Time* magazine article credited him with being the first, in 1922, to install machine guns in the wing of an airplane. *Time* also recognized his 1928 invention of the low-level parachute bomb, which he later had his aircrews in the Southwest Pacific use to good effect. In the 1920s Kenney also attended the Air Corps Tactical School, where he later taught, and the Army Command and General Staff College. In the 1930s Kenney headed the Army Air Corps Plans Division and then served as Chief, Operations and Training, General Headquarters Air Force. His duties from 1939 to 1942 included tours as Air Corps Observer with the Navy, Assistant Attache for Air in France, and Commanding Officer, Air Corps Experimental Division and Engineering School. Kenney, in sum, was an innovative, technically-oriented combat veteran professionally interested in adapting air power as needed to destroy targets in the air, on the ground, and at sea.[31]

By 1942 Kenney was commander of the Fourth Air Force based in San Francisco, charged with defending America's West Coast. On July 11, 1942, Kenney learned that he would report to General MacArthur in Australia, to command the air component of MacArthur's multinational forces. His journey to his new command took him through Hawaii and via the chain of island airfields that linked America with Australia.

Kenney realized his new command would be heavily involved in anti-shipping strikes. During a stopover in the Fiji Islands Kenney and his aide, Major William Benn, borrowed a B–26 and they experimented with "skip bombing." This experimental technique involved dropping a bomb into the sea while in level flight at low altitude. The number of bombs dropped depended on the type of vessel attacked, with merchant ships requiring three bombs from each plane in a three-aircraft element. Properly launched, the bombs would skip like stones across the water and plunge into a ship's side. Delayed tail fuzes kept them from exploding when they hit the water. The RAF had developed this procedure in the European theater. After Henry H. "Hap" Arnold, Commanding General of the USAAF, had visited England in April 1941, he brought word of this innovation back to the United States. At Arnold's direction, American airmen tested the method at Eglin Field, Florida.[32] Kenney found that a bomb dropped about 400 yards from a target might work. He and Benn agreed that such hazardous close run-ins against enemy ships at low level would require additional forward-firing machine guns or cannon in attacking aircraft to suppress antiaircraft fire.[33]

Shortly after arriving in Australia, Kenney halted all bomber missions pending reorganization and refitting. He specified that reconnaissance aircraft should keep searching for Japanese shipping, which should be attacked at every opportunity. He wanted, he said, "aviators who could fly, shoot down Jap[anese]s, and sink Jap[anese] ships."[34] But the first bombing mission Kenney dispatched to sink Japanese ships failed. Air reconnaissance spotted a convoy consisting of a light cruiser, two destroyers, two sub chasers, and two transports en route from Rabaul, New Britain, to Buna, New Guinea, on August 13, 1942. Kenney sent twenty-two B–17s and six B–26s to make four raids on the Japanese convoy. The raid failed. The American bombers attacked from high altitude as doctrine prescribed, but no bombs hit any ships. The attacking aircraft did encounter heavy fighter opposition. From this experience Kenney determined that to attack Japanese ships successfully fighter opposition had to be eliminated. He also discovered that bombsights were in such short supply that only the lead aircraft in each flight of three had one. As a result, if the first bombardier made a mistake, the following two aircraft made the same one.[35] Subsequent high altitude air attacks on Japanese shipping also proved indecisive.

Buna, the northern New Guinea terminus of an overland trail to Port Moresby, became a Japanese target when their amphibious invasion failed. From Buna, the Japanese planned to trek across the 13,000-foot Owen Stanley Mountains to seize the strategically important Allied airfield and harbor at Port Moresby.

On July 19, 1942, a B–17 reconnaissance mission spotted a Japanese convoy heading south from Rabaul toward New Guinea. The convoy consisted of the light cruisers *Tenryu* and *Tatsuta*, three destroyers, and three transports. On July 20, Japanese bombers and fighters raided Port Moresby. On July 21, a Japanese naval float plane made a reconnaissance and strafing mission over the beach at Buna. The Japanese convoy was now off Buna and the cruisers and destroyers in the force shelled the village.

The first of several Allied aerial missions against the Japanese amphibious force took place late in the afternoon on July 21. One B–17 and five B–26s made a bomb run over the ships at a relatively low altitude of 6,000 feet. They reported that a B–26 bomb made a direct hit on a transport. Five more B–26s followed, but it was too dark for them to find the enemy ships. Under cover of darkness the Japanese put about 2,000 combat troops ashore at Gona, about ten miles north of Buna. Early on July 22 American bombers and fighters, accompanied by an RAAF No. 32 Squadron Hudson, again sortied to attack the Japanese ships. Although no Japanese fighters appeared, antiaircraft fire from the Japanese warships kept ten attacking B–17s at 25,000 feet and their bombing was ineffective. An eleventh B–17 made a low-level bomb run and claimed two direct hits on a transport. Five B–25s, six B–26s, and the Hudson also attacked the ships, but only one, a B–26, claimed a hit. Fighter pilots in sleek, bubble-canopied P-39 Aircobras strafed Japanese landing barges. The Japanese invasion fleet withdrew northward at midday on July 22, its mission completed.[36]

Allied aerial reconnaissance located another invasion force 120 miles north of Milne Bay, New Guinea, on August 25. It included the cruisers *Tenryu* and *Tatsuta*; the destroyers *Tanikaze*, *Urakaze*, and *Hamakaze*; the submarine chasers *SC-22* and *SC-24*. The warships were escorting the transports *Kinai Maru* and *Nankai Maru*. Repeated air attacks did not prevent the Japanese from landing at Milne Bay later in the day. Australian infantry and American aviation engineers had previously occupied Milne Bay, at the southern end of New Guinea at the end of June 1942. They built three air fields there, from which two RAAF fighter squadrons began to operate. From Milne Bay, the land-based aircraft could dominate the Solomon Sea. When Allied aircraft moved in, aerial missions to the Solomon Islands and New Britain would be shorter. The anchorage at Milne Bay could also serve as a base for sea

operations along New Guinea's northern coast. Controlling Milne Bay became important to both Japanese and American commanders.[37]

Foul weather prevented B–17s from locating the enemy convoy that was approaching Milne Bay on August 25. All available B–25s and B–26s were flown from their bases in Port Moresby. Six RAAF No. 75 Squadron Kittyhawks (P-40s) from Milne Bay, each carrying a 300-pound bomb, attacked the Japanese ships in late afternoon. They did no damage, although an RAAF Hudson flying in a pathfinder role with the Kittyhawks made a mast-top attack on a small craft, probably a submarine chaser. A near miss caused the vessel to lose speed. Then between 4:40 and 5:30 p.m., six Kittyhawks from No. 76 Squadron armed with 300-pound bombs and three Kittyhawks from No. 75 Squadron armed with 250-pound bombs attacked again. They scored two near misses on a transport and a direct hit on a small ship, thought to be the sub chaser damaged earlier. They strafed the rest of the vessels. At 6:00 p.m., two Hudsons, one from No. 6 Squadron and one from No. 32 Squadron attacked the convoy at an altitude of 100 feet. The first Hudson dropped seven bombs, one of which landed ten feet from the side of an 8,000-ton transport.[38]

Nine other Kitty Hawks from No. 75 Squadron had more luck when they attacked seven Japanese troop barges reported by a coast watcher as they moved down New Guinea's northern coast toward Milne Bay. The troops intended to go overland to attack the Allied force at Milne Bay from the rear. The RAAF mission found the barges beached on the western coast of Goodenough Island. While three of the Kittyhawks flew top cover, the other three machine-gunned the barges. They left all seven of the equipment-laden ten-by-fifty-foot craft ablaze. The troops from the barges found themselves stranded on Goodenough Island, where they remained until Australian infantry rooted them out in late October 1942.[39]

Despite the Allied air raids on August 25, the Japanese at Milne Bay used fifteen steel barges to land between 1,500 and 2,000 troops from transports offshore during the night of August 25-26. They went ashore on the north side of the bay. The Japanese ships withdrew under the cover of low clouds once the troops had landed. On August 26, RAAF Kittyhawks and Hudsons attacked the Japanese barges tied-up just off the beach and the Japanese troops who had landed. USAAF B–17s, B–26s, and P-40s pushed through bad weather to bomb the Japanese ships and troops. The B–17s reported sinking one transport and damaging a minesweeper. In fact, they badly damaged the *Nanki Maru* and drove the other transport and the escorts out to sea. The B–26s and P-40s sank several landing barges.[40]

On August 29 the Japanese decided to focus their efforts in support of Japanese forces on Guadalcanal, to the north. They evacuated 450 members of their Milne Bay landing force. Another fifty of the Emperor's soldiers struggled north through the jungle to Buna. Australian infantry tracked down and exterminated other Japanese survivors over the next several months. Allied air missions had aided in repulsing the Japanese, but had not proved decisive except in destruction of the landing barges that had been carrying troops south for a flank attack on Milne Bay.[41]

Non-aviators at all levels in the American and Australian forces criticized the poor record of Southwest Pacific Allied land-based aerial forces in maritime operations. In response, Allied aviators strove to improve the situation. The A-24 dive-bomber seemed an obvious solution to the problem, but Fifth Air Force planners concluded that they could not be sent across New Guinea without fighter escort. Torpedoes, another obvious solution, never seemed to do the job when launched from American Army Air Forces aircraft. In the end the USAAF transferred its stock of torpedoes to the RAAF for use with its twin-engine Beauforts, which could be used either as light bombers or torpedo bombers. Rather than use dive

bombers or torpedo bombers, American airmen in the Southwest Pacific experimented with new bombing techniques and with modified bombs.

American Army Air Forces doctrine called for high altitude pattern bombing by nine-plane formations against shipping targets. Aircraft shortages usually meant that American and Australian squadrons in the Southwest Pacific could seldom muster enough planes to meet the requirements of doctrine. In addition, low clouds frequently interfered with bombing patterns. Review of the situation resulted in suggestions that low-level bombing was an alternative, one that the British had successfully used in other theaters. These proposals led to discussions of this radical departure from Army Air Forces' bombing doctrine in Washington, D.C. and in the Southwest Pacific and South Pacific theaters during the late summer and fall of 1942. Kenney, commanding Allied Air Forces in the Southwest Pacific, had taught "attack" aviation at the Air Corps Tactical School in the 1930s and became a proponent of low-level bombing.[42]

William Benn, now commanding officer of the 63rd Bombardment Squadron, used his own B–17 to develop low-level bombing tactics with heavy bombers. He made repeated practice runs on a hulk in Port Moresby harbor during August and September 1942. Benn tried skip bombing and planting bombs directly on the wreck. His tests revealed that bomb fuzing was critically important. Southwest Pacific experience indicated that fuzes with eight to eleven-second delays worked best in bombs dropped at low level against merchant shipping. The delayed fuzing allowed the bombers to escape blast damage from the detonating bombs. Allied Air Forces armorers used RAAF detonators to modify American bomb fuses to produce the desired results until standard fuzes became available in 1943. Benn tried out the newly-developed techniques and weapons in an October 23 raid on shipping in Rabaul harbor.

Benn, killed in combat on January 18, 1943, described skip-bombing with a B–17 in detail before his death. "The sight used," he explained, "is an X on the co-pilot's window six and three quarter inches from the top. The forward point of reference is the outline of the nose." When the sights lined up, Benn concluded, "in level flight indicating approximately 220 mph a bomb will fall from 60 to 100 feet short of the vessel, skip into the air and hit 60 to 100 feet beyond."[43]

Several planes in the October 23 attack on Rabaul dropped their bombs at 250 feet or less and reported resulting explosions and debris. Post-raid damage assessment, however, revealed that no enemy ships were sunk. Subsequent experience caused Fifth Air Force bombers to revert to impact fuzes for anti-shipping attacks in December 1942.[44]

Successful shipping strikes remained an important Allied need. The Japanese tried six times in November and December of 1942 to send reinforcement and supplies by sea to their troops fighting on New Guinea. Kenney gave top priority to attacking these convoys. Poor weather and Japanese fighter escorts made these attacks difficult and hazardous. Despite increasingly determined efforts by Allied aircrews, the Japanese succeeded in their reinforcement efforts through the beginning of December.

December began well for the Japanese convoys to Buna. Despite attempted air interdiction, four destroyers landed 800 troops on the night of December 1-2. Five B–17s and six B–25s bombed and strafed the destroyer convoy as it steamed toward Buna. The ships then diverted to the mouths of the Kumusi and Mambare rivers, which are forty miles northwest of Buna. Additional Allied aircraft machine-gunned the Japanese troops as they unloaded but 800 of an estimated 1,000 to 1,200 reinforcements got ashore.[45] On December 9 Allied bombers drove away six destroyers bring more reinforcements. Six days later one of the high-winged four-engine B–24s beginning to be used in the Southwest Pacific reported

two cruisers and three destroyers heading for Buna. B–17s attacked them through clouds and thunderstorms in an afternoon raid. Despite the opposition, the Japanese ships anchored off Buna and disembarked reinforcements and supplies on the night of December 15-16. When the IJN vessels withdrew, RAAF Catalinas and USAAF B–17s, B–24s, and B–25s bombed and strafed the ships without sinking any of them.[46]

December 1942 marked the month that the Fifth Air Force modified the B–25 to become a remarkable anti-shipping weapon. Kenney directed Major Paul I. "Pappy" Gunn, at Brisbane, to load an experimental B–25 with as many forward-firing .50-caliber machine guns as possible. This armament, he believed, would allow B–25s making low-level bomb runs to suppress antiaircraft fire from Japanese ships. Gunn replaced the bombardier's nose station and bomb sight with four machine guns, put a pair on either side of the fuselage just under the pilot's window, and strapped three more underneath the fuselage. To compensate for increased weight, the lower turret and tail guns were removed. The first innovatively-armed aircraft was ready at the end of December. When the guns blazed away in tests on the ground, vibration shook rivets out of the airframe. Gunns' solution was to put longer blast tubes on the machine guns and to stiffen the gun mounts with steel plates. Finally he used sponge rubber pads to lessen the shock of the guns firing and moved those mounted on the sides of the fuselage farther back. In the end, the three bottom guns had to be deleted. The B–25 had a door on the bottom of the fuselage that closed after the nose wheel retracted. When the guns fired, the door kept falling off. In lieu of the belly guns, Kenney told Gunn to lock the twin .50-calibers mounted in the top turret in a forward-firing position. Kenney had a squadron of his B–25s modified with the forward-firing machine guns. Captain Ed Larner took command of the 90th Squadron of the 3d Attack Group. His orders directed him to train it to use the modified aircraft for skip-bombing and strafing missions.[47]

The modified B–25s, later designated B–25C-1s, could project a cone of fire five-to-six-feet wide and two-to-three-feet high. Ammunition cans provided 480 rounds for each gun. The 480 rounds were belt-loaded in sequences of two tracer, four incendiary, and five armor-piercing shells. The massed impact of the guns could also devastate targets other than ships. They proved fatal to Japanese fighters that blundered into their field of fire since the .50-calibers outranged Japanese .303-caliber machine guns and 20mm cannon by 300-to-400 yards.[48]

Larner's pilots did not practice skip-bombing. Instead, they perfected the technique of throwing bombs with five-second delay fuzes into ships from masthead height. The bombs, traveling at the speed of the aircraft from which released, would arc into a vessel and plunge through its deck or hull before detonating. Each pilot dropped thirty to forty practice bombs, one bomb to a run, on the same shipwreck that Benn had used to test skip-bombing from a B–17. A mark painted on the noses of their B–25s gave them a reference point to use as a bomb sight. By June 1943, Kenney's pilots were able to tell him that "mast height" bombing was more effective than skip bombing.[49] Meanwhile, American and Australian infantry and tanks, supplied by air transport and aided by close air support, eliminated the Japanese at Buna. They did so with hard fighting by January 22, 1943.

Lieutenant General Hitoshi Imamura, commanding officer of Japan's Eighteenth Army, moved to reinforce his outposts at Lae and Salamaua to the north as the Allies drove his troops out of Buna. The first convoy sent to accomplish this and its aerial escort faced formidable difficulties. Slow-moving Japanese transports, averaging eight knots, needed fifty hours to move the 400 nautical miles from Rabaul to Lae. Pilots of Japan's 6th Army Air Force Division needed to fly two eight-hour missions each day to provide air cover. Although the IJN's Eleventh Air Fleet promised to bomb Port Moresby before the convoy sailed in order

to suppress Allied air activity, it was unable to do so. Despite this omission, the convoy sailed on schedule on January 6.[50]

Isolation of the Japanese garrisons was the responsibility of the Fifth Air Force. On December 30, 1942, photo reconnaissance had revealed ninety-one enemy vessels assembled in Rabaul harbor. Other surveillance identified Japanese float planes, usually an indicator of antisubmarine sweeps in advance of a convoy, near Lae. On January 6, 1943, Allied aircraft spotted a Japanese convoy heading from Rabaul toward Lae. This confirmed signals intelligence that had warned of an impending attempt to reinforce Lae.

The convoy consisted of two light cruisers, four destroyers, and four transports. Allied aircraft attacked the convoy and its IJN fighter escorts on January 7 and 8. Allied aircraft involved twenty-eight heavy bombers, twenty-two medium bombers, and thirty-two light and fighter bombers. The latter included nineteen Australian Beaufighters, twin-engine adaptations of the Beaufort bomber. In fighter configuration they had four 20mm cannon in the nose and six .303-caliber machine guns in the wings. Thirty-five American fighters provided cover for the bombers.

The convoy ships withdrew on the morning of January 9, leaving behind one beached transport. Allied airmen had sunk the transports *Nichiryu Maru* and *Myoko Maru*, killed 600 of the reinforcements, and destroyed more than fifty enemy aircraft at a cost of ten Allied planes. The 6th Air Division lost 20 percent of its pilots in defense of the convoy. But more than 4,000 Japanese troops had unloaded from their transports. The Japanese had put enough reinforcements ashore so that they could take offensive action against the Australian base at Wau, about 150 miles northwest of Buna. Wau had to be captured. In Allied hands, Wau could serve as a base for air power that would make Lae and Salamua untenable.[51]

On January 19, the Japanese also put 9,400 troops ashore at another northern New Guinea outpost, Wewak, 382 miles northwest of Lae. A convoy of eight transports covered by two light cruisers and five destroyers came and went unmolested by Allied air forces. The *Triton*, a U.S. Pacific Fleet submarine, tipped off by radio intercepts, sank one transport and damaged another.[52]

Rushed in by air, Allied artillery and infantry contained the Japanese assault on Wau. In consequence, Japanese commanders at Rabaul decided to send 6,900 Eighteenth Army soldiers assembled there into Lae. Japan did not have an airlift capability comparable to that of the Allies.[53] The reinforcements had to go by ship, despite the danger of air attack while at sea. The only alternative to delivering them directly to Lae was to send them to Madang on the northwestern coast of New Guinea. This was beyond the reach of Allied air power. Troops landed there, however, would have to trek through nearly 300 miles of jungle to reach Lae or travel down the coast in barges. Either route would be safer, but would not put them ashore when and where needed.

General Imamura and Admiral Jin'ichi Kusaka, commander of the Eleventh Air Fleet, recognized the hazards incurred by sending a convoy direct to Lae. War gaming indicated that 40 percent of the ships involved and 33 to 50 percent of covering aircraft could be lost. They planned to ameliorate the danger by providing the convoy with an extensive fighter escort. Imamura and Kusaka also believed that the convoy could take advantage of weather to hide itself from enemy observation and attack. One three-ship convoy sailed from Rabaul to Wewak, arriving there without incident on February 19. For the Lae convoy they were planning, the Japanese added to the odds by scheduling heavy air raids on Allied airfields within range of the convoy's route to diminish the Allied Air Forces' ability to strike at the ships.[54]

The convoy would consist of eight transports escorted by eight destroyers. Destroyers assigned include the *Tokitsukaze*, *Yukikaze*, *Arashio*, *Asashio*, *Shirayuki*, *Uranami*, *Shikinami*, and *Asagumo*. Antiaircraft armament on each warship included six dual-purpose 5-inch guns, ten or more 25-mm antiaircraft weapons, and supplementary machine guns. Transports included the Naval Special Service ship *Nojima*, 8,251 tons; the *Aiyo Maru*, 2,746 tons; *Kembu Maru*, 953 tons; *Kyokusei Maru*, 5,493 tons; *Oigawa Maru*, 6,493 tons; *Taimei Maru*, 2,883 tons; *Teiyo Maru*, 6,869 tons; and *Shin-Ai Maru*, 3,793 tons. Each transport had its own anti-air armament to supplement those of the escorting destroyers and the *Nojima*. These totaled ten antiaircraft guns, six pom-poms, five Army field guns, and four machine guns distributed among the seven civilian ships. Rear Admiral Masanori Kimura, head of the 3rd Destroyer Flotilla, commanded the convoy from the *Shirayuki*.[55]

The eight transports loaded 6,004 troops. Other cargo included twelve antiaircraft guns, twenty-one artillery pieces, seven mortars, and 138 motor vehicles. The ships also carried thirty-eight large motorized landing craft. Cargo handlers stowed 2,400 drums of fuel and large quantities of ammunition so that they would be readily accessible when the ships arrived at Lae. The *Kembu Maru* was one of the small new "sea trucks" the Japanese were building. It carried no munitions, but loaders crammed it with 1,000 drums of aviation gasoline and 650 drums of lower-octane fuel. In addition to the personnel and cargo on the transports, the destroyers also embarked motorized landing craft, collapsible boats, and nearly 1,000 Army personnel. Careful loading insured that all vital material or critical personnel would not be lost if the Allies sank a particular ship.[56]

The convoy's defense measures were to include evasive action, antiaircraft fire, and smoke screens to be generated by the escorts. The Japanese Army Air Force and Naval Air Force shared responsibility for fighter cover.

Planned Japanese Air Cover, Rabaul-Lae Convoy[57]

Date	Time Period	Air Cover
March 1	0500-1800	Army
March 2	0500-1200 1100-1800	Navy Army
March 3	0500-1200 1100-1800	Navy Army
March 4	0500-1200 1100-1800	Navy Army
March 5	0500-1200 1100-1800	Navy Army
March 6	0500-1200 1100-1200	Army Navy
March 7	0500-1800	Navy

To meet this schedule, forty Navy and sixty Army fighters were available. Army air units also scheduled attacks on Wau and Buna while the convoy was at sea. Navy air units planned attacks on Port Moresby and Milne Bay for the same time period.[58]

As early as February 19 MacArthur's headquarters knew from intercepted radio traffic that the Japanese intended to send a convoy to Lae in early March. This communications intelligence confirmed other indicators that a convoy was imminent. A February 7 sighting of a float plane off New Britain signified the typical sign of antisubmarine surveillance in advance of a convoy. February 22 reconnaissance photography revealed a shipping buildup at Rabaul.[59]

The Southwest Pacific Area intelligence staff alerted Kenney to the impending convoy on February 25, 1943. Brigadier General Ennis Whitehead was in charge of the Fifth Air Force's Bomber Command and of the Air Force's advance headquarters in New Guinea. A World War I veteran like Kenney, Whitehead had participated in the 1921 American test bombings of tethered German warships and some of the record-setting distance flights of the inter-war years. After arriving in Australia in July 1942 Whitehead became a key figure in the rebuilding, reorganization, and increased combat effectiveness of the USAAF in the Southwest Pacific.[60]

Kenney directed Whitehead to move his P-38s and B–25s from Port Moresby to Dobodura, an air field a few miles inland from Buna. Kenney didn't want bad weather at Port Moresby to interfere with air strikes on the convoy. When MacArthur discussed the planned Japanese convoy with Kenney, he assigned the highest priority to its destruction.[61]

Allied meteorologists forecast bad weather north of New Britain and conditions south of the Japanese-held island. Kenney and Whitehead reviewed the routes of previous enemy convoys. They concluded that the Japanese would route the Lae reinforcements under the bad weather. The Fifth Air Force commander ordered increased reconnaissance over the Bismarck Sea, which lies north of New Britain, west of New Guinea, and south of the Admiralty Islands.[62]

While the convoy traveled along New Britain's northern coast it would be within range of only the Allied Air Forces' heaviest bombers, the B–17s and B–24s. When it passed through the straits connecting the Bismarck and Solomon Seas and separating New Guinea and New Britain, the convoy would be within range of Kenney's medium bombers and long-range fighters. While they, and the heavy bombers pounded the convoy, he planned to send some of his A-20s, P-40s, and all of his shorter-ranged P-39s to destroy Japanese fighters on the ground at Lae. The heavies would bomb the convoy from eight to ten-thousand feet. When they finished, his medium bombers would start skip and mast height bombing. A-20s and Beaufighters would follow the specially-armed B–25 anti-shipping aircraft. P-38s would provide fighter cover. The total mix of combat aircraft available for convoy strikes included sixty P-40s, thirty-six P-38s, twenty-eight B–25s, twenty-eight B–17s, nine B–24s, fifteen A-20s, six Bostons (as the British and Australians designated A-20s), nine Beauforts, and nine Beaufighters. American air units involved included the 35th and 49th Fighter Groups; the 13th, 89th, and 90th Squadrons of the 3rd Attack Group; the 38th Bombardment Group; the 43d Bombardment Group; and the 90th Bombardment Group. Australian aircraft available came from RAAF No. 30 and No. 75 Squadrons in No. 9 Operational Group. In addition, some Australian airmen plugged gaps in the personnel-short American squadrons. The early intelligence tipoff about the convoy even allowed Kenney's airmen the luxury of a rehearsal for the attack.[63]

The Japanese convoy left Rabaul on the night of February 28. Although weather conditions prevented preemptive strikes against Allied air bases, the Japanese Army and Navy commanders had decided that the reinforcement of Lae could not wait. On March 1, 1943, George Sellmer, the navigator of a B–24 from the 321st Squadron, 90th Bomb Group, spotted the Japanese convoy in the Bismarck Sea about 150 miles from Rabaul. Sellmer's

pilot, Lieutenant Walter Higgins, reported to Port Moresby the sighting of six destroyers and eight transports heading west. The Japanese ships below intercepted the contact report and its receipt by Port Moresby. Despite being discovered, the convoy continued.[64]

Bad weather prevented further sightings of the convoy until the morning of March 2. In the interim, American B–17s and B–24s tried unsuccessfully to bomb the ships through heavy clouds. On the morning of March 2, the weather cleared enough for Allied aircraft to bomb Japanese airfields at Lae and Gasmata and to relocate the convoy. A Fifth Air Force B–24 radioed that it had located a convoy of fourteen vessels about fifteen miles north of Cape Gloucester, at the opposite end of New Britain from Rabaul. The ships were steaming south toward the strait between New Britain and New Guinea. The B–24, from the 320th Squadron, 90th Bomb Group, circled the convoy until Allied bombers arrived.[65]

Before the B–17s and B–24s appeared over the convoy, sixteen P-38s from the 39th Fighter Squadron arrived to provide air cover. Although they did not sight the convoy, they encountered three Japanese fighters. The P-38s shot down two of the Japanese aircraft and reported a third as a probable kill. Japanese files record the loss of three Imperial Japanese Navy aircraft over the convoy on March 2.[66]

Twenty minutes after the P-38s splashed the Japanese fighters, Major Ed Scott of the 63d Squadron, 43d Bomb Group, arrived over the convoy with seven B–17s. Scott and his two wingmen made a bomb run on the transport *Kyokusei Maru* at an altitude of 6,500 feet while under attack by eight Japanese fighters and receiving antiaircraft fire from the ships below. Five bombs hit the *Kyokusei Maru*. Secondary explosions from the ship's munitions and fuel cargo added to the holocaust created by the bombs. At 10:30 a.m. the ship's captain ordered his crew to abandon ship. The destroyers *Asagumo* and *Tokitsukaze* stood by as rescue vessels. In addition to surviving crew and troops, two mountain artillery guns were salvaged from the burning hulk which eventually exploded and sank.[67]

The four other B–17's in Scott's raid attacked ships individually. One, piloted by Lieutenant Jim Murphy, first went after a destroyer but was frustrated by the warship's violent evasive actions. Then Murphy bombed a transport, which may have been the *Kyokusei Maru*. He reported that his bomb blew out of the sides of the target vessel which quickly broke in two and sank. The other B–17s, hampered by bomb sight and bomb rack malfunctions, also attacked ships but without results.[68]

Eleven B–17s from the 64th and 403d Bomb Squadrons followed Scott's raid on the ships. Bombing from lower altitudes between 4,700 and 5,600 feet, they reported one direct hit and several near misses on the Japanese ships. Their aerial gunners claimed three Japanese fighters shot down and five probably destroyed. While these B–17s attacked, two 321st Bomb Squadron B–24s at 7,000 feet dropped twelve bombs on a large destroyer and a transport but achieved no hits. They reported that the B–17s had sunk one cargo vessel and set another on fire.[69]

From 2:00 p.m. on, a B–17 shadowed the convoy. Just before six o'clock a single B–17 from the 403d Bomb Squadron appeared, dropped two 1,000-pound bombs without effect, and suffered some battle damage inflicted by twelve attacking IJN fighters. At 6:20 p.m., nine B–17s from the 64th and 403d Bomb Squadrons brushed aside Japanese fighters to send bombs plunging toward the ships below. They reported two direct hits on one transport and four near misses on two others. Heavy opposition, mounted by eighteen Japanese Army and Navy fighters and antiaircraft fire, damaged four B–17s and wounded seven aircrew.[70]

When Allied reconnaissance aircraft sighted the convoy for the last time on March 2 at 6:40 p.m., only twelve ships were sailing in company. Two of the destroyers, *Asagumo* and *Yukikaze* had rushed away at high speed to convey survivors from the *Kyokusei Maru* to Lae.

When this mission was completed, they returned to the convoy. Two of the ships remaining with the convoy, the *Teiyo Maru* and the *Nojima*, had suffered some casualties and damage from near misses. As the convoy steamed south toward Vitiaz Strait, Admiral Kimura decided to delay its arrival at Lae until morning.[71]

Kimura took his convoy south through Vitiaz Strait just before daybreak. The strait is a thirty-five-mile-wide, 150-mile-long channel between New Guinea and the offshore islands of Long and Umboi Islands. Dampier Strait, in turn, separates the islands from New Britain. An RAAF Catalina used its Air to Surface Vessel (ASV) radar to locate the convoy at 11:00 p.m. The Australian aircrew kept the Japanese ships under surveillance throughout the night and occasionally caused it to scatter by dropping flares and twice dropping single bombs. The Catalina pilot, Flight Lieutenant Terry Duigan, reported the convoy's turn south when it began. The flying boat left the convoy just before dawn after unloading its remaining four 250-pound bombs from 2,000 feet over a destroyer. A Fifth Air Force B–17 took over its shadowing role.[72]

Allied aircraft renewed their assaults on the convoy in the Huon Gulf about 100 miles east Lae. Seven Beaufort torpedo bombers from No. 100 Squadron set out from Milne Bay to attack the convoy. Bad weather kept all but three from finding the Japanese ships. Squadron Leader J. A. Smibert, found the convoy and dropped flares to guide following aircraft to it. Pilot Officer Ken Waters initiated the attacks. He made a 6:30 a.m. run against a destroyer at an altitude of 100 feet and dropped his torpedo at 1,000 yards without result. A second Beaufort, piloted by Flying Officer Lew Hall, attacked the *Shin-Ai Maru* about 7:00 a.m. but its torpedo would not release. Frustrated, Hall strafed the ship before turning away.[73]

While the Beauforts attempted to torpedo the Japanese ships, other Allied squadrons received mission instructions. Beaufighters, B–17s, B–25s, A-20s, and P-38s were to rendezvous at 9:30 a.m. over Cape Ward Hunt, 160 miles north of Port Moresby, to form a strike force. When assembled, they would assail the convoy using the tactics they had rehearsed.[74]

Thirteen Beaufighters from RAAF No. 30 Squadron went first, to suppress antiaircraft fire. They strafed the convoy in line-abreast 220-knot runs made below 500 feet. The Japanese expected more torpedo attacks. To counter them, they concentrated their heavy guns on the bombers at high altitude while depending on their lighter weapons and violent evasive maneuvers to defend against the low-altitude aircraft. When the Australian attack planes approached, the Japanese warships on that side of the convoy turned toward them to comb the tracks of the anticipated torpedoes. This presented the destroyers as smaller targets but limited the number antiaircraft guns that the ships could bring to bear on the attacking aircraft. It also unmasked the less-well-armed transports. The Beaufighters' .303-caliber machine guns and 20-mm cannon wreaked havoc among the exposed Japanese antiaircraft gunners and ignited some of the transports' volatile deck cargoes. While No. 30 Squadron aircraft pounded the ships, thirteen B–17s began dropping 1,000-pound bombs from an altitude of 7,000 feet. Thirteen B–25s followed the B–17s, also bombing from medium altitude. As the bombs fell from above, twelve of the B–25s modified with additional forward-firing machine guns swept in at 500 feet. Their concentrated .50 caliber bullets did their own substantial damage as the Allied aircrews flew even lower to drop thirty-seven 500-pound bombs at masthead height. One bomb started a fire that exploded the after magazine of the destroyer *Shirayuki*, Admiral Kimura's flagship. The explosion blew off the ship's stern and sank the ship. Other ships severely damaged by the 90th Squadron attack included the destroyers *Arashio, Asagumo* and *Tokitsukaze*, the merchant transports *Teiyo Maru, Aiyo*

Maru, *Oigawa Maru*, and the naval transport *Nojima*. The *Arashio*, with its bridge destroyed and rudder jammed, crashed at high speed into the *Nojima*, which began to sink. Twelve skip-bombing A-20s followed the low-level B–25s. They loosed twenty more 500-pound bombs. One of the bombs caused the small *Kembu Maru* to sink immediately. A-20 aircrews also claimed ten other direct hits. Then six more B–25s concluded the midmorning raid. Despite the sequenced attack, the strafing and bombing had occurred so rapidly that Beaufighters were still hammering ships as the last B–25 bombs fell.[75]

Twenty-eight P-38s had provided cover while the bombers struck at the convoy. Fighter opposition was heavy, with thirty aircraft present, but ineffectual. To the detriment of the ships below, most of the Japanese pilots focused their attention on the B–17s. This allowed the low-level Allied bombers to make their run with little interference. In all, Allied aerial forces over the convoy lost three P-38s and one B–17 while destroying twenty Japanese aircraft. An Allied air raid by thirty-eight fighters on the Japanese field at Lae concurrent with the attack on the convoy kept additional Japanese fighters from rushing to aid the convoy. Pilots making the raid reported destroying six more Japanese fighters, probably destroying another two, damaging four, and setting a small Japanese cargo vessel in Lae Harbor on fire.[76]

Allied aircraft returned to attack the convoy in mid-afternoon. Bad weather had closed in over the Owen Stanley Mountains. Many of the strike aircraft could not navigate over or through the peaks. None of the Beaufighters managed to cross the range nor did twelve of the seventeen A-20s dispatched. Some of the aircraft that did find their way from Port Moresby to the northern coast of New Guinea had difficulty finding the remnants of the enemy convoy. Six of twenty-nine B–25s could not find the Japanese ships. The other B–25s found two destroyers and four or five merchant ships, the latter all burning. Eleven P-38s covered a bombing force of sixteen B–17s, twelve unmodified B–25s, ten specially-equipped B–25s from USAAF squadrons and five RAAF Boston bombers. The raiders headed for the convoy with B–17s from the 65th Bombardment Squadron first, followed in turn by B–25s from the 90th, 71st, and 405th Squadrons, B–17s from the 64th Squadron, and Bostons from RAAF No. 22 Squadron.[77]

The B–17s struck first, at 3:15 p.m. They claimed two direct hits on a destroyer. B–25s followed. Eight came in just over the water and were followed by fifteen more at low and medium altitudes. The *Asashio* received attacks from all types of aircraft over a period of seven minutes. B–25s from 90th Squadron flying at 7,000 feet showered 1,000-pound bombs on the hapless ship and brought it to a halt in the water. Other B–25s attacked it with skip and masthead height bombing. The Bostons, loaded with 250- and 500-pound bombs, simultaneously attacked the destroyer *Tokitsukaze*. Diving individually from altitudes of 4,000 to 1,500 feet, the Bostons scored at least two direct hits. B–25s followed with low-level attacks on the destroyer. At the same time, more B–17s rained bombs down through the B–25s and Bostons. When the bombers had emptied their bomb bays, they strafed the burning and sinking ships. The Allied aircraft left both Japanese destroyers on fire, one of them sinking. Three of the Japanese transports remained afloat but sinking. When debriefed, the attacking pilots stated that too many Allied aircraft were over the target at the same time.[78]

Japanese fighters, which rotated over the battle area in formations of twelve to fifteen aircraft during the bombing, confronted the P-38s and the heavily armed B–25s and B–17s. Despite skillful flying the Japanese Army and Navy pilots could not prevent devastation to the ships below. Japanese documents recorded the loss of twelve fighters on March 3.[79]

While daylight lasted on March 3, additional Allied aircraft visited the battle area to strafe survivors in the water and assure that none of the stricken vessels could get away. The last attack of the day was by a 321st Bomb Squadron B–24 that dropped six 500-pound bombs on the stationary *Tokitsukaze* but missed.[80]

During the night of March 3-4, eight American motor torpedo boats (PTs) came from Tufi, south of Buna on New Guinea's northern coast, to search for ships that had survived the previous day's air strikes. Two, *PT–143* and *PT–150*, found the burning and abandoned *Oigawa Maru*. Each boat launched a torpedo. Both struck home and quickly sank the hulk. Allied aircraft found two damaged Japanese destroyers in Huon Gulf on the morning of March 4. The first, the *Arashio*, went to the bottom after a B–17 dropped a 500-pound bomb into her forward stack. Low-level bombers destroyed the second, probably the *Asashio*, in late afternoon on March 4. Nine modified B–25s from the 90th Squadron reported finding a ship, later believed to be the *Asahio*, about fifty miles east of Cape Ward Hunt. Three dropped six bombs that achieved two hits and three near misses, after which the destroyer quickly sank.[81]

When the battle ended, air power had sunk all eight of the transports and four of the eight destroyers in the convoy from Rabaul to Lae. The warships *Asagumo*, *Shikinami*, *Uranami*, and *Yukikaze* escaped to fight again, although the first three sank in combat in 1944. The *Yukikaze* survived until July 1945, when it ran aground. Japanese destroyers managed to rescue 2,734 of the troops originally embarked on ships that went to the bottom. Several hundred more troops made their way ashore in lifeboats, barges, or by swimming only to be killed or captured over the next several months. Fifth Air Force statistics reported Japanese air losses of sixty planes definitely destroyed, twenty-five probably destroyed, and ten damaged. Allied losses totaled thirteen killed, twelve wounded, four airplanes shot down, and two airplanes demolished on landing.[82]

Allied fighters and light bombers came back to the area for several days following the battle. Their mission was to kill surviving Japanese troops in lifeboats or in the water so that they could not go ashore and fight again. Japanese fighters several times intercepted the strafers, with casualties resulting on both sides. On March 5, PTs *143* and *150* encountered a Japanese submarine which was rescuing survivors from three landing craft. The PTs launched torpedoes that missed but forced the submarine to submerge. Then they used depth charges and machine guns to sink the barges and kill their occupants.[83]

Kenney woke up MacArthur at 3:00 a.m. on March 4 to report his aircrews' success in devastating the Japanese convoy. According to Kenney, he "had never seen him so jubilant." The Allied Supreme Commander quickly wired his congratulations to the airmen in New Guinea. In postwar reflection, MacArthur described the Battle of the Bismarck Sea as "the decisive aerial engagement" in the Southwest Pacific Area.[84]

Victory in the Battle of the Bismarck Sea was decisive. Allied Air Forces achieved the victory with a combination of effective leadership plus specially trained and equipped forces. After-action analysis vindicated the technique of low altitude bombing. A report issued in June 1943 found that during the action seventy-two B–17 sorties dropped 253 bombs and scored nineteen direct hits. Although the average altitude for this bomb runs was 6,000 to 7,000 feet, altitudes varied from 4,500 to 14,500 feet. B–25s conducted sixty-two minimum altitude (from masthead height to 300 feet) sorties against the convoy. The medium bombers reported forty-nine direct hits out of 215 500-pound bombs released. A-20s also operated at minimum altitude, dropping ten 250-pound and ten 500-pound bombs with twelve hits claimed.[85] Kenney's aviators gained remarkable advantage gained through intelligence collection and analysis. Fortuitous weather permitted them to exploit the intelligence almost to its fullest extent.

In the aftermath of the Rabaul to Lae convoy's destruction, Japan's Imperial General Headquarters decided to shift priority in the Southwest Pacific from defense of the Solomon Islands to defense of their forward bases in New Guinea. Japanese Army Air Force formations in the area were restricted principally to New Guinea operations. Naval Air Force units supported New Guinea operations, had primary responsibility for air defense of the Bismarck Archipelago, and sole responsibility for air operations in the Solomon Islands.[86]

The shift in priorities involved Japanese aerial forces in costly air battles with the Fifth Air Force that drained away their trained pilots and destroyed many of their aircraft. Japanese ground forces also continued to reach New Guinea, where they could not be adequately supplied. They all came by night and by barge or submarine. Once ashore they suffered tremendously because Allied air power interdicted most supplies shipped to Japanese outposts. Despite suffering from malnutrition and disease, the Japanese troops remained formidable foes. Severe fighting was required to drive them out of Lae and Salamaua in September 1943 and Finschafen to the north in October. Months of bloody mopping up, mostly by Australian troops, followed. Capture of Lae, Salamaua, and Finschafen, however, effectively cleared the northern New Guinea coast. This, together with the seizure of Guadalcanal by American forces from the South Pacific Area, isolated Japanese forces at Rabaul and assured the safety of air and sea routes from North America to Australia. Conquest of New Guinea and Guadalcanal also opened the way for the Allies' further advance toward the Philippines.[87]

Endnotes to Chapter V

1. Frank Uhlig, Jr., *How Navies Fight: The U.S. Navy and Its Allies* (Annapolis, Md.: Naval Institute Press, 1994), p. 195.
2. Paul S. Dull, *A Battle History of the Imperial Japanese Navy (1941-1945)* (Annapolis, Md.: United States Naval Institute, 1978), p. 36; Arthur Hezlet, *Aircraft and Sea Power* (New York: Stein and Day, 1970), p. 202. Hezlet's figures on 22d Air Flotilla strength differ from those presented by Dull. Hezlet states that the flotilla included 36 fighters, 6 reconnaissance aircraft, and 138 bombers and was supported by 3 seaplane tenders with 30 seaplanes.
3. Len Deighton, *Blood, Tears, and Folly: an Objective Look at World War II* (New York: Harper Collins Publishers, 1993), p. 573.
4. United States Army, comp., *Reports of General MacArthur, Volume II—Part I, Japanese Operations in the Southwest Pacific Area, 1950* (Washington, D.C.: United States Government Printing Office, 1966 reprint), p. 75.
5. Hezlet, *Aircraft and Sea Power*, p. 204; H. P. Willmott, *Empires in the Balance: Japanese and Allied Pacific Strategies to April 1942* (Annapolis, Md.: Naval Institute Press, 1982), p. 105.
6. Douglas Gillison, *Royal Australian Air Force 1939-1942* (Canberra: Australian War Memorial, 1962), pp. 204-5.
7. Dennis Richards and Hillary St. George Saunders, *Royal Air Force 1939-1945*, Vol. 2, *The Fight Avails* (London: Her Majesty's Stationary Office, 1974), pp. 7-10.
8. *Ibid*., p. 20.
9. Deighton, *Blood, Tears, and Folly: an Objective Look at World War II*, p. 5; Hezlet, *Aircraft and Sea Power*, p. 204; Richards and Saunders, *Royal Air Force 1939-1945*, Vol. 2, *The Fight Avails*, p. 21.
10. E. E. H. Archibald, *The Fighting Ships of the Royal Navy 1897 - 1984* (New York: Military Press, 1987), pp. 176-77; Deighton, *Blood, Tears, and Folly*: *An Objective Look at World War II*, p. 579-80; Stephen Roskill, *Churchill and the Admirals* (New York: William Morrow and Company, Inc., 1978), p. 181.
11. Quoted in Edwin T. Layton with Roger Pineau and John Costello, *"And I was There," Pearl Harbor and Midway—Breaking the Secrets* (New York: William Morrow and Company, Inc., 1985), p. 178.
12. Archibald, *The Fighting Ships of the Royal Navy 1897—1984* pp. 181-82.
13. Gillison, *Royal Australian Air Force 1939-1942*, p. 250.
14. Dull, *A Battle History of the Imperial Japanese Navy (1941-1945)*, p. 38; Hezlet, *Aircraft and Sea Power*, p. 205; Gillison, *Royal Australian Air Force 1939-1942*, p. 251.
15. Nathan Miller, *The Naval Air War* (Annapolis, Md.: Naval Institute Press, 1991), p. 55.
16. Roskill, *Churchill and the Admirals*, 1978, pp. 119, 199. Roskill, a Royal Navy officer, came back from Norway and discussed the bombing with Phillips in April 1940.
17. Stephen W. Roskill, *The War at Sea 1939-1945, Volume I, The Defensive* (London: Her Majesty's Stationery Office, 1954), pp. 564-65.
18. Dull, *A Battle History of the Imperial Japanese Navy (1941-1945)*, p. 40; Roskill, *Churchill and the Admirals*, p. 200, says that Adm. Sir Dudley Pound, the First Sea Lord, told Churchill this was probably the reason that the *Prince of Wales* and *Repulse* did not attempt to create a smokescreen.
19. Deighton, *Blood, Tears, and Folly: An Objective Look at World War II*, pp. 581-82; Dull, *A Battle History of the Imperial Japanese Navy (1941-1945)*, p. 40; Richards and Saunders, *Royal Air Force 1939-1945*, Vol. 2, *The Fight Avails*, pp. 28-29.

20. Hezlet, *Aircraft and Sea Power*, p. 206.
21. David Brown, *Warship Losses of World War Two* (Annapolis, Md.: Naval Institute Press, 1995), pp. 58, 61, 161, 173.
22. Quoted in Ronald H. Spector, *Eagle Against the Sun* (New York: The Free Press, 1985), p. 128.
23. Willmott, *Empires in the Balance: Japanese and Allied Pacific Strategies to April 1942*, pp. 54-56.
24. *Ibid*., p. 57-58.
25. *Ibid*., p. 58.
26. Willmott, *Empires in the Balance: Japanese and Allied Pacific Strategies to April 1942*, pp. 59-61; Wesley Frank Craven and James Lea Cate, eds., *The Army Air Forces in World War II*, Vol. I, *Plans and Early Operations, January 1939 to August 1942*, 1948 (Washington, D.C.: Office of Air Force History, reprint ed., 1983), p. 417. The inability of B–17s at high altitudes to hit ships underway was again demonstrated in early May when they attempted to bomb Japanese transports in an invasion fleet steaming toward Port Moresby (Craven and Cate, Vol. I, *Plans and Early Operations, January 1939 to August 1942*, p. 449).
27. Dull, *A Battle History of the Imperial Japanese Navy, (1939-1945)*, p. 101; Willmott, *Empires in the Balance: Japanese and Allied Pacific Strategies to April 1942*, p. 61.
28. Craven and Cate, *The Army Air Forces in World War II*, Vol. I, *Plans and Early Operations, January 1939 to August 1942*, pp. 419-20.
29. *Ibid*., pp. 473-74.
30. Craven and Cate, *The Army Air Forces in World War II*, Vol. I, *Plans and Early Operations, January 1939 to August 1942*, p. 460, pp. 480-81; Assistant Chief of Air Staff, Intelligence, United States Army Air Forces, "The B–26 in the Southwest Pacific," Special Informational Intelligence Report, No. 43-10, June 16, 1943, Declassified per EO 11652, File 142.034-2, AFHRA, Maxwell AFB, Ala, p. 3.
31. Herman S. Wolk, "George C. Kenney," pp. 88-114, in *We Shall Return! MacArthur's Commanders and the Defeat of Japan*, William M. Leary, ed. (Lexington: University of Kentucky, 1988), pp. 88-91; Gen. George C. Kenney, *General Kenney Reports: A Personal History of the Pacific War*, 1949 (Washington, D.C., Office of Air Force History reprint, 1987), pp. xi-xiv.
32. Fifteenth Air Force, "Digest Report of Skip Bombing," Apr. 16, 1943, in File K-23454, AFHRA, Maxwell AFB, Ala.; Gen. H. H. Arnold, *Global Mission* (New York: Harper & Brothers, Publishers, 1949), pp. 230-31.
33. Kenney, *General Kenney Reports: A Personal History of the Pacific War*, pp. 21-22, 55.
34. *Ibid*., pp. 44-45, 50.
35. *Ibid*., pp. 66-67.
36. Gillison, *Royal Australian Air Force 1939-1942*, pp. 566-67.
37. *Ibid*., pp. 604-6.
38. *Ibid*., pp. 609-10.
39. *Ibid*., pp. 609, 629.
40. Samuel Eliot Morrison, *History of United States Naval Operations in World War II*, Vol. VI, *Breaking the Bismarcks Barrier*, 1950 (Boston: Little, Brown and Company, 1968 reprint), pp. 37-38.
41. Kenney, *General Kenney Reports: A Personal History of the Pacific War*, pp. 83-89.
42. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan, August 1942 to July 1942*, pp. 106-107. See pp. 63-70 for a discussion of South Pacific army air commander Maj. Gen. Millard Harmon's approach to this issue.

43. Quoted in Steve Birdsall, *Flying Buccaneers, The Illustrated History of Kenney's Fifth Air Force* (Garden City, N.Y.: Doubleday & Company, Inc., 1977), p. 26.
44. Wesley Frank Craven and James Lea Cate, eds., *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan, August 1942 to July 1944*, 1950 (Washington, D.C.: Office of Air Force History, 1983), p. 107, p. 112; Kenney, *General Kenney Reports: A Personal History of the Pacific War* p. 140.
45. Kenney, *General Kenney Reports: A Personal History of the Pacific War*, p. 158.
46. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan, August 1942 to July 1944*, p. 122.
47. Kenney, *General Kenney Reports: A Personal History of the Pacific War*, pp. 144, 155, 164, 173.
48. "Exchange of Information Between Groups in Active Theaters and Groups in Training," memo with unidentified author, Jun. 15, 1943, to Commanding General, 5th AF, Microfilm 0258184, AFHRA, p. 3. The memo states that "a squadron of this group...is flying a modified B–25...designated the B–25C-1." This indicates the memo originated from the 3rd Attack Group.
49. "Exchange of Information Between Groups in Active Theaters and Groups in Training," 15 June 1943, pp. 3-4.
50. Edward J. Drea, *MacArthur's Ultra: Code-Breaking and the War Against Japan, 1942-1945* (Lawrence: University of Kansas Press, 1992), p. 64.
51. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan, August 1942 to July 1944*, p. 136; Kenney, *General Kenney Reports: A Personal History of the Pacific War*, p. 177; Drea, *MacArthur's Ultra: Code-Breaking and the War Against Japan*, p. 66; Dull, *A Battle History of the Imperial Japanese Navy (1941-1945)*, p. 268.
52. Morison, *United States Naval Operations in World War II*, Vol. IV, *Breaking the Bismarcks Barrier*, p. 52; Drea, *MacArthur's Ultra: Code-Breaking and the War Against Japan*, p. 66.
53. Gerhard Krebs, "The Japanese Air Forces," pp. 228-34, in *The Conduct of the Air War in the Second World War, An International Comparison*, Horst Boog, ed. (New York: Berg Publishers Limited, 1992), p. 231.
54. Morison, *United States Naval Operations in World War II*, Vol. IV, *Breaking the Bismarcks Barrier*, pp. 54-55; Drea, *MacArthur's Ultra: Code-Breaking and the War Against Japan*, p. 67; Dull, *A Battle History of the Imperial Japanese Navy (1941-1945)*, pp. 268-69.
55. *Ibid*., p. 269; Lex McAulay, *Battle of the Bismarck Sea* (New York: St. Martin's Press, 1991), p. 36. McAulay, p. 37, gives Kimura's given name as Shofuku while Morison, *United States Naval Operations in World War II*, Vol. IV, *Breaking the Bismarcks Barrier*, p. 55, reports Kimura's given name as Masatomi. Dan van der Vat, *The Pacific Campaign, World War II, The U.S. Japanese Naval War, 1941-1945* (New York: Simon & Schuster, 1991), states that Masatomi Kimura was the admiral involved with the Lae to Rabaul convoy (pp. 258-59) and that Shofuku Kimura was the admiral involved in the evacuation of Japanese troops from Kiska in the North Pacific in August 1943 (p. 276).
56. McAulay, *Battle of the Bismarck Sea*, pp. 36-37.
57. *Ibid*., p. 38.
58. *Ibid*.
59. Drea, *MacArthur's Ultra: Code-Breaking and the War Against Japan*, pp. 68-69.
60. Donald M. Goldstein, "Ennis C. Whitehead," pp. 178-207, in McLeary, *We Shall Return! MacArthur's Commanders and the Defeat*

of Japan, pp. 178-84.
61. Kenney, *General Kenney Reports: A Personal History of the Pacific War*, pp. 197-98.
62. *Ibid*., p. 199.
63. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan, August 1942 to July 1944*, p. 142; Kenney, *General Kenney Reports: A Personal History of the Pacific War*, p. 199-200.
64. United States Army, *Reports of General MacArthur*, Vol. II - *Part I, Japanese Operations in the Southwest Pacific Area*, pp. 201-2; McAulay, *Battle of the Bismarck Sea*, pp. 44-45.
65. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan, August 1942 to July 1944*, p. 143; Kenney, *General Kenney Reports: A Personal History of the Pacific War*, p. 202; McAulay, *Battle of the Bismarck Sea*, p. 46.
66. McAulay, *Battle of the Bismarck Sea*, pp. 46-47.
67. *Ibid*., p. 48.
68. *Ibid*., p. 49.
69. *Ibid*., p. 51.
70. *Ibid*., p. 52.
71. *Ibid*., p. 54.
72. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan, August 1942 to July 1944*, p. 143; Kenney, *General Kenney Reports: A Personal History of the Pacific War*, p. 203.
73. McAulay, *Battle of the Bismarck Sea*, pp. 61-62.
74. *Ibid*., p. 65.
75. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan, August 1942 to July 1944*, p. 144; Kenney, *General Kenney Reports: A Personal History of the Pacific War*, p. 203; McAulay, *Battle of the Bismarck Sea*, pp. 63-111. McAulay gives a detailed account of the battle, include recollections of survivors.
76. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan, August 1942 to July 1944*,
p. 144; Kenney, *General Kenney Reports: A Personal History of the Pacific War*, p. 204. Kenney states that twenty-two Japanese fighters were destroyed, two probably destroyed, and four damaged.
77. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan, August 1942 to July 1944*, p. 145; Kenney, *General Kenney Reports: A Personal History of the Pacific War*, p. 204; McAulay, *Battle of the Bismarck Sea*, p. 116.
78. McAulay, *Battle of the Bismarck Sea*, p. 117, p. 119, p. 123.
79. *Ibid*., p. 131.
80. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan, August 1942 to July 1944*, p. 145; Kenney, *General Kenney Reports: A Personal History of the Pacific War*, pp. 204-5.
81. Birdsall, *Flying Buccaneers, The Illustrated History of Kenney's Fifth Air Force*, pp. 132-33; Morison, *History of United States Naval Operations in World War II*, Vol. VI, *Breaking the Bismarcks Barrier*, p. 61. McAulay, *Battle of the Bismarck Sea*, p. 136, cites information from Japanese survivors that the *Arashio* sank during the night of Mar. 3-4. According to Kenney, *General Kenney Reports: A Personal History of the Pacific War*, p. 205, on the morning of Mar. 4 an American B–25 returned to the scene where it found a single Japanese destroyer dead in the water. The B–25 used skip bombing to administer the *coup de grace* to the dying ship. MacAulay, *Battle of the Bismarck Sea*, reproduces a photo (between pp. 154-55) that is identified as the abandoned *Tokitsukaze* being bombed by the 65th Squadron,

43d Bomb Group, at 8:45 a.m., March 4. David Brown, in *Warship Losses of World War Two* (Annapolis, Md.: Naval Institute Press, 1995), p. 82, states that the *Shirayuki* and *Tokitsukaze* fell victim to Allied bombers on March 3 and the *Arashio* and *Asashio* on March 4.

82. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan, August 1942 to July 1944*, pp. 146-49, discuss post-battle attempts to reconcile conflicting data regarding type and size of ships sunk and damaged in various after action reports. The figures presented of four destroyers and eight transports sunk seems conclusive. Morison, *History of United States Naval Operations in World War II*, Vol. VI, *Breaking the Bismarcks Barrier*, p. 62. On pp. 63-64 Morison discusses the types and sizes of ships sunk and comes to the same conclusion as Craven and Cate.

83. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan, August 1942 to July 1944*, p. 145; Morison, *History of United States Naval Operations in World War II*, Vol. VI, *Breaking the Bismarcks Barrier*, p. 62.

84. Craven and Cate, *The Army Air Forces in World War II*, Vol. IV, *The Pacific: Guadalcanal to Saipan, August 1942 to July 1944*, p. 146; Kenney, *General Kenney Reports: A Personal History of the Pacific War*, p. 206.

85. Office of the Assistant Chief of Staff, Intelligence, United States Army Air Forces, "Tactics in the Bismarck Sea Battle," Command Informational Intelligence Series, No. 43-110, Jun. 23, 1943, Declassified per DOD Dir 52009.9, Sep. 27, 1958, File 142.034-3, AFHRA, pp. 4-5.

86. United States Army, *Reports of General MacArthur, Volume II, Part I, Japanese Operations in the Southwest Pacific Area*, p. 205.

87. John Miller Jr., *Cartwheel: the Reduction of Rabaul* (Washington, D.C.: Office of the Chief of Military History, Department of the Army, 1959), p. 1; Spector, *Eagle Against the Sun*, pp. 240-41; Van der Vat, *The Pacific Campaign, World War II, The U.S. Japanese Naval War, 1941-1945*, p. 279.

CHAPTER VI

THE FALKLANDS WAR

The first post-World War II conflict that engaged land-based aircraft against naval forces equipped with modern anti-air defenses occurred in 1982 in the Falklands or the Malvinas.*** The westernmost point of these remote, windswept South Atlantic islands is about 300 miles east of the Strait of Magellan and Argentina's southern coast. The war between Argentina and Britain began on April 2, when Argentine marines seized the islands. The invasion enforced Argentina's claim to them as former Spanish possessions in South America, although the Falklands had been a British colony since 1833.[1] Britain responded by sending a naval task force to recapture the islands. A short, fierce contest ensued, pitting Royal Navy (RN) ships and carrier-based Vertical/Short Takeoff and Landing (VSTOL) aircraft against Argentine aerial forces operating from distant mainland bases. During the Falklands War the British lost six major ships and had ten damaged by air attacks, while the Argentines lost more than 100 fixed wing and rotary aircraft. British forces later claimed responsibility for seventy-two aircraft "kills." Of these, thirty-five were destroyed in attacks on naval targets.[2]

The Falklands were an unlikely prize for so costly a campaign. Two major islands, East Falkland with an area of 2550 square miles and West Falkland with an area of 1750 square miles are the principal islands in the group. About 200 smaller islands totaling 4700 square miles are satellites about them. Together, the islands supported a population of about 1800 persons and are characterized by rocky hills and boggy, rolling plains, on which sheep-raising was in 1982 the only economic activity. About 700 miles to the southeast lie the Falkland Island Dependencies consisting of South Georgia Island, South Sandwich Island, and a few islets. These completed the contested territory.[3]

Great Britain Orders a Fleet

During the first three months of 1982, Britain received several indications that Argentina might transform their diplomatic dispute into armed conflict. Signals intelligence revealed on March 31 that several Argentine ships were en route to the islands. A conference of Britain's civilian and military leadership convened that evening in London. Those present learned that the Royal Navy was prepared to dispatch a task force to the Falklands. It would consist of two VSTOL aircraft carriers, surface escorts, landing ships, submarines, and assault troops. The task force had three components: Task Group 317.8, the carrier battle group; Task Group 317.0, the amphibious group; and Task Group 317.1, the landing force. Admiral Sir John Fieldhouse commanded the entire task force from the United Kingdom, Rear Admiral J. F. "Sandy" Woodward commanded the carrier battle group, Captain M.C. Clapp commanded the Amphibious Group with the title of Commodore, and Brigadier J. H. A. Thompson commanded the landing force.[4]

***British seafarers named the passage between the two main islands in the group "Falkland Sound" in 1690 to honor Viscount Falkland, Treasurer of the Royal Navy at that time. British usage subsequently applied the name Falklands to the island group. Argentina calls the islands the "Malvinas," a name that the Spanish assigned to them about 1767.

At this time Britain's total combatant fleet consisted of the two carriers, fourteen destroyers, forty-six frigates, twelve nuclear-powered and sixteen diesel-powered attack submarines, and four nuclear-powered ballistic missile submarines. The 8,000-mile voyage from the United Kingdom to the South Atlantic islands would take a minimum of three weeks.[5]

The aircraft carriers *Hermes* and the *Invincible* formed the heart of the British task force. The Royal Navy classified the *Hermes* as an antisubmarine warfare (ASW)/commando carrier. The ship's aircraft could carry out ASW or insert a Royal Marine commando brigade ashore. The Royal Navy commissioned the 28,000-ton ship as a conventional carrier with angled flight deck in 1959. A 1971-1973 refit and conversion removed the *Hermes*' steam launching catapults and arrester gear. This ended the ship's capability to launch conventional fixed-wing aircraft. Besides defenses provided by embarked aircraft, the carrier's armament consisted of two quad launchers for close range surface-to-air or surface-to-surface Sea Cat missiles. The Sea Cats, with explosive warheads and a maximum range of just under three miles, could be guided either by joystick or automatic radar from a director unit.[6]

The ship's small aircraft load consisted of five VSTOL Sea Harrier attack jets and nine Sea King helicopters. For the Falklands War, this complement was increased to twelve Harriers. Additional aircraft crammed every inch of available deck space. The Sea Harriers, easily recognizable by their high wings and large air intakes on either side of the fuselage, were single-seater ground attack aircraft with a secondary air defense role. Capabilities of the aircraft included a unique capacity to move vertically, sideways, and backwards as their pilots varied the direction of the jet thrust. Pilots could also effect rapid changes in speed by raising or lowering an air brake in the rear of the fuselage. These "jump-jets" could attain speeds of 597 miles-per-hour at sea level and a maximum speed of 720 miles-per-hour at 1,000 feet. Their method of take off dictated range. Fuel-extravagant vertical takeoffs limited the Sea Harrier's round-trip range to 228 miles. More conservative short takeoffs using the *Hermes'* ski-jump flight deck extended the Sea Harriers' combat radius to 828 miles with wing tanks. In practice, it proved necessary to launch two Sea Harriers every twenty minutes to provide a constant Combat Air Patrol (CAP) for the carriers.[7]

When it reached the battle area, the task force's carriers generally steamed about 150 nautical miles east of the Falklands. Intercept aircraft from the *Hermes* and *Invincible* patrolled west of the missile engagement zones of British radar picket ships stationed closer to the islands. The carrier crews worked hard to maintain an overall aircraft availability rate of 80 percent. They attained a 95 percent availability rate at the beginning of each day on which their ships launched combat missions. Nearly 100 percent of all planned missions were executed. This required each Sea Harrier with the task force to spend about nine hours aloft each day. The average sortie time for the Harriers was about ninety minutes.[8]

A Sea Harrier's normal armament included two 30-mm cannon capable of firing twenty-two rounds per second and two Sidewinder, AIM-9L, heat-seeking air intercept missiles. Rocket motors propelled the Sidewinders, which could carry twenty-five-pound high explosive warheads to a maximum distance of eleven miles. Five hard points on the Harriers (two on each wing and one under the fuselage) gave them the added capability to carry cluster bombs, conventional bombs, and rocket pods.[9]

The square-bodied Sea King helicopters had large cockpits forward of their cargo/weapons compartment and were amphibious all-weather aircraft, capable of ASW, search-and-rescue, and attack applications. Powered by two engines, they could attain a maximum speed of 143 miles-per-hour at sea level and had a maximum range of 764 miles. In airlift configuration, the Sea Kings could carry twenty-two combat-equipped troops or six

stretcher cases and twelve seated wounded. Configured for ASW or attack roles, the helicopters could carry automatic weapons, rocket pods, missiles, and homing torpedoes.[10]

The British had built the *Invincible,* a light aircraft carrier of 19,500 tons, to carry a mix of Sea Harriers and Sea Kings. Commissioned in June 1980, the *Invincible* normally embarked five Sea Harriers and ten Sea Kings. Like the *Hermes,* the *Invincible* carried an increased load of eight jump-jets plus helicopters into the Falklands War. Each operational Harrier squadron (800 in *Hermes* and 801 in *Invincible*) normally had only five aircraft. Naval authorities rounded up aircraft assigned to a training squadron, aircraft in reserve, and an aircraft from an aviation experimental station to bring the total number of Sea Harriers available up to twenty. Eventually the British would ship or fly a total of twenty-eight Sea Harriers and fourteen Royal Air Force (RAF) GR3 Harriers to the South Atlantic.[11]

The *Invincible's* defensive armament included one twin Sea Dart launcher. Sea Darts, surface-to-air or surface-to-surface missiles, carried a high explosive warhead to a maximum range of twenty-four miles. Their fire control system featured a surveillance radar and a tracking radar that complemented the missile's own semi-active homing radar. During the Falklands War, Sea Darts proved able to destroy attacking aircraft and incoming missiles.[12]

After Argentine forces occupied the Falkland Islands, the two aircraft carriers left Portsmouth, England, for the South Atlantic in a well-publicized April 5, 1982 departure. Escorting combatants, oilers, and supply ships slipped quietly out of other British ports. These included Gibraltar, at which the Royal Navy's 2d Flotilla of destroyers and frigates happened to be exercising. The flotilla commander, Rear Admiral Sir John "Sandy" Woodward, assumed command of the carrier battle group on its way to the Falklands. These unobtrusive departures were intended to prevent the Argentines from knowing the total strength of the British fleet. One particularly important ship, the *Atlantic Conveyor,* steamed south on April 21. This container ship, requisitioned by the Royal Navy for the duration of the conflict, had quickly been converted into an "aircraft transport ship." One of four on which conversion was begun, the *Conveyor* carried a cargo of mixed cargo of twenty-four Harriers and helicopters intended to replace anticipated losses from aircraft embarked in task force ships that sailed earlier. Royal Navy planners also hoped to use the *Conveyor* as an auxiliary carrier in emergencies. Its shipboard systems were modified so that aircraft could be refueled, liquid oxygen supplied to Sea Harriers, and fresh water was available to wash down aircraft. In total, the Royal Navy dispatched a force consisting of two aircraft carriers, seven destroyers and frigates, and four tankers and supply ships within three days of the Falklands invasion.[13]

Surface combatants either sailing from England with the task force or joining it off the Falklands included one light cruiser, eleven destroyers, and twenty frigates. The light cruiser *Bristol* mounted one twin Sea Dart launcher, one 4.5-inch gun, and two 20-mm guns. The *Bristol* was the only British warship that did not carry its own helicopters. Two County class destroyers, the *Antrim* and the *Glamorgan,* each mounted four Exocet anti-ship missiles, one twin Sea Slug and two quad Sea Cat surface-to-air missile launchers, two 4.5-inch guns, and two 20-mm guns. The Sea Slug missiles, designed as long-range anti-air weapons, could engage targets at a maximum distance of thirty-six miles and a maximum height of 47,200 feet.[14]

Three Type 22 destroyers, *Broadsword, Brilliant,* and *Battleaxe,* also accompanied the task force. The anti-air armament of these ships included two six-tube Sea Wolf missile launchers and two 40-mm guns. The supersonic Sea Wolfs, with high-explosive warheads and proximity fuzes, provided close-in defense. Type 42 destroyers also sailed with the task force. These included the *Cardiff, Coventry, Exeter, Glasgow, Sheffield,* and *Southampton*. The

4,100-4,700-ton Type 42s mounted one twin Sea Dart missile launcher, six torpedo tubes, one 4.5-inch gun forward, and two 20-mm Oerlikon guns aft. A helicopter on each ship carried four Sea Skua anti-ship missiles. Contray to press reports made during the campaign, aluminum had not been used in fabricating the superstructures of the Type 42 destroyers. Leander-class frigates made up the task force's second largest class of warship. They included the *Andromeda*, *Argonaut*, *Ariadne*, *Aurora*, *Dido*, *Euryalus*, and *Minerva*. Each of these small ships of about 3,000 tons mounted two or three quad Sea Cat launchers and two or more 40-mm Bofors guns in addition to a varying mix of antisubmarine weapons and surface-to-surface Exocet missiles.[15]

Type 21 frigates also joined the task force in large numbers. They were a little larger than the "Leander" class at 3,250-tons. The Type 21s with the British force were the *Active*, *Alacrity*, *Ambuscade*, *Antelope*, *Ardent*, *Arrow*, and *Avenger*. Air defense weapons on each included one quad Sea Cat launcher, one 4.5-inch gun, and two 20-mm Oerlikon guns. The ships' other armament included four Exocet launchers and six torpedo tubes. These types used an aluminum-magnesium alloy in their superstructures to decrease topside weight. Overall, each vessel had 139.5 tons of alloy to 739.5 tons of steel. The magnesium in the alloy proved inflammable. When the magnesium ignited, water spray could not extinguish it. Type 12 frigates were the next-to-smallest surface combatants assigned to the British task force. These were the *Berwick*, *Falmouth*, *Plymouth*, *Rhyl*, and *Yarmouth*. The 2,800-ton vessels each mounted one Sea Cat launcher and two 4.5-inch guns plus an antisubmarine mortar. A 2,700-ton "Tribal" class frigate, the *Tartar*, armed with two quad Sea Cat launchers, two 4.5-inch guns, and two 20-mm guns was the smallest combatant in the task force.[16]

Other Royal Navy ships in the British task force included the assault ships *Fearless* and *Intrepid* and six small landing ships. The latter were the *Sir Bedivere*, *Sir Galahad*, *Sir Geraint*, *Sir Lancelot*, *Sir Percival*, and *Sir Tristram*. One of the 12,000-ton assault ships could carry up to 700 troops plus tanks and other vehicles to the scene of an opposed invasion. They could then put them ashore in assault landing craft launched from davits or a well deck. Flight decks on each ship provided space for five helicopters. Four quad-mount Sea Cat launchers and two 40-mm Bofors antiaircraft guns protected the assault ships' cargoes from air attack. The 5,647-ton "Sir" landing ships had the capacity to carry troops or vehicles, which they could put directly onto the beach. Two 40-mm Bofors antiaircraft guns on each of the "Sirs" gave only token protection from air attack.[17]

Seven Royal Fleet Auxiliary Service Vessels, including helicopter support ships, replenishment ships, and tanks, accompanied the British task force. Only one, the 22,890-ton *Resource* had its own antiaircraft weapons. These were limited to two 40-mm Bofors guns. The Royal Navy also requisitioned more than forty British civilian ships of various classes ranging from tugs to ocean liners for task force support. None of these vessels were armed.[18]

The British task force comprised both the largest naval target and the most extensive naval air defense complex exposed to air attack since World War II. It suffered nonetheless from the lack of a full-deck carrier capable of operating high-performance fixed-wing aircraft and of airborne early warning (AEW) planes. A conventional carrier, interceptors comparable to the American-built F-14, and AEW capability could have given the Royal Navy's battle force an additional several hundred miles of air defense coverage. As it was, the Royal Navy's air defense system off the Falklands had no way of intercepting Exocet-launching aircraft before they fired their missiles. The British ships also found that when they operated in waters bordered by high terrain that their radars had difficulty detecting low-flying aircraft approaching from landward.[19]

Task Force Air Defense Weapons[20]

Weapon	Number of Aircraft/ Launchers/Guns	Number of barrels
Harriers & Sea Harriers	20	N/A
Sea Cat missiles	50	196
Sea Dart missiles	6	12
Sea Slug missiles	2	4
Sea Wolf missiles	6	36
4.5-inch guns	34	34
40-mm guns	32	32
20-mm guns	38	38

In all, the task force mounted 248 surface-to-air missile tubes and 104 gun barrels usable for air defense. Many shoulder-fired surface-to-air missiles and temporarily mounted machine guns supplemented the permanent armament. Not all of the task force's ships sailed together at any one time. But in total it numbered thirty-four surface combatants. This provided the task force commander with an extensive and sophisticated array of anti-air weapons. Later additions would bring up to fifty-one the total number of British combatants involved at various times. Peak strength off the Falklands, however, never exceeded the two aircraft carriers and twenty-three destroyers and frigates.[21]

Land-based aircraft supported the British task force's first action in the Falklands area. This occurred when two destroyers, the *Antrim* and *Plymouth*, and the tanker *Tidespring* detached from the main body on April 7. The ships took a Royal Marine assault team to South Georgia Island. As they neared the island, the Royal Navy's *Endurance*, a 3,600-ton ice patrol ship kept in the South Atlantic joined the detached vessels. A Royal Air Force Victor K2 tanker made a 7,400-mile reconnaissance flight from Ascension Island on April 20 to make sure that no Argentinean ships lay in the path of the small task group. Ascension Island is a nine-mile-long by six-mile-wide British possession in the South Atlantic. Despite its position 3,000 miles northeast of the Falklands, the island served as an air base for British bombers, reconnaissance aircraft, and tankers during the Falklands War.

First Contest of Arms

The invasion task force reached the South Georgia area on April 21. Once there, the Royal Marines recaptured the Falkland Dependencies after a short skirmish with Argentine troops.[22]

The long flight from Ascension to the Falklands required the reconnaissance aircraft to refuel eight times from other Victors, which also flew from Ascension. The Mark K2 Victors, distinguished by their high tail-planes, were converted bombers. These relics of the RAF's 1950s strategic bombing force were each capable of carrying 123,000 pounds of fuel.

The Victors later played critical roles in support of RAF Vulcan bombers that cratered the runway at Stanley on East Falkland Island. The Vulcans were also 1950s aircraft. The needle-nosed delta-wing four-engine jets with their canopies perched atop their fuselages had a range of 4,600 miles, aerial refueling capability, and could carry as many as twenty-one 1,000-pound bombs. Their attack on the Stanley runway helped prevented the Argentine Air Force (*Fuerza Aerèa Argentina* or FAA)and Argentina's naval air command (*Commando Aviacion Naval Argentina* or CANA), from basing high performance combat aircraft there to operate against the British fleet. The 4,000-foot runway consisted of three to four inches of asphalt laid over solid rock. When undamaged, it was at best marginal for modern combat jets but might have accommodated some Argentina's Skyhawks. If the A-4s had been able to operate from Stanley, they would have posed a greater threat to the British task force and posed a greater challenge to the limited number of Harriers embarked with it.[23]

Argentine authorities estimated that the British task force should be entering South Atlantic waters about April 21. On that date, FAA Boeing 707s began flying reconnaissance missions from Buenos Aires to locate the British ships. The military versions of the venerable Boeing four-engine jets, with their wings placed at a midpoint on the long fuselage, were very similar in appearance to the civilian airliner version of the 707. The FAA 707s were configured to carry military cargo. They had no special sensors making them particularly suitable for their assigned mission. They had to depend on their commercial weather radars to locate the British task force. But the three 707s operated by FAA were the only Argentine military aircraft capable of very extended searches.[24]

FAA mission planners, hampered by a lack of specific intelligence, drew up a geometric search plan. They posited an imaginary triangle with a line between the Falkland Islands and South Georgia Island as its base. Ascension Island was the apex of the triangle. Reconnaissance flights were to head east from Buenos Aires to the western leg of the triangle. When they intersected the leg, the planes were to fly north toward Ascension Island. At a point predetermined by the 707s' range, the FAA aircraft were to turn east again and fly to the eastern leg of the triangle. On reaching the eastern leg, the 707s were to turn south and go no further than a point from which they could safely head west for their home base.[25]

FAA's first 707 mission took off from Buenos Aires at 3:00 a.m. local time on April 21.[26] The flight crew included four pilots, a navigator, two engineers, and a loadmaster. Argentine Navy experts aboard included a pilot advisor, an intelligence specialist, and a photographer. Most of the flight was made at 40,000 feet to conserve fuel. The 707 reached the western leg of the triangle four hours after takeoff and changed course to head northeast toward Ascension Island. The aircraft reached the predetermined point for turning east after another four hours. Here, remaining fuel made it possible to continue toward Ascension rather than turning. Almost immediately, the 707's radar picked up a single ship. Vicecomodoro Jorge Ricardini took the large jet down to 2,000 feet. From this altitude the Argentinean flight crew could identify the radar blip as a merchant vessel with no connection to the British task force. Ricardini then headed southeast to intersect the eastern leg of the triangle at the point from which he had to start for the 707's base. As the FAA plane climbed to 20,000 feet, its radar picked up images reflecting several ships to the southwest. Just before 9:00 a.m., the Argentineans visually identified the radar images as six British ships. These were the aircraft carriers *Hermes* and *Invincible* plus four escorts. They were 1,400 miles east northeast of Rio de Janeiro.[27]

The British ship's radar had detected the Boeing 707 when it was 150 miles away from the task force. A Sea Harrier launched from the *Hermes* when the FAA plane was first discovered. In response, the shadowing Argentinean aircraft turned away when eighty to 130

miles from the task force. The Harrier caught up with the FAA plane at 35,000 feet. Flying a close parallel course, the RN pilot and the Argentineans photographed each other. After a few minutes, the Sea Harrier broke away. British rules of engagement at this time did not permit the Sea Harrier to attack the Argentine aircraft. Five hours later, the 707 thus returned safely to Buenos Aires.[28] On April 22, FAA 707s again found the British task force. Sea Harriers intercepted a morning reconnaissance sixty miles from the carriers and an afternoon reconnaissance 120 miles from the carriers. In the latter instance, three Sea Harriers boxed in the Argentinean 707 to emphasize its vulnerability. The pattern repeated on April 23, but the afternoon reconnaissance aircraft passed not more than five miles north of the *Invincible*. On April 24 the 707s made their final close-in reconnaissance flight. On April 25 the British government modified its rules of engagement to allow attacks on aircraft or vessels shadowing their fleet. When the Argentineans learned of the change, the 707s remained out of Harrier range.[29]

Just after midnight on May 1, 1982, ships of the Royal Navy task force began to enter the "Total Exclusion Zone." The British government had defined this 200-nautical mile (230 statute mile) circle around the Falkland Islands on April 30. Argentine aircraft and ships approaching or within that area, they said, risked attack.[30]

The *Hermes* and *Invincible* formed the center of the British formation. The *Broadsword* and *Brilliant* steamed nearby to provide close-in anti-air defense with their Sea Wolf missiles, while the frigates *Alacrity*, *Arrow*, *Plymouth*, and *Yarmouth* with Sea Cat launchers took station farther out. The destroyers *Coventry*, *Glasgow*, and *Sheffield* sailed in the van. They kept twenty miles ahead of the *Hermes* and *Invincible* to provide outlying air defense with their Sea Dart missiles.[31]

The British carriers advanced to within one-hundred miles of Stanley, the Falklands' Argentine-occupied principal settlement. Then just before 8:00 a.m. on May 1, they launched a combat air patrol of six Harriers. Twelve other Harriers then took off on bombing missions. Nine went to attack the airfield at Stanley. Three struck at the air strip at Goose Green, a 400,000-acre sheep ranch southwest of Stanley. The raids were the initial thrusts of a two-week campaign designed to draw out and destroy Argentina's Air Force and Navy.[32]

Argentina had a small air force, naval air force, and navy with which to oppose the British task force. FAA strength included a bomber group, an attack group, four fighter groups, an air transport group, and an aerial photographic group. CANA units included two attack squadrons, two fighter-attack squadrons, an antisubmarine squadron, a reconnaissance squadron, two transport squadrons, and two helicopter squadrons. Fighter and attack plane strength of the Argentine forces included five Super Étendards, eleven Mirage IIIs, thirty-four Mirage Vs or Daggers (the latter built in Israel), and fifty-seven Skyhawk A-4s.[33]

The Daggers and Mirages had no provision for air-to-air refueling. The former could, when equipped with external fuel tanks, reach Falkland Sound and remain there for up to ten minutes. In an interceptor role they carried two Shafrir infra-red missiles and in an attack role could carry a pair of 1000-pound bombs. The Mirages, also limited in range, carried three air-to-air missiles. The speed of the Daggers and Mirages, theoretically Mach 2.0, decreased by more than half when the planes carried external fuel tanks. The Daggers lacked navigational radar and had to be led to the Falklands by "pathfinder" aircraft. When the pathfinders turned back the Dagger pilots had to rely on map, compass, air speed indicator, and stop watch.[34]

FAA and CANA A-4s were capable of aerial refueling, but the Argentine Air Force had only three KC-130 tankers in its inventory. Although they could just reach East Falkland

Island with a standard load of three 500 or two 1,000 bombs, the Skyhawks needed to refuel en route to allow for maneuvers in the battle area. The A-4s, with recently installed Omega navigational systems, were all weather aircraft.[35]

An Argentine Air Force unit, Argentine Group 2, Air Warning and Control, provided an important adjunct to the squadrons. The group arrived at Port Stanley with its Westinghouse AN/TPS-43 radar on April 2 and had it operational four days later. The radar provided coverage to a distance of 240 miles. It was integrated with an Argentine air defense system that included seventy automatic anti-aircraft guns. It proved also, by tracking the activity of British carrier aircraft, to be able to provide rough locational information on the Royal Navy's carriers.[36]

The CANA pilots had trained for anti-shipping strikes, but the FAA pilots were completely unfamiliar with maritime operations. Most came from inland bases. The closest mainland base to the Falklands was 380 miles distant and the furthest 517 miles away. Navy fliers had to instruct them in ship recognition and low-level, over-water strike tactics. As the Royal Navy's historian of the conflict later wrote, "The Air Force pilots had to learn to fly at less than 30 feet, in formation, and to stay out of one another's way while pressing an attack on a target which could move its own length while they were covering the last mile, probably under fire."[37]

Argentine Navy (*Armada Argentina*) vessels available to oppose the British included one aircraft carrier, one cruiser, six destroyers, three corvettes, one patrol craft, one amphibious landing ship, two submarines, and a number of polar vessels and transports used to carry cargo and passengers and to serve as hospital ships.[38]

Argentine Air Force land-based aircraft were the first to respond to the closing British task force. Briefers instructed the Argentine pilots to spend the limited amount of time they would have in the battle area attacking British warships. The FAA sorties took off from Rio Gallegos, on the mainland 495 miles west of the Falklands. This first mission on May 1 included four Skyhawk A-4Bs. Each small, agile single-seat light attack jet carried two 500-pound bombs. Four delta-winged Mirage IIIE As, each armed with two Matra Magic air-to-air missiles and two 30-mm cannon, provided escort. Four Daggers, each armed with two Shafrir air-to-air missiles and two 30-mm cannon, launched from Rio Grande, a mainland base 440 miles southwest of the Falklands. Their purpose was to supplement the raid's fighter strength.[39]

FAA air controllers at Stanley began to direct the Argentine aircraft as they approached the Falklands. The controllers vectored the Skyhawks and their escorts toward targets northeast of the islands. These turned out to be radar reflections of two airborne Sea Harriers. One Mirage fired a missile at the British aircraft but missed by fifty feet. The British pilot mistook the Matra for an Exocet and reported it as such. This caused the British ships to turn their sterns to the threat and fire off clouds of chaff. Then this first Argentinean bombing mission, with its fighter escorts nearly out of fuel, returned to its mainland bases.[40]

Afternoon sorties by land-based Argentinean aircraft began with three Daggers flying from San Julian, a mainland base 485 miles northeast of the Falklands. The three aircraft set off in early afternoon. They were to raid the East Falkland Island coast about fifteen miles north of Stanley. When they reached their intended target they found no British forces. The Daggers continued south to Stanley. There, at 3:00 p.m., they found the destroyer *Glamorgan* and the Type 21 frigates *Alacrity* and *Arrow* bombarding Argentinean forces ashore. As the FAA Daggers sped toward the ships at an altitude of 900 feet, the Argentine flight commander assigned each aircraft to attack a separate vessel. The *Glamorgan* and *Alacrity* suffered near-misses by Argentine bombs and 30-mm cannon fire. An Argentine pilot

later described the bombing technique to a *London Times* reporter: "You dive straight toward the ship, release the bomb at 150 meters [409 feet], then keep traveling straight, as low as possible -- preferably clipping the mast, where the missiles can't get you." The *Glamorgan* had some of its plates dented by bomb blast. Cannon fire from the fighter-bombers hit both ships but caused no casualties. Bombs also narrowly missed the *Arrow*, and one British seaman was slightly wounded by a bomb splinter. The surprised ships were hesitant in responding to the raid. The *Glamorgan* launched one Sea Cat missile, but it found no target. The *Arrow* fired got off a few 4.5-inch and 20-mm rounds, but hit nothing. The air attack did not seriously damage any of the British ships. It did make them break off their bombardment of the Argentinean positions at Stanley.[41]

The FAA next sent out six Skyhawk raids, each flown by four aircraft. They launched from both San Julian and from Rio Gallegos. Only one flight, its strength down to three aircraft because of mechanical trouble, found a target. This turned out to the Argentine freighter *Formosa*. The cargo vessel was off the south coast of East Falkland Island as it returned from carrying military supplies to Stanley. The Argentine pilots mistook it for a British tanker. When they attacked, one of their bombs bounced off the freighter. Another bomb penetrated the ship but did not explode. Strafing that followed caused additional damage to the *Formosa*.[42]

As the Skyhawks from San Julian and Rio Gallegos searched for British ships to attack, six FAA Canberra bombers took off from Trelew, a mainland base 670 miles northwest of the Falklands, in search of similar targets. The obsolete twin-engine jet bombers found no Royal Navy ships to attack. They did encounter two Sea Harriers, one of which downed a Canberra with a Sidewinder missile. The Sidewinder penetrated the jet bomber at its wing root. A few seconds later the FAA plane exploded.[43]

The FAA also launched a series of two-aircraft fighter missions intended to provide high altitude cover for its attack aircraft. This led to air-to-air combats. In one instance north of the Falklands, two Mirages met two Sea Harriers. The British pilots hit both FAA jets with AIM-9L missiles. One Mirage pilot ejected as his plane went into the sea north of Pebble Island, at the Northwestern tip of West Falkland Island. As the second Mirage pilot attempted to land his damaged aircraft at Stanley, Argentine machine gunners shot him down. In a second encounter over the south coast of East Falkland Island, Sea Harriers used missiles to destroy a Dagger.[44]

While Argentina's Air Force attacked, its Navy ships and aircraft threatened the British task force but the two service branches did not coordinate their efforts. As the fighting began the Argentine Navy had four task groups at sea and four Super Étendards ashore at the Rio Grande airfield.[45]

On May 1 the opposing fleets located each other, but launched no air strikes and fought no ship-to-ship actions. On May 2 a planned strike by Skyhawks from the carrier *25 de Mayo* did not launch. Some accounts attribute cancellation of the mission to wind conditions. Others indicate that it was terminated when a twin-engine S-2E Tracker antisubmarine plane shadowing the British fleet lost contact with the enemy carriers. A Super Étendard strike from Rio Grande aborted because of refueling difficulties. At about 4:00 p.m., the day's first naval combat took place when the British submarine *Conqueror* torpedoed the Argentine cruiser *General Belgrano*. The World War II-vintage ship was steaming in company with two destroyers about 240 miles southwest of the British task force.[46]

Loss of the Argentine Navy's largest surface combatant with over 300 crew members profoundly influenced subsequent employment of Argentine naval units during the Falklands

War. Thereafter, Argentina's surface ships, including the Argentine Navy's only aircraft carrier, remained in shallow waters off the mainland. This put them where they were unlikely to be attacked by Britain's large nuclear-powered submarines.[47] As a result, Argentine naval aircraft flying against the British fleet had to launch from mainland bases. Striking targets near the limits of its aircraft's combat range limited the tactics CANA could employ. This degraded the effectiveness of the swept-wing Super Étendards. These planes were the most dangerous anti-shipping weapons in the Argentine inventory. The Super Étendards were new to CANA. The Argentines had accepted the first one on November 17, 1981. Although eighteen were on order, only five had been delivered when the French government suspended deliveries and technical assistance because of the Falklands War. CANA also had only five air-to-surface AM.39 Exocet missiles on hand. The fifteen-foot-long two-stage solid-fuel rockets were designed to penetrate a ship's hull before exploding. Their range varied from twenty-five to forty miles depending on launch techniques employed. The French embargoed a second batch of Exocets due to be delivered at the end of April. They did not withdraw a team of technicians who remained in Argentina to help CANA its missile launchers and newly-acquired missiles. At the same time, France sent some of its Mirage fighters to England so that British Harrier pilots could practice air-to-air combat with them. By the time hostilities began, ten Argentine naval aviators each had about eighty hours flying time in Super Étendards. CANA pilots were self-trained to use the Super Étendard/Exocet weapons system in attacks on ships. Consultations with the officers of *Armada* Type 42 destroyers gave the pilots an idea of the characteristics and capabilities of similar British ships. They practiced long over-water flights and aerial refueling in conditions of radio and other electronic emissions silence. No Exocets could be spared for a live fire exercise, but the Super Étendard squadron declared itself operationally ready in mid-April 1982.[48]

The first Super Étendard attack on the British ships clustered around the Falklands came on May 4. Strike preparations began early on the morning of that day after a CANA Neptune made radar contact with British ships south of the Falklands. The twin-engine Neptune was one of four SP-2H models transferred from the U.S. Navy to Argentina in 1977. Only two were airworthy in 1982. Both had newly installed Very Low Frequency Omega navigational equipment, but their obsolete search radars could only detect ships within a one-hundred-mile range. On May 4 one of Neptunes with a crew of twelve was patrolling in advance of three FAA C-130s that were to fly to Stanley from the mainland. The four-engine turbo-prop transports provided vital support for Argentine forces in the Falklands. By chance the Neptune was southwest of West Falkland Island as Sea Harriers attacked Stanley airport. This caused the C-130 mission to be canceled. But the Neptune loitered in the area. Its radar soon identified four warships about eighty-five miles south of Stanley steaming eastward away from the Falklands. The patrol plane maintained intermittent contact with the ships for three hours. Its own Radar Warning Receiver (RWR) indicated that British radars had scanned it. The Neptune simulated a search pattern designed to mislead British radar operators into thinking it was searching for survivors of the *General Belgrano*. Periodically the Argentine pilot would take his plane back up to an altitude from which it could take fresh bearings on radar emissions emanating from the British ships.[49]

Two hours after the Neptune had first reported contact with the British vessels, two Super Étendards armed with Exocets took off from Rio Grande at 9:45 a.m. Forty minutes later the Neptune climbed to 3,500 feet. Then it transmitted a final contact report that gave positions for the two British ships most suitable to be attacked. This was the last time any of *CANA's* Neptunes participated in the Falklands War. Argentine Navy authorities decided

that the aged aircraft were too unreliable and vulnerable for further operations. Pilots ferried the Neptunes back to Buenos Aires for storage on May 15. This decision further degraded Argentina's already weak aerial reconnaissance capability. CANA compensated to some extent for the Neptunes' absence by exploiting radar intelligence. After May 15, naval technicians at radar stations on the Falklands plotted minute-by-minute all aircraft radar tracks originating and disappearing at sea. This provided the basis for informed estimates as to the location of the British carriers.[50]

Two-hundred and sixty miles from Rio Grande, the CANA Super Étendards refueled from one of the Argentine Air Force's three KC-130 Hercules tankers. Onboard radar alerted pilots Capitan de Corbeta Augusto Bedacarratz and Teniente de Fragata Armando Mayora that British search radar was active when the attacking aircraft were 130 miles from their targets. They quickly took their aircraft to a wave-top altitude through a 300-foot ceiling and sped toward the retiring British from a position south of the Falklands. At fifty miles out the Argentineans popped up to 2,000 feet for an unsuccessful three-second radar scan before again hugging the sea. A similar maneuver at thirty miles out revealed two targets, a large one to their right and a smaller one to their left. Bedacarratz, the mission commander, decided that both aircraft should attack the larger target. The Super Étendards made their 500-knot attack through rain squalls at an altitude of 120 feet . Both pilots launched their missiles at 1104 when twenty miles from the targeted ship. They immediately turned away and successfully evaded two Sea Harriers. These interceptors had taken off from the *Invincible* in response to the Argentineans' radar "pop-up" when fifty miles out.[51]

The $200,000 Exocet's target proved to be the $50,000,000 destroyer *Sheffield*. The warship's own radar and electronic capabilities might have detected either the Super Étendards or emissions from the Exocets' radar guidance systems in time for it to begin evasive action. In the event, the destroyer was using its satellite communications system. This obscured the radar frequencies of the Argentine aircraft and missiles. The missiles themselves skimmed the ocean's surface and flew too low to be picked up by the *Sheffield's* radars. A radar operator on the *Glasgow*, the westward ship of the British formation, detected emissions from a Super Étendard radar about the time the missiles were launched. The commanding officer of the *Glasgow* had banned daytime use of his ship's satellite communication system because it could interfere with detection of the Super Étendard "Handbrake" radar. The *Glasgow* radar operator's alert caused his own ship to fire chaff and go to action stations. The *Glasgow* broadcast a warning to the other Royal Navy ships. But it was too late. Only two minutes elapsed from the time the Exocets were launched until one struck the *Sheffield*. Those aboard the destroyer saw the missile only a few second before it struck. The second Exocet failed to find a target and fell into the sea when it ran out of fuel.[52]

The Exocet that found its target entered the *Sheffield's* starboard side midships, about six feet above the waterline. Although its warhead did not explode, the 364-pound missile was traveling at a speed of nearly 700 miles-per-hour. It tore a four-foot-high hole fifteen-feet-across in the destroyer's hull, then penetrated deep into the ship before disintegrating. The missile's remaining rocket fuel burst into flames. Blast damage from this explosion extended as far as the ship's bridge. The impact and fire left the ship unable to move under its own power, unable to pump water to fight fires, and unable to operate computers necessary to fire its weapons. Some crew members were killed and injured when the missile struck. Many subsequently died or suffered burn and smoke inhalation injuries while trying to restore the ship's systems and fighting fires. Four and one-half hours after the Exocet struck, the *Sheffield's* captain gave the order to abandon ship. Captain James Salt later recalled: "in fifteen to twenty seconds the whole working area of the ship filled with black, acrid, pungent

smoke, mainly from the cable runs and paint." Most of his surviving crew had been forced to the open upper decks, darkness approached, and raging fires nearing the Sea Dart magazine. An explosion there would endanger those remaining aboard and perhaps other ships assisting in rescue and fire fighting. *Sheffield* casualties included twenty dead and twenty-four injured out of a total crew of 290. The *Sheffield* sank while under tow six days after the attack.[53]

The Super Étendard attack confirmed to the British task force the danger from air-to-surface missiles. It highlighted the ships' extra vulnerability without the protection that could be provided by airborne early warning platforms. The Exocet threat influenced the subsequent deployment of British ships in the battle for the Falklands. It is possible to speculate that if the Argentine pilots had pushed farther into the British fleet they might have targeted one of the two Royal Navy aircraft carriers. But it is also possible that the Britons' air defense system might have destroyed one or both Argentine planes before they could have launched their missiles at a carrier.[54]

On May 9, eighteen FAA Skyhawks took off from San Julian to attack the destroyer *Conventry* and frigate *Broadsword*. The ships were bombarding shore targets near Stanley. They also were attempting to lure Argentine aircraft into a Sea Dart and Sea Wolf missile trap. Bad weather prevented the Skyhawks from making their attack. Two aircraft and pilots were lost in operational accidents incidental to the mission to attack the British ships.[55]

Another incident occurred later on May 9 as the two Royal Navy ships steamed ten miles off Stanley. When their radars picked up five aircraft approaching the Falklands from the northwest, the *Coventry* fired three Sea Darts at the targets when they were forty-miles away. Subsequent intercepted radio chatter between pilots convinced the British that the Sea Darts had destroyed two of four Skyhawks escorting a Hercules flying into Stanley. It was about this time, however, that two Skyhawks flew into a cliff in bad weather. Three hours later a Sea Dart from the *Coventry* destroyed an Argentinean helicopter on its way to help the *Narwhal*. Royal Marines had earlier captured this small *Armada* patrol trawler by descending on it from helicopters.[56]

The British Navy tried again on May 12 to lure Argentine aircraft into a missile trap. The destroyers *Glasgow* and *Brillant* closed with Stanley to shell shore positions. When Argentinean troops at Stanley requested help, two flights of four FAA Skyhawks each launched from Rio Gallegos. The first flight of Skyhawks reached their targets southeast of Stanley in mid-afternoon. They arrived as air cover for the Royal Navy ships was changing and no Sea Harriers were present. The *Glasgow's* fire control radars did not acquire the Argentine planes until they were too close for *Glasgow's* Sea Darts to be used. Sea Wolfs from the *Brillant* brought down two of the Skyhawks when they were a mile away from the ship. A third Skyhawk crashed after running into debris from the first two aircraft. Its engine passed over the *Brillant's* flight deck. All three pilots died. Bombs from the fourth Skyhawk in the first flight hit the water and skipped over the *Brillant's* stern as the aircraft passed over the ship unharmed. Both aircraft and bombs were so close that the British sailors could see the markings on them.[57]

The second flight of Skyhawks fared better. They approached the British ships twenty minutes after the first flight, at a low altitude from seaward and out of the sun. Three attacked the *Glasgow*, which was the leading ship. Only one Skyhawk tried to bomb the *Brillant*. The Argentineans pressed their attack closely. The Skyhawks weaved to confuse the Royal Navy sailors manning their antiaircraft guns. The weaving also confounded the Sea Wolf missile system, which trained its launchers to their fore-and-aft position. One bomb which hit the *Glasgow* failed to explode because it was released from too low an altitude. The

unexploded bomb penetrated to the engine room and went out the other side of the ship. The entry and exit holes in the destroyer's hull, each about three feet in diameter, were quickly repaired. But electrical system damage caused as the bomb passed through the ship necessitated *Glasgow's* return to England for dock yard work. The *Glasgow's* Sea Dart system again had not locked on to the attacking planes in time. The *Brillant's* Sea Wolf system in this instance identified the group of approaching aircraft as "non-missiles" and refused to fire. An exchange of radio messages with the Sea Wolf manufacturer allowed this fault to be quickly rectified by an adjustment to the system's fire control computer. Although the FAA planes suffered no damage from British missiles or cannon in this engagement, Argentinean gunners on East Falkland Island shot down one of the Skyhawks as it flew back toward Rio Gallegos.[58]

British efforts to whittle down Argentine strength with air raids, missile traps, and shore bombardment ended on the night of May 20-21. British troops began the ground phase of the campaign to recapture the Falklands by landing on East Falkland Island. This exposed the British ships involved to light attack aircraft that the Argentineans had stationed on the Falklands themselves. These were Pucaras of the FAA and Aermacchi MB-339s of the CANA. The former were Argentine-built close support/counterinsurgency turboprop single-seaters. The MB-339s were light attack versions of a jet trainer.

The first Aermacchi strike happened coincidentally. A single plane on a reconnaissance mission from Stanley sighted the frigate *Argonaut* in Falkland Sound. Lieutenant Gullermo Crippa, the Argentinean pilot, flew through missile and antiaircraft fire to attack with cannon and rockets. His low approach from landward brought him too close to be engaged by the *Argonaut's* Sea Cat missiles. The ship did respond with Bofors and small arms. Crippa damaged the frigate's radar aerial and superstructure. The Aermacchi's fire also wounded three sailors, one seriously. After making his run, Crippa flew back over the sound through intense fire to count the assembled British invasion fleet. The British were going ashore at San Carlos Water, a four-mile-long harbor on the west coast of East Falkland Island about fifty miles from Stanley.[59]

A series of Argentine air missions against the invasion fleet followed Crippa's lone raid. The Argentinean Air Force had an estimated thirty-nine Skyhawks and twenty-three Daggers available for daylight attacks on the British invasion force. The six remaining Canberras were too vulnerable for anything but night operations. In addition to the *FAA's* strength, eight CANA Skyhawks disembarked from the *25 de Mayo* had flown to Rio Grande and were available for anti-shipping strikes. The CANA Super Étendard unit at Rio Grande still had three Exocets unexpended. But the high-speed jets and their missiles were more suitable for attacks over the open ocean than in the confines of Falkland Sound and San Carlos Water.[60]

Contesting the Invasion Fleet

In midmorning on May 21, FAA jets flying from the mainland made the first of a series of aerial attacks on the British fleet. Most of the raids focused on Royal Navy warships operating in Falkland Sound rather than on ships engaged in landing troops. The Argentine pilots had to fight their way through the ships' anti-air defenses and Sea Harrier combat air patrols. They also faced a new threat from shoulder and crew-served surface-to-air missiles (SAMs) manned by British ground troops now ashore at the landing sites. The troops had what seemed an unlimited supply of visually-sighted, shoulder-launched Blowpipe missiles that radio commands could guide once they were in the air. They also had several crew-

served Rapier missile systems that included a surveillance radar, tracking radar and optical tracking system.[61]

An Argentine Air Force formation of eight Daggers and six Skyhawks carried out the first raid from the mainland on the British ships which were involved in the landings at San Carlos. The Daggers, each armed with two 30-mm cannon and two 500-pound iron bombs, led the way. FAA mission planners intended a series of strikes. They were to take place within a limited time frame to confuse the Royal Navy's anti-air defense system. The first two Daggers arrived over Falkland Sound at 1025. They bombed and strafed the destroyer *Antrim* in a line astern attack. Cannon fire riddled the ship's helicopter, blinded a chief petty officer, and less seriously wounded seven other crew members.[62] Six additional Daggers arrived at Falkland Sound within a few minutes. One attacked the frigate *Broadsword*, two attacked the frigate *Argonaut*, and three attacked the destroyer *Antrim*. The *Broadsword* received twenty-nine rounds of 30-mm cannon fire, which wounded fourteen men and damaged two helicopters. The *Argonaut* also escaped relatively unharmed and brought down one of the Daggers with a surface-to-air missile. The *Antrim* suffered more grievously. One bomb plunged through a flare locker and the ship's Sea Slug magazine and came to rest in a head without bursting. A second bomb bounced off the forward part of the ship but detonated only when it hit the water. The presence of a large unexploded bomb below decks forced the ship to retire to San Carlos Water. There repairs could be made and the bomb disarmed. The rolling hills and mountains on either side of the long, narrow fiord provided some protection from air attack.[63]

The six Skyhawks involved in the first raid were each armed with cannon and a single 1,000-pound bomb. They approached the British ships in pairs, line abreast, running in toward them over West Falkland Island. This caused the ships to briefly lose radar contact with the Skyhawks until they were spotted visually. The Argentine aviators chose the frigate *Argonaut* at the mouth of San Carlos anchorage as their target. The six planes dropped all of their bombs. Two went into the ship, but neither exploded. One, which landed in the vessel's Sea Cat missile magazine, caused two missiles and some antiaircraft ammunition to explode. The other plunged into the boiler room. Two seamen died during the bombing and strafing. The damage and defusing to be done effectively put the frigate out of action. All of the Skyhawks involved returned safely to their mainland base at Rio Gallegos.[64]

Seven more Skyhawks from the mainland attacked the British naval formation at about 1:00 p.m. One flight of four of the FAA jets, each armed with a single bomb, took off from Rio Gallegos. Only three continued when mechanical difficulties forced one to return to base. As the aircraft approached West Falkland Island, more mechanical difficulties resulted in still another Skyhawk aborting. The two remaining planes then made an abortive attack on the Argentine freighter *Rio Carcarana*, which had been abandoned close to West Falkland Island several days earlier. By the time the pilots realized their mistake, one of the Skyhawks had dropped its bomb. A single FAA aircraft continued the raid. This Skyhawk targeted the frigate *Ardent*, but achieved no hits. The pilot flew home, unaware that he had narrowly missed being intercepted by two Sea Harriers.[65]

Four FAA Skyhawks from the mainland followed-up the preceding attack. They encountered the Sea Harriers that had been chasing the plane that bombed the *Ardent*. Two of the four FAA planes quickly fell victim to air-to-air missiles from the British jump jets. Neither Argentine pilot survived. Then a Sea Harrier damaged one of the two remaining Skyhawks with cannon fire. Both surviving Argentine fighter-bombers abandoned their mission.[66]

A raid by eleven FAA Daggers and six CANA Skyhawks constituted the last Argentinean aerial attack of the day. They arrived in waves at the scene of action. Each Skyhawk carried four 500-pound bombs under its fuselage. The final aircraft in the strike package took off from Rio Grande at 3:45 p.m. Rather than depend on aerial refueling, the planes used drop fuel tanks mounted under their wings. The naval jets' intended target was a frigate spotted south of the main landing force as a picket ship. This turned out to be *Ardent*. The fighter-bombers crossed from the mainland to the Falklands at 30,000 feet. The first three-plane flight of the mission descended to wave-top height to attack the frigate from astern at about 4:10 p.m. Two bombs from the lead Skyhawk struck the British warship. The first bomb went into the ship's hangar and detonated. This caused some of the ship's torpedoes to explode in turn. It also blew the *Ardent's* Sea Cat launcher, mounted on top of the hangar, onto the helicopter pad. The second bomb crashed into the frigate's after auxiliary machinery room but did not explode. Three Royal Navy officers and one sailor died as a result of the bombs. Six bombs from the other two Skyhawks participating in the attack missed the frigate, although one bounced off the water and between the ship's masts. Antiaircraft fire from the *Ardent* badly damaged the second Skyhawk in line. As the three Argentinean jets retired to the south, they encountered two Sea Harriers. A Sidewinder missile from one Sea Harrier destroyed the Skyhawk that had successfully bombed the *Ardent*, although the pilot ejected safely. This Sea Harrier also put cannon fire into the Argentine plane earlier damaged by the *Ardent's* antiaircraft weapons. The Skyhawk remained flyable. When it attempted to make an emergency landing at Stanley, ground personnel advised the pilot that part of his landing gear had been shot away. The Argentine aviator ejected safely and was rescued from the sea by a helicopter, but his plane continued to fly. Argentinean gunners finally shot it down to preclude it crashing in a populated area. The third Skyhawk disintegrated when struck by a missile from the second Sea Harrier.[67]

The three Skyhawks in the second flight of the six-plane Argentinean mission made their attack on the *Ardent* about fifteen minutes after the first bombing. Antiaircraft fire damaged two of the three jets, but all returned safely to Rio Grande.[68]

Six of the eleven FAA Daggers, each of which carried a single 1,000-pound bomb, took off from San Julian between 1:45 p.m. and 1:55 p.m. The Daggers flew in two separated flights of three aircraft each. They approached the British landing force and its escorts by flying low across West Falkland Island. Two of the three Daggers attacked the frigate *Brillant*. Their bombs missed. Their cannon fire did sever wiring for the frigate's Sea Wolf missile system. The 30-mm rounds also made the ship's sonar inoperable and injured three sailors. The third Dagger in this first flight did little damage in a bombing and strafing run on a nearby unidentified British warship. Then the flight climbed to 35,000 feet and returned to San Julian.[69]

The second flight of Daggers from San Julian ran into trouble. The *Brilliant's* radar picked them up as they descended over West Falkland Island. A British fighter director assigned two Sea Harriers flying combat air patrol to intercept the Daggers. A brief aerial combat ended in destruction of all three Argentinean aircraft just before 4:00 p.m., but their pilots successfully ejected.[70]

Five additional Daggers had launched from Rio Grande at 2:30 p.m. One of these jets aborted because of mechanical problems. Sea Harriers intercepted the four remaining jets as they flew low across West Falkland Island toward San Carlos. Three of the Daggers escaped unscathed. A Sidewinder missile destroyed the fourth. The surviving Rio Grande Daggers descended in a line astern formation below low-hanging clouds into a ravine to reach West Falkland Island's east coast. As the FAA pilots left the island's shoreline, they found the

frigate *Ardent* in front of them at about 3:40 p.m. The Daggers attacked from astern. A bomb from the first Dagger skipped off the water into the after part of the ship but did not explode. The second Dagger's bomb detonated on impact. It destroyed the ship's helicopter and hangar. It also rearranged the wreckage of the Sea Cat missile launcher, which had earlier been demolished by bombs from CANA Skyhawks. The third Dagger dropped its bomb without effect before all three of the Rio Grande aircraft departed the scene to safely return home.[71]

The FAA and CANA squadrons which had been involved in the Falklands raids on May 21 used the following day to recuperate from their intensive efforts and heavy losses. All units involved had dispatched a total of forty-five aircraft to oppose the first day of the British landings. Of the forty-five, thirty-six had reached the Falklands. Twenty-six making it through had attacked British warships. They left one frigate sinking, two out of action, and two damaged. British air defenses destroyed nine (five Daggers and four Skyhawks) of the 36 aircraft reaching the Falklands. Friendly antiaircraft fire destroyed another Skyhawk, severely damaged by the British, as it tried to land at Stanley. The 28 percent loss rate was higher than expected.[72]

Two of the *FAA's* 707s narrowly missed disaster on the next day, May 22. One, making a reconnaissance flight to the north of Falkland Sound around three o'clock in the morning, approached to within twenty-five miles of the *Coventry*. Although the destroyer acquired the jet with its Sea Dart radars, the failure of a flash door prevented missile loading and the plane escaped. The second 707, flying 1,800 miles to the northeast of the Falklands, spotted the cruiser *Bristol* and its escorts on patrol. The frigate *Cardiff* dropped back from the formation while ships in the task group altered their positions to cover its leaving. When the FAA aircraft came within extreme range the *Cardiff* fired a Sea Dart salvo. One missile exploded close to the 707, which immediately took evasive action.[73]

It was only on the evening of May 22 that two CANA Skyhawks from the mainland reached San Carlos. Their bombs caused no damage and they returned to the mainland safely.[74] FAA squadrons on the mainland made the majority of the subsequent attacks on the British invasion fleet. They continued to approach the landing beaches from over West Falkland Island.

On May 23 the FAA sent out the Argentineans' most effective attack missions to date. Four Skyhawks of *Grupo 5* sortied from Rio Gallegos in mid-afternoon. They approached San Carlos Water from the southwest at 4:50 p.m. The Skyhawks passed north of the mouth of the bay. Then they turned to put the Verdes Mountains lining the north shore of the harbor behind them as they made their attack. The *Antelope* was the first ship they encountered. A run by the two leading aircraft put a 1,000-pound into the after part of the frigate. The bomb hit the water off the ship's starboard side, plunged through the hull just below the bridge, and came to rest in a compartment above the engine rooms. One of the aircraft exploded, possibly as a result of fire from the *Antelope's* 20-mm Oerlikon or perhaps because it struck the mast just forward of the ship's funnel. It was also the target of other weapons on the ship and on the adjacent destroyer *Broadsword*, and even a British Army Rapier post ashore. The surviving Skyhawk turned quickly and put a second bomb into the frigate's port side. This projectile also failed to explode, but passed through the petty officers' mess before lodging in a cabin. During its passage the bomb killed one crew member and injured two others. The intense air defense discouraged the second pair of Skyhawks from pressing home their attack. When a team of two Royal Engineers and two of the ship's crew later attempted to defuse the first unexploded bomb, it detonated. One member of the team died, one lost an arm, and two were less seriously injured. The resulting fires caused the ship's Sea Cat magazines to

explode just after the crew abandoned ship. About halfway through the night the second bomb exploded. The blast broke the *Antelope* in two and it quickly sank.[75]

The events of May 23 also temporarily ended participation of *CANA's* 3rd Naval Attack and Fighter Squadron in the battle for the Falklands. This unit, already severely hurt by missions on May 21, sent its four operational Skyhawks from Rio Grande to San Carlos late in the day on the twenty-third. One aborted because of fuel transfer problems after aerial refueling 200 miles east of Rio Grande. The remaining jets arrived over Falkland Sound from the west fifteen minutes after the *Grupo 5* mission had bombed the *Antelope*. The naval jets attacked three separate enemy ships to no effect and left the battle area unharmed. As one attempted to land at Rio Grande with four 500-bombs still in place, it ran off the runway. The pilot ejected and was killed when his parachute did not deploy fully. This left the squadron with only two operational aircraft and it was withdrawn to refit.[76]

Aerial action on May 24 began when four FAA *Grupo 6* Daggers took off late in the morning from San Julian, for a raid on the enemy naval force at San Carlos. Two Sea Harriers vectored to the Daggers by a fighter-controller on the destroyer *Broadsword* intercepted the fighter-bombers at 12:15 p.m. British air-to-air missiles destroyed three of the Argentine planes even before their pilots sighted the Royal Navy ships. The fourth Dagger retired at high speed. While this combat took place, four more *Grupo 6* Daggers from Rio Grande approached San Carlos Water from the south. They flew low up the harbor in line abreast formation. The pilots later reported attacking one large ship and in turn receiving hits from gun fire. Their attack imposed no significant damage. All four aircraft returned safely to Rio Grande. Four *Grupo 4* Skyhawks, also from San Julian, reached the scene of the landings at midday. They attacked the assembled ships in line-astern formation but caused no damage. Antiaircraft fire downed one of the fighter-bombers. Ground fire severely damaged another, A Sea Dart Missile from the destroyer *Coventry* blew apart a third Skyhawk as it started back toward the mainland.[77] Five *Grupo 5* Skyhawks also flying from Rio Grande attacked the British landing force ships at 1:00 p.m. The planes stirred up a hornets' net of air defense weapons, including shoulder-launched surface-to-air missiles fired from ships. Neither bombs nor missiles scored hits, although gun fire struck three of the Argentine aircraft. In a subsequent raid at 2:15 p.m., two bombs from a flight of three *Grupo 4* Skyhawks from San Julian went into the landing ships *Sir Galahad* and *Sir Lancelot*. Neither bomb exploded. All three aircraft were damaged by antiaircraft fire. One eventually crashed into the sea, killing the pilot.[78]

In an initial gambit on May 25, the FAA tried to eliminate the destroyers *Broadsword* and *Coventry*. These ships, on picket duty about fifteen miles north of Pebble Island between the mainland and San Carlos Water, were using their radars to detect incoming Argentine air raids. Early warning radar allowed Sea Harriers to intercept approaching aircraft and shipboard and land-based antiaircraft weapons to be at the ready.

Grupo 5's first mission on Argentina's national day May 25(which commemorates an 1810 uprising against the Spanish) targeted the two ships. The destroyers had advance warning of the raid from their own radars and from intercepted radio traffic. A Sea Dart missile from the *Coventry* downed the flight commander's Skyhawk at 10:30 a.m. The three surviving planes aborted. Four more *Grupo 5* Skyhawks took off from Rio Gallegos about 3:00 p.m. for another assault on the picket vessels. The ships' relative nearness to the mainland made it possible for each Skyhawk to carry three 1,000-pound bombs. As was the case earlier in the day, an FAA C-130 provided reconnaissance in advance of the fighter-bombers. As the Argentine planes approached the two destroyers, Sea Harriers had the A-4s almost within Sidewinder range when fighter control sent the British planes away. Instead, the ships

depended on the *Broadsword's* Sea Wolf surface-to-air missile system, which had locked on to two of the FAA planes. The system, however, lost contact with the Skyhawks as they came closer. Only gunfire interfered with the Argentines' final attack. Even so, only one bomb struck the *Broadsword*. It skipped into the destroyer's starboard side, and crashed up through the ship's helicopter pad. The bomb demolished the nose of the destroyer's helicopter before falling into the sea off the ship's port side but did not explode. The bomb, which had a new impact-sensitive fuze, should have detonated but struck nothing substantial as it plunged across the ship.

The pilots of the other two FAA Skyhawks on the mission struck at the *Coventry* as their colleagues pulled away from the *Broadsword*. Once again, the Sea Harriers were waved off and the ship's defense rested on surface-to-air missiles. As they pressed forward with a wave-top attack at 4:21 p.m., the Argentines successfully evaded a Sea Dart missile fired by the *Coventry*. Then the *Coventry* began evasive maneuvers. This brought the ship between the *Broadsword* and the attacking aircraft. As a result, the latter destroyer's Sea Wolf missile system lost contact with the Argentine planes. The bombs on one of the Skyhawks refused to release, but three 1,000-pounders from the other planes pierced the ship's port side. All the bombs exploded, one destroying the ship's computer room. Less than thirty minutes after the attack, the *Conventry's* crew abandoned ship. Within sixty minutes of attack the destroyer capsized.[79]

Five days after Argentine aircraft sank the *Coventry*, a CANA Super Étendard sent an Exocet missile into the *Atlantic Conveyor*. The Cunard roll-on, roll-off vessel had been with the task force for six days after bringing a cargo of Harriers, helicopters, and other military materiel from Britain. Fourteen Harriers on the ship had been flown off to the *Hermes* and *Invincible*, but the Argentineans' constant air attacks had prevented offloading of all but two of the helicopters and the rest of the *Conveyor's* cargo.[80]

When the *Hermes* and *Invincible* and their escorts moved closer to San Carlos on May 30 to support the landing ships, two CANA Super Étendards, each carrying an Exocet air-to-surface missile, took off from Rio Grande at 2:28 p.m. After aerial refueling they approached Falkland Sound from the northeast about 5:00 p.m. The two aircraft descended to thirty feet above the waves when they were about 150 miles from the British task force. They were in a line abreast formation with about 200 yards between the two planes. Their first radar sweep produced two large images and one smaller one. These were the *Atlantic Conveyor* and the *Hermes*. The ships were about two miles apart. Eight miles beyond lay the *Invincible*. The pilots selected the largest radar image as their target. This was the cargo ship, which had containers stacked three-high along its deck edges to protect aircraft being transported from saltwater damage. The CANA pilots launched their missiles at a range of thirty-one miles at 5:32 p.m. Despite multiple Sea Dart firings and chaff launchings, one of the Exocets struck the port side of the *Atlantic Conveyor* at 5:36 p.m. The other failed to find a target and disappeared. The *Hermes* was only two nautical miles away and the *Invincible* ten miles away. After the action it was not clear if the missile which struck home had exploded. Another possibility was that the Exocet's unspent fuel had ignited when it came to rest deep inside the ship. In any case, the resulting fires proved uncontrollable. They were soon near 200 bombs in the ship's cargo. Ninety minutes after the attack the crew abandoned ship. The missile killed three sailors as it penetrated the ship. Nine others died while fire fighting or in escaping the burning vessel. Although the fires were eventually suppressed, the *Atlantic Conveyor* sank three days after the attack while being towed.[81]

An FAA strike intended to follow immediately the CANA Exocet mission ran into surface-to-air missile crews on the alert. Within minutes of the Exocet strike, four Air Force

Skyhawks started bomb runs on the frigate *Avenger*. They believed it to be the carrier *Invincible*. Suddenly, Sea Dart missiles picked two of the planes out of the air. The *Exeter*, twenty miles away under low clouds, and invisible to the FAA fliers was responsible. Bombs from the two remaining Skyhawks missed the *Avenger*. The surviving pilots sped away from the action. They were unscathed, shocked by the unexpected disintegration of their colleagues' planes, and certain they had damaged a British carrier.[82]

The May 25 sinking of the *Atlantic Conveyor* proved to be *CANA's* last significant achievement during the Falklands War. Although Navy fliers mounted another Exocet attack on May 30, it achieved nothing. The Argentine Navy's Skyhawk squadron dispatched a couple of sorties against British troops ashore in early June, but attacked no more maritime targets.[83]

Argentine Air Force squadrons continued to fly anti-shipping missions after May 25. British ships landing troops at Fitzroy, a small settlement southwest of Stanley proved the most vulnerable targets. FAA planners developed an attack scheme after Argentine lookouts on a mountain ten miles from the landing site spotted the ships on June 7. The mission called for eight Skyhawks and six Daggers to bomb the ships on June 8. A Learjet would precede the strike aircraft to assist in navigation and four Mirages would make a decoy attack on the north coast of East Falkland Island to lure away British air cover. The Argentine Navy's destroyer *Santisima Trinidad*, steaming off the mainland, was to jam frequencies used by British air controllers.[84]

On June 8 two flights of four Skyhawks, each loaded with three 500-pound bombs, set out at 12:00 p.m. from Rio Gallegos for Fitzroy. En route mechanical problems forced three of the aircraft to abort. The remaining planes approached Fitzroy from the southwest at 1:50 p.m. They increased speed as they flew low through rain squalls. After a pass over the harbor the FAA pilots turned and saw the landing ships *Sir Galahad* and *Sir Tristram*. No warships were nearby to protect them. The three leading aircraft attacked the *Sir Galahad*. Three bombs went into the ship and exploded, three other bombs narrowly missed the vessel, and three bombs on one Skyhawk refused to release. The three bombs that hit the *Sir Galahad* had devastating effects. One passed through an open hatch to the ship's well deck. It burst into flames among closely-packed troops, twenty tons of ammunition, and drums of gasoline. Forty-three British soldiers died and another 150 were wounded. Another bomb penetrated to the engine room and galley area. The third 500-pounder plunged in officers' quarters. Surviving crew and troops escaped from the burning ship into nearby small boats and helicopters that came to evacuate them. Fires in the landing ship were left to burn themselves out. One of the two Skyhawks following the first flight put two bombs into the starboard side of the *Sir Tristram*. One of them rifled through the ship and came out the other side. The other detonated inside a small below-decks compartment. It killed two members of the crew and buckled bulkheads inside the ship. More 500-pounders from the last Skyhawk narrowly missed the *Sir Tristram*.[85]

The FAA followed up the first successful mission to Fitzroy with two later in the day. One flight of four Skyhawks took off from Rio Gallegos at 3:30 p.m. on an anti-shipping strike. After passing over Stanley they spotted a landing craft from the assault ship *Fearless* about 5:45 p.m.. Two dived to machine gun and bomb the small boat. Struck by a 500-pound bomb, the small craft quickly sank. Two Sea Harriers on combat air patrol at 10,000 feet had spotted the Skyhawks. Within minutes, Sidewinder missiles had destroyed two of the Argentine fighter-bombers. A third flew into the ground trying to evade another missile. The fourth FAA aircraft involved made it back to base. The Skyhawks from San Julian in the meantime reached the Fitzroy area, inflicted no damaged, and returned home unharmed.[86]

The six Daggers, also sent out to attack the two landing ships, each carried a 1,000-pound bomb. One aborted after a 1:00 p.m. takeoff. The others diverted to bomb the frigate *Plymouth*, which they sighted as it crossed Falkland Sound on a naval gunfire mission. The ship turned to regain the protection of San Carlos Water after sighting the aircraft. The Daggers attacked in line astern formation. They flew at 575 knots through 20-mm gunfire and evaded a Sea Cat missile to put four bombs into the ship. The antiaircraft fire inflicted only minor damaged on one of the Daggers. None of the bombs detonated, although one caused a depth charge on the frigate to explode. This left the ship burning as the Daggers evaded Sea Harriers and returned to base.[87]

Terminal Events

The June 8 raids were the last significant anti-shipping operations by land-based Argentine aerial forces during the Falklands War. Thereafter the focus of the war shifted to land battle as British troops advanced on Stanley from the landing beaches. This phase of the conflict and the war itself ended on about midday on June 14 when the Argentine occupation force surrendered. On June 15, General Mario Menendez, commander of Argentine forces in the Falklands formally capitulated. Three days later Argentina notified the United Nations Security Council that hostilities had stopped. Britain received word through its Swiss representatives in Buenos Aires on July 12 that Argentina did not intend to renew the fighting. The 1980s were over before Britain and Argentina renewed diplomatic relations.[88]

Argentina's National Day on May 25, 1982, marked the high point of FAA and CANA anti-shipping operations during the Falklands War. In actions preceding the concentrated effort on that day, the Argentines had sunk two British frigates. Unexploded bombs had substantially damaged three other warships and three landing ships. Strafing had inflicted lesser damage on a number of other vessels. On May 25, Argentine aviators capped these achievements. They sank one enemy destroyer and decreased the combat capability of another. They also destroyed cargo important to the British landing forces and set in motion the sinking of the large freighter carrying it. But their accomplishments, despite the loss of twenty-three attack aircraft, did not prevent the British landings from taking place. Several factors diminished the effectiveness of the Argentine air attacks. The lack of an adequate airfield in the Falklands meant that CANA and FAA aircraft had to fly long distances to the scene of battle. This limited the number of sorties that could be launched, the weapons loads that could be carried, and the use of fuel-demanding maneuvers in air-to-air combat. It also added navigational and refueling complexities to the missions. Moreover, with strike aircraft based in the Falklands, the Argentineans might have been able to attack Britain's carriers in sufficient strength to sink at least one. This probably would have been a "war stopper." Improper fuzing of bombs or the necessity for flying low to stay under missile envelopes resulted in a number of bombs that did not explode. Ordnance released from too low an altitude did not have time to arm before striking. Poor intelligence also hampered the Argentine pilots. They seldom knew in advance what ships they would find in the battle areas. When they did arrive over potential targets, the pilots often selected inappropriate ones. They should have concentrated on the British assault and landing ships rather than the destroyers and frigates. The June 8 raid on the *Sir Galahad* and *Sir Tristram* showed that successful missions against the landing ships could be devastating. This would have done more to impede the landings, but been costly since the Argentineans lacked enough aircraft to suppress the task force's air defense and simultaneously attack the landing ships.

As it was, the FAA and CANA pilots sank six modern warships and seriously damaged another ten.

Endnotes to Chapter VI

1. Lawrence Freedman, *Britain and the Falklands* (London: Blackwell, 1988) gives a good summary of the diplomatic history preceding the outbreak of hostilities in 1982 and of diplomatic initiatives that followed.
2. John F. Guilmartin Jr., "The South Atlantic War: Lessons and Analytical Guideposts-A Military Historian's Perspective," in James A. Brown and William P. Snyder, eds., *The Regionalization of Warfare* (New Brunswick, N.J.: Transaction Books, 1985), p. 64; Secretary of State for Defence, *The Falklands Campaign: The Lessons* (London: Her Majesty's Stationery Office, 1982), p. 45; Paul F. Walker, "Smart Weapons in Naval Warfare," in *Scientific American*, Vol. 248, No. 5 (May 1983), p. 53.
3. John Laffin, *Fight for the Falklands* (New York: St. Martin's Press, 1982), p. 33; *Webster's New Geographical Dictionary* (Springfield, Mass.: 1988), pp. 389-90.
4. David Brown, *The Royal Navy and the Falklands War* (Annapolis, Md.: Naval Institute Press, 1987), p. 68, pp. 89-90. Hereafter, "task force" is used as a general term to refer to the British force assembled to retake the Falklands.
5. Martin Middlebrook, *Task Force: The Falklands War,* 1982, rev. ed. (New York: Penguin Books, 1987), pp. 65-67.
6. Bryan Perrett, *Weapons of the Falklands Conflict* (New York: Sterling Publishing Co., Inc., 1982), pp. 21-22, 132.
7. Roy Braybrook, "Reassessing the lessons of the Falklands War," in *Asia-Pacific Defence Reporter*, Apr.-May 1992, p. 42; Middlebrook, *Task Force*, p. 72; Perrett, *Weapons*, pp. 45, 75; Eugene Kozicharow, "War Spurs NATO Analysis of Combat," in *Aviation Week & Space Technology,* Jul. 19, 1982, p. 20.
8. Braybrook, "Reassessing the lessons of the Falklands War," p. 42; Kozicharow, "War Spurs NATO Analysis of Combat," p. 20; Dov S. Zakheim, "The South Atlantic War: Evaluating the Lessons," in Brown and Snyder, *The Regionalization of Warfare*, p. 50.
9. Perrett, *Weapons of the Falklands Conflict*, pp. 75, 131.
10. *Ibid*., p. 63.
11. Brown, *The Royal Navy and the Falklands War,* p. 69; Guilmartin, "The South Atlantic War: Lessons and Analytic Guideposts—A Military Historian's Perspective," p. 64.
12. Middlebrook, *Task Force*, p. 72; Perrett, *Weapons*, p. 22, p. 128.
13. Brown, *The Royal Navy and the Falklands War*, p. 94; Middlebrook, *Task Force*, pp. 73-74; Samuel L. Morison, "Falklands (Malvinas) Campaign: a Chronology," in *Proceedings of the United States Naval Institute* (June 1983), p. 120.
14. Perrett, *Weapons of the Falklands Conflict*, pp. 22-23, 129.
15. Perrett, *Weapons of the Falklands Conflict*, pp. 25-26; Secretary of State for Defence, *The Falklands Campaign: The Lessons*, p. 19; Walker, "Smart Weapons in Naval Warfare," p. 56.
16. John Moore, Capt, RN, "Lessons of the Falklands War," *Jane's Naval Review* (London: Jane's Publishing Co., Ltd., 1982), p. 20; Perrett, *Weapons of the Falklands Conflict*, pp. 26-27.
17. Middlebrook, *Task Force*, pp. 78-79; Perrett, *Weapons of the Falklands Conflict*, pp. 28-29.
18. Perrett, *Weapons of the Falklands Conflict*, pp. 30-32.
19. Damian Housman, "Lessons of Naval Warfare," *National Review* 34 (July 23, 1982): 894; Secretary of State for Defence, *The Falklands Campaign: The Lessons*, p. 21.
20. Table information is a summary of Perrett, *Weapons of the Falklands Conflict*, pp. 21-28. It identifies the maximum potential of the task force but not all ships were present at one location at any one time.

21. Lawrence Freedman, "The War of the Falkland Islands," *Foreign Affairs* Vol. 61, No. 1 (Fall 1982): 202.
22. Morison, "Falklands (Malvinas) Campaign: a Chronology," p. 120.
23. David A. Brown, "Missiles Used in the Falklands Conflict," *Aviation Week & Space Technology* (May 10, 1982): 22; Robert W. Duffner, Conflict in the South Atlantic: the Impact of Air Power," *Air University Review* Vol. 35, No. 3 (April-May 1984): 84; Middlebrook, *Task Force*, pp. 98, 104; Perrett, *Weapons of the Falklands Conflict*, p. 74; Cmdr "Sharkey" Ward, RN, *Sea Harrier* (Annapolis, Md. : Naval Institute Press, 1992), p. 129.
24. Rodney A. Burden with Michael I. Draper, Douglas A. Rough, Colin R. Smith, and David L. Wilton *Falklands: The Air War* (New
York: Arms and Armour Press, 1986), p. 83.
25. *Ibid*., pp. 83-84.
26. Local time on Argentinia's east coast is three hours ahead of Greenwich Mean Time (or Zulu Time), and one hour ahead of Falklands' time. Times cited are local times.
27. Burden, *et al*., *The Air War*, pp. 84-85.
28. *Ibid*., p. 85.
29. Burden *et al*., *The Air War*, p. 85; Middlebrook, *Task Force*, pp. 101-2.
30. The area was first designated, from Apr. 12, a "Maritime Exclusion Zone," in which Argentine ships risked attack. Middlebrook, *Task Force*, pp. 125-26; Martin Middlebrook, *The Fight for the "Malvinas": The Argentine Forces in the Falklands War* (New York: Viking, 1989), pp. 74-75.
31. Middlebrook, *Task Force*, p. 125.
32. Freedman, *Britain and the Falklands*, p. 58; Middlebrook, *Task Force*, p. 126; Victor Flintham, *Air Wars and Aircraft: A Detailed Record of Air Combat, 1945 to the Present* (New York: Facts on File, 1990), pp. 372-73.
33. José O'Dorico, Commo, FAA-Ret., "La Fuerza Aerea Argentina," *Air University Review* Vol. 37, No. 5 (July-August 1986): 100; Middlebrook, *The Fight for the "Malvinas"*, pp. 293-95; Joseph F. Udemi, Capt., USAF, "Modified to Meet the Need: British Aircraft in the Falklands," *Air Power Journal* (Spring 1989): 52. Brown, *The Royal Navy and the Falklands War*, p. 117, notes that one of the five available Super Étendards served as a source of spare parts.
34. Brown, *The Royal Navy and the Falklands War*, pp. 115-16.
35. *Ibid*., p. 115.
36. *Ibid*., p. 59.
37. Brown, *The Royal Navy and the Falklands War*, p. 115; Udemi, "Modified to Meet the Need: British Aircraft in the Falklands," p. 52.
38. Middlebrook, *The Fight for the "Malvinas"*, pp. 293-95.
39. Laffin, *Fight for the Falklands!*, p. 95; Middlebrook, *The Fight for the "Malvinas"*, p. 82.
40. Middlebrook, *The Fight for the "Malvinas"*, p. 83; Middlebrook, *Task Force*, p. 132.
41. Middlebrook, *The Fight for the "Malvinas"*, p. 87; Middlebrook, *Task Force*, p. 132; The *Sunday Times of London* Insight Team, *War In the Falklands* (New York: Harper & Row, Publishers, 1982), p. 216.
42. Middlebrook, *The Fight for the "Malvinas"*, p. 89.
43. Middlebrook, *The Fight for the "Malvinas"*, p. 89; Ward, *Sea Harrier*, p. 160.
44. Middlebrook, *The Fight for the "Malvinas"*, pp. 90-91.
45. *Ibid*., pp. 96-97.
46. Middlebrook, *The Fight for the "Malvinas"*, pp. 108-9; see Burden, *et al*., *The Air War*, pp. 40-41 for a detailed discussion of reasons for cancellation of the Skyhawk strike.

47. Middlebrook, *The Fight for the "Malvinas"*, p. 116.
48. Burden, *et al*., *The Air War*, p. 34; Braybrook, "Reassessing the Lessons of the Falklands War," p. 41; Jorge Luis Colombo, Cmdr, ARA, "Falkland Operations I: Super Étendard Naval Aircraft Operations During the Malvinas War," in *Naval War College Review*, April-May 1984, p. 15; The *Sunday Times of London* Insight Team, *War in the Falklands*, pp. 168-69; Walker, "Smart Weapons in Naval Warfare," p. 54.
49. Burden, *et al*., *The Air War*, pp. 47-48; Middlebrook, *The Fight for the "Malvinas"*, pp. 122.
50. Burden, *et al*., *The Air War*, p. 48; Colombo, "Falkland Operations I," p. 19; Middlebrook, *The Fight for the "Malvinas"*, p. 123.
51. Burden, *et al*., *The Air War*, p. 35; Sub-Lieutenant Armando Mayora, CANA, in Middlebrook, *The Fight for the "Malvinas"*, pp. 123-24. Mayora provides a first-hand account of the raid from refueling to turnaway.
52. Middlebrook, *Task Force*, pp. 158-59; Martin Streetly, "Ruling the Airwaves: Electronic Warfare at Sea," *Jane's Naval Review*, John Moore, Capt, RN, ed. (New York: Jane's Publishing,
Inc., 1986), p. 101; Walker, "Smart Weapons in Naval Warfare," p. 54; Sandy Woodward with Patrick Robinson, *One Hundred Days: The Memoirs of the Falklands Battle Group Commander* (Annapolis, Md.: Naval Institute Press, 1992), pp. 6-14.
53. Brown, *The Royal Navy and the Falklands War*, pp. 141-42; Middlebrook, *Task Force*, pp. 162-63. Middlebrook's figures in *Task Force* and *The Fight for the "Malvinas"* differ slightly. In *Task Force* he reports 24 dead, 24 injured, and 242 escaping injury. In *The Fight for the "Malvinas"* he reports 20 dead and 236 surviving. Moore, "The Lessons of the Naval War in the Falklands," p. 20; Salt, quoted in John Brecher with Tony Cliford, "A Naval Postmortem," *Newsweek* (June 7, 1982): 22.
54. Kozicharow, "War Spurs NATO Analysis of Combat," pp. 20-21.
55. Middlebrook, *The Fight for the "Malvinas"*, p. 126.
56. Middlebrook, *Task Force*, p. 187.
57. Capt John Coward, commanding officer of HMS *Brillant*, quoted in Middlebrook, *Task Force*, p. 189; Middlebrook, *The Fight for the "Malvinas"*, p. 133.
58. Brown, *The Royal Navy and the Falklands War*, p. 160; Jeffrey Ethell and Alfred Price, *Air War South Atlantic* (New York: Macmillan, 1983), pp. 88-89; Capt [no first name available] Zelaya, commander of the second Skyhawk, from an oral history interview included in "Dios y los Halcones," an unpublished ms. compiled by the FAA and quoted in Middlebrook, *The Fight for the "Malvinas"*, p. 133.
59. Ethell and Price, *Air War South Atlantic*, p. 108; Middlebrook, *The Fight for the "Malvinas"*, p. 151; Capt Kit Layman, RN, commanding officer, HMS *Argonaut*, quoted in Middlebrook, *Task Force*, p. 219.
60. Middlebrook, *The Fight for the "Malvinas"*, p. 162.
61. Middlebrook, *Task Force*, p. 221; Perret, *Weapons*, p. 127, p. 131.
62. Burden, *et al*., *The Air War*, p. 133; Middlebrook, *Task Force*, p. 221.
63. *Ibid*., p. 133; Middlebrook, *Task Force*, p. 221; Perrett, *Weapons of the Falklands Conflict*, pp. 127, 131.
64. Burden, *et al*., *The Air War*, p. 119; Capt C. H. Layman, RN, commanding officer, HMS *Argonaut*, quoted in Middlebrook, *Task Force*, p. 223.
65. Burden, *et al*., *The Air War*, p. 119.
66. *Ibid*., pp. 111-12.
67. Burden, *et al*., *The Air War*, p. 41; Comdr Alan West, RN, commanding officer, HMS *Ardent*, quoted in Middlebrook, *Task Force*, pp. 224-25.

68. Burden, *et al.*, *The Air War*, p. 42.
69. Burden, *et al.*, *The Air War*, p. 134; Middlebrook, *Task Force*, p. 224.
70. Burden, *et al.*, *The Air War*, pp. 134-35.
71. *Ibid.*, pp. 132-33.
72. Middlebrook, *The Fight for the "Malvinas"*, pp. 164-65.
73. Brown, *The Royal Navy in the Falklands War*, pp. 201-2.
74. Middlebrook, *The Fight for the "Malvinas"*, p. 166.
75. Brown, *The Royal Navy and the Falklands War*, p. 207; Burden, *et al.*, *The Air War*, p. 120; Middlebrook, *The Fight for the "Malvinas"*, p. 168; Middlebrook, *Task Force*, pp. 234-35; Woodward and Robinson, *One Hundred Days*, p. 275.
76. Burden, *et al.*, *The Air War*, p. 42.
77. *Ibid.*, pp. 112-13.
78. Burden, *et al.*, *The Air War*, p. 137; Ethell and Price, *Air War South Atlantic*, pp. 140-41.
79. Brown, *The Royal Navy and the Falklands War*, pp. 221-23; Burden, *et al.*, *The Air War*, p. 121; Middlebrook, *The Fight for the "Malvinas"*, p. 172-73; Capt. David Hart-Dyke, RN, commanding officer, HMS *Coventry*, quoted in Middlebrook, *Task Force*, p. 239; Ward, *Sea Harrier*, p. 220; Woodward and Robinson, *One Hundred Days*, pp. 286-287. According to Middlebrook, *Task Force*, p. 241, and Woodward and Robinson, *One Hundred Days*, p. 299, some Royal Navy personnel believed that the Argentineans switched to impact fuzes after learning from British Broadcasting Corporation news programs that their bombs were not exploding.
80. Middlebrook, *Task Force*, p. 243-44.
81. Roy Braybrook, "Anti-Ship Missiles: No Let-Up for Defences," p. 119; Brown, *The Royal Navy and the Falklands War*, pp. 230-31; Burden, *et al.*, *The Air War*, p. 36; Middlebrook, *The Fight for the "Malvinas"*, p. 174; Middlebrook, *Task Force*, pp. 246-47; Woodward and Robinson, *One Hundred Days*, pp. 295-97.
82. Burden, *et al.*, *The Air War*, p. 114.
83. *Ibid.*, pp. 37, 42.
84. Middlebrook, *The Fight for the "Malvinas"*, pp. 211-12.
85. Burden, *et al.*, *The Air War*, p. 124; Middlebrook, *Task Force*, pp. 306, 308-9.
86. Burden, *et al.*, *The Air War*, pp. 124-25.
87. *Ibid.*, p. 138.
88. James Brown and William P. Snyder, eds., *The Regionalization of Warfare* (New Brunswick, N.J.: Transaction Books, 1985), p. 15; Freedman, "The War of the Falkland Islands," p. 207; Morison, "Falklands (Malvinas) Campaign: a Chronology," p. 123; "Argentina, United Kingdom Decide to Re-establish Diplomatic Relations," *UN Chronicles* (June 28, 1990): 27.

CHAPTER VII

THE TANKER WAR

The "Tanker War," a campaign of the Iran-Iraq War (1980-1988), included the first sustained use of land-based aerial forces against merchant shipping since World War II. Both sides used their air forces to attack a variety of merchant and naval vessels, but many writers have used the term "tanker war" to describe this air-sea campaign. In the course of the conflict ships bearing oil became the most significant type of vessel targeted. Military analysts agree that an intense effort against them began in 1984, although a few tankers were struck earlier in the war. During the ninety-five months of the war the belligerents attacked between 437 and 500-plus ships.[1]

The Iran-Iraq War began on September 22, 1980, when Iraq invaded Iran. The invasion came after nearly 240 border incidents, most initiated by Iran. Iraq had several war aims. These included Iranian recognition of exclusive Iraqi navigation rights on the Shatt al-Arab, a 130-mile-long river that forms fifty-five miles of the border between Iran and Iraq; return of the islands of Abu Musa and Tunb in the southern Persian Gulf, which Iraq claimed that Iran had occupied in 1971; and self-rule for the predominately Arab population of Khuzestan, a 25,000-square-mile province in northern Iran. The last could have given Iraq, an Arab country, effective control of the province's oil fields.[2]

The two sides did not appear evenly matched. Iraq had a population of 16 million and territory of about 168,000 square miles. It was taking on Iran, which had a population of more than 50 million and territory of about 636,000 square miles. Iran's land army and navy were far larger than Iraq's. The air forces of both countries were about equal in size, but that of Iran had been equipped and trained by the United States while that of Iraq had been equipped and trained by the Soviet Union.

Iran's air force appeared far superior to that of Iraq in September 1980. Its inventory included about 430 American-built air superiority and attack aircraft, more than 200 attack helicopters, and 300 other assault aircraft. Iranian armed forces were, however, in chaos caused by purges following the Islamic revolution of the 1970s. This was particularly true of the Iranian Air Force. The revolutionary government had executed or imprisoned many of the air force's officers, noncommissioned officers, and technicians following the fall of the Shah. At the time the war began Iran could field only about 350 of its fixed-wing combat aircraft.[3]

At the outset of the war, Iraq's aerial forces included a mix of 332 fixed-wing, Soviet-built fighters, fighter-bombers, and light bombers. As export models, these fighters and bombers did not have the full range of electronics and weapons available in similar aircraft used by the Soviet Air Force. A variety of attack helicopters bolstered the fixed-wing inventory. Iraqi Air Force training was focused on high-altitude dog fighting. Skills useful in attack and bombing missions were purposely slighted. This restrained the development of forces that might assist in a revolt against Iraq's ruler, Saddam Hussein. The Iraqi Air Force had no long-range reconnaissance capability and operational readiness in its units at the outset of the war was 50 percent or less.[4]

Like the Iranian Air Force, the Iraqi aviation branch suffered from political interference and decimation. In the spring of 1982 Saddam Hussein grounded the entire Iraqi Air Force for "plots against the regime." He then had the entire senior leadership shot in September 1983 after an attempted coup.[5]

Iraq began its air war against Iran with raids on ten Iranian military airfields. These failed for two reasons. The first was that the Iraqis targeted only the runways at the air

bases. The second was that the Iraqis mounted only eighty sorties on the first day of the war. They were able to mount only fifty sorties on each of the following two days. Postwar analysis indicated that several hundred sorties over several days would have been required to ground the Iranian Air Force.[6]

Iranian fighter-bombers struck back immediately. They forced the Iraqi Air Force to disperse to Jordan, Saudi Arabia, Oman, the United Arab Emirates, North Yemen and Kuwait. Their hosts quickly sent the Iraqis home when they realized the vulnerability of their own oil installations to Iranian retribution. Shortages of parts, poor maintenance, and a shortage of trained personnel kept the Iranian Air Force from exploiting its first success. Iran's Islamic fundamentalist government released a number of pilots and technicians from jail to meet Iraqi's first onslaught. It later reimprisoned or executed hundreds of them when the initial danger had passed.[7]

Iran had greater naval strength than Iraq. With nearly 2,000 miles of coastline (compared to Iraq's thirty-six miles), Iran had more reason for naval forces. Those forces included three destroyers, eight frigates, seven large and eighty small patrol boats, five minesweepers, fourteen hovercraft, and a number of auxiliary vessels. Many of these were equipped with modern surface-to-air missile systems as well as with anti-aircraft guns. Iraq had only a training frigate, twenty-four fast attack craft, five large and ten coastal patrol vessels, eight minesweepers, four landing craft, and some inshore patrol craft.[8]

Naval engagements quickly followed the outbreak of war. On September 22, 1980, Iraqi ships destroyed five Iranian craft that had harassed Iraqi-flag vessels on the Shatt al-Arab. Another naval engagement, with Iraqi land-based artillery participating, followed when Iran's navy shelled Basra, a port at the head of the river and two oil terminals at Fao, at its mouth. Iraq claimed to have sunk two Iranian frigates and Iran claimed to have destroyed four Iraqi combatants. On September 25, Iraqi gunboats and helicopter gun ships met an Iranian naval attack on Khor Abdulla, an oil port near Fao. Radio Baghdad subsequently told the world that Hussein's military forces had sunk three frigates and two gunboats of the Iranian Navy. Iran said it lost two gunboats and a minesweeper while destroying six Iraqi missile boats and two other craft. Another major naval battle took place between November 29-30 off the city of Fao and near Iraq's offshore oil terminal of Mina al-Bakhr. After this engagement, Iran claimed to have raised its flag over Mina al-Bakhr and destroyed four missile boats and seven gunboats of the Iraqi Navy. Iraq, in turn, said it used air and naval forces to repulse the Iranian attack and had destroyed three Iranian naval vessels including a frigate.[9]

If the claims of both sides are taken at face value, these encounters cost Iran seventy-six combatants of all types, or 56 percent of its total naval inventory. Iraq, which started with a much smaller and less effective naval force, lost only forty-two vessels, but this was 66 percent of its naval strength. These figures include craft lost not only in naval battles, but also those claimed for air strikes, artillery, and in one case, capture by troops. The claimants possibly exaggerated their successes. It is certain that Iraq's navy ceased to exist as an effective fighting force before two months of the war had passed. This created a situation in which, Iraq, if it chose to pursue an anti-shipping campaign, had no choice but to do so with its land-based aerial forces.[10]

Each side had pressing motives for an anti-shipping campaign. Both Iran and Iraq relied on oil exports to provide most of their economic base. Petroleum revenues provided at least 90 percent of each nation's foreign exchange. Without oil sales, Iran and Iraq would have been hard pressed to sustain their war efforts.[11]

Immediately after being invaded, Iran announced that the waterways near its coast were in a war zone. The restricted area ran the length of the Persian Gulf and extended seaward from the Iranian coast for about forty miles. It would not allow, Iranian officials said, ships to carry cargo to or from Iraqi ports. Iranian air raids following the Iraqi initiation of the war and the November 1980 naval clash at Mina al-Bakhr and Fao reduced Iraq's oil export capacity by one-third. All of Iraq's ports and its two marine oil terminals were shut down. After that, no commercial vessels sailed to or from Iraq. Iran then persuaded Syria to block Iraq's access to an overland pipeline running through that country. This left Iraq with only a less than 700,000 barrel-per-day (bpd) pipeline running through Turkey as a way to get its oil to market. This contrasted with a prewar export level of 1.5 million bpd.[12]

Iran, without access to overland pipelines, depended entirely on the sea for exporting its oil. Nevertheless, Iran still had a functional air force and naval supremacy relative to Iran. It was able to increase its own oil production to nearly three million bpd and export all the oil it could sell. More than 80 percent of this oil was picked up by tankers at Kharg Island off the southwest coast of Iran. Anti-aircraft guns and Hawk surface-to-air missile batteries protected the forty-mile-long island, which is twenty-miles-wide. Oil flowed to the island via buried underwater pipelines. On the island pipelines were dispersed, often buried or sheltered, and redundant. The tanker jetties were the island facilities most vulnerable to air attack. A large T-shaped jetty on the eastern side of the island could berth fourteen small to medium tankers. A J-shaped jetty on the western side of the island could accommodate twenty ships, including three supertankers. The island was designed to load between 1.5 and two million bpd. Before the war it had actually loaded as much as six million bpd.[13]

Despite the importance of these oil facilities and the ships they served, neither Iran nor Iraq initially had the resources to launch a strategic air campaign against them. Both sides fought fiercely for nearly three years. This resulted in a stalemate in the ground war and a negotiated suspension of the strategic air and missile war against population centers that has been called "The War of the Cities." It was only when the latter was abandoned that Iraq could spare aerial forces for a serious anti-shipping campaign.[14]

In the interim, there were sporadic assaults on commercial shipping. This early phase of the "Tanker War" began with an Iraqi air attack on the Panamanian-registered *Louise I*, a freighter, on May 21, 1981. Thereafter, Iraq's aerial forces occasionally targeted individual ships sailing in the northern Persian Gulf. They were usually steaming to or from the Iranian ports of Bandar Khoemini and Bandar Mahshahr at the head of the gulf. The Iraqis used Super Frelon helicopters to launch AM.39 Exocet surface-to-air missiles at underway vessels. They fired from up to thirty miles from their intended targets. The fifteen-foot-long radar-guided missiles weighed 1437 pounds, carried a 364-pound high explosive warhead, and had a maximum range in excess of forty-three miles. Aircraft involved launched the French-made weapons at altitudes of 200 to 300 feet. The missiles then dipped to ten to fifteen feet above the sea and raced toward their targets at a speed of Mach 0.93.[15]

Civilian ships anchored in Iranian ports also suffered in air raids, as when variable-wing MiG-23Bs and swept-wing Mirage F-1s bombed two freighters. Four other merchantmen passing through the channel between the Iranian ports of Bandar Khomeini and Bandar Mahshahr fell victim to Iraqi sea mines, which had probably been delivered by air.[16]

Iraq did bomb Kharg Island in April and August 1982, but without much effect. This occurred despite warnings from other Persian Gulf countries not to destroy the facility. That same month, Saddam Hussein's regime announced a "Maritime Exclusion Zone." It was that area of the Persian Gulf above latitude 29˚ 30' North. Ships sailing in the zone were on notice

that they risked attack without warning. This merely formalized a situation that had existed since September 1981.[17]

In 1983 Iraq acquired five transonic Super Étendards (SÉs), the French-manufactured naval strike planes which Argentina had used so effectively in the Falklands War. France leased the aircraft to Iraq and provided instruction for the pilots who would fly them. The pilots completed their training in October 1983. While the Super Étendards were becoming operational, Iraqi continued shipping attacks with the equipment it had. On November 3, a Puma helicopter fired an Exocet at a Greek freighter, the *Avra*. This assault caused only superficial damage to the ship but killed three crew members. On November 21, another helicopter-missile raid sank the *Antigoni*, also a Greek freighter, but there was no loss of life.[18]

At this time Iraq also committed to increasing significantly its surface navy strength. The Hussein regime ordered four frigates, six corvettes, and a large replenishment ship from Italy. Because Iraq had no functioning ports, however, these ships were never delivered.[19]

Iran responded to the impending air threat with bluster. It said that if its opponent used the Super Étendards to deploy anti-ship missiles, then the Iranian Navy would close the Strait of Hormuz. The United Nations Security Council took note of the situation by affirming the right of free navigation and commerce in the Persian Gulf. The United States announced that its national interests required freedom of navigation in the Persian Gulf. It stepped up its naval patrols in the area. A nineteen-ship task force centered on the carrier *Midway* entered the Persian Gulf. American officials showed which side they favored by pointing out that while Iraq confined its attacks on shipping to a declared war zone, Iran attacked ships in international waters. It later was revealed that the United States had begun to selectively share intelligence collected by its Airborne Warning and Control System (AWACS) platforms and surveillance satellites with Iraq as early as 1980. From that year forward, four American multi-engine jet E-3As provided continuous airborne radar surveillance of air and sea areas of the northern Persian Gulf. U.S. Navy flights from Bahrain by four-engine turboprop P-3 Orions supplemented this coverage. American officials also offered shoulder-fired Stinger surface-to-air missiles to their Persian Gulf client states so that they could protect their shipping from air attacks.[20]

The prospect of a shipping war in the Gulf and perhaps closure of the Strait of Hormuz between Iran and Quatar intensified international concern over the Iran-Iraq War. The Persian Gulf area was home to about two-thirds of the world's known oil supplies. Two-thirds of the oil, or about eight million bpd, exported by Persian Gulf countries passed through the strait. This provided about 25 percent of the oil consumed by Western countries and Japan. Although this total provided only about 6 to 8 percent of United States' oil imports, it included about 56 percent of Japan's oil supply and 36 percent of France's oil requirements. The Strait's characteristics made its successful closure unlikely other than by intense air and naval patrols. Currents, depth, and width decreased the chances of successful mining. A navigable width of up to twenty miles for supertankers, with a main channel five to eight miles across and 300 feet deep made infeasible the tactic of sinking ships in the channel to block commerce.[21]

Merely stimulating Iran to provoke international concern served Iraq's purposes. The war begun by Saddam Hussein to gain navigation rights and control of a province's oil resources had become a war for national survival. Iran's war aims had developed to include five major points. Removal of Saddam Hussein and his Baath Party from power in Iraq was the most significant. Other items included an admission of aggression from Iraq, reparations of up to $150 billion, repatriation of some 100,000 Arabian Iraqis previously deported by

Hussein from Khuzestan, and withdrawal of Iraqi forces from Iranian-claimed territory. Iraq's air and ground forces had proved able to repel but not push aside Iran's artillery, infantry, and armor. Its strategic air and missile campaign against Iran's population in the "War of the Cities" had failed to break the Iranian will to resist. Iraq called for a cease-fire in June 1983, but Iran refused discussions. This situation left Iraq with only two possibilities for forcing an end to war that it had started but could not win. These were to mount a strategic air campaign against the petroleum shipping that formed the foundation of Iran's economy and to "internationalize" the war. The first option could end Iran's capacity to make war by depriving it of needed foreign exchange. It could also, in concert with Iranian retaliation against other shipping, threatened the economies of the Western nations and Japan. This promised to increase world pressure on Iran to negotiate an end to hostilities. When, in the fall of 1983, the United Nations urged a suspension in fighting, Iraq agreed but Iran ignored the request.[22]

By early 1984 Iraq was ready to intensify its interdiction of shipping that carried Iranian oil and its air raids on the marine terminals where the ships loaded. On February 14, 1984, Iraq declared that it would sink any ships approaching the Iranian ports of Bandar Khomeini or Busheir. At the time, Iran was exporting three million bpd and was negotiating with Japan to deliver 200,000 bpd.[23]

The first in a series of anti-ship strikes occurred on January 31, 1984. The attacks were seldom, if ever, preceded by reconnaissance. On that date Iraqi aircraft claimed destruction of five Iranian naval targets near Khor Musa, an island off Quatar. The "naval targets" probably included some tankers being convoyed by the Iranian Navy. The following day, the Iraqi Air Force claimed credit for mining the Cypriot tanker *City of Rio*. It also made Exocet attacks on the Greek ship *Skaros* and Cypriot ship *Neptune*.[24]

An Exocet launched by an Iraqi aircraft on February 16, 1984, started a fire that badly damaged a Liberian bulk carrier. Then on March 1, the Iraqis attacked a convoy of eleven ships near the Iranian port of Bandar Khomeini. Missile and rocket-firing helicopters and fixed-wing aircraft sank the Indian cargo ship *Apj Ambika*. They also caused extensive damage to the Cypriot-flagged *Sema-G* and the British *Charming*. The *Charming* may have been hit by a heat-seeking missile rather than an Exocet.[25]

Air strikes on ships carrying Iranian oil intensified. On March 27 an Exocet lodged without exploding in the *Filikon L.*, a Yugoslav-crewed Greek bulk carrier loaded with steel. The freighter sank with the loss of three lives. This was the first ship attack that Iraqi aircraft made outside the Maritime Exclusion Zone previously announced by Saddam Hussein's regime. It also marked Iraq's first use of an Exocet-equipped Super Etendard in a ship strike. The Greek freighter *Iapetos* was the next victim. A March 29 Iraqi air strike set fires on the ship that caused serious damage. Then on April 18 an Iraqi-launched Exocet caused minor damage to the Panamanian tanker *Rover Star*. On April 25 a Saudi-owned tanker chartered by a Swedish company suffered an explosion and serious fire because of Iraqi air attack. This embarrassed Iraq, which was receiving covert Saudi support, because it illustrated its inept targeting. It also embarrassed Saudi Arabia, because the *Safina Al* had just taken on a cargo of oil at Iran's Kharg Island terminal. In early May, however, Saddam Hussein announced that ships loading at Kharg Island would be attacked even if they belonged to Iraq's Arab neighbors. This underscored Hussein's hopes for the anti-shipping campaign as Iraq at this time was receiving about 400,000 bpd of Kuwaiti and Saudi Arabian oil to sell.[26]

Iran responded to these attacks by using a few of its remaining F-4 Phantom strike jets to fire Maverick missiles at Kuwaiti and Saudi Arabian oil tankers. The first such attack

came on May 13, 1984, when F-4 Phantoms rocketed the *Umm Casbah*, a Kuwaiti Oil Tanker Company vessel with 76,000 tons of fuel oil on board. A raid on the Saudi flag tanker *Yanbu Pride* followed on May 16. While these were not Iraqi ships, Iran hoped that endangering its opponent's covert supporters would encourage decreased support for Iraq. Kuwait had given loans to Iraq and permitted the Iraqi Air Force to pass through Kuwaiti air space en route to shipping attacks. It was also permitting cargo vessels with war supplies to be unloaded at Kuwaiti ports and transported under seal to Iraq.[27]

The Iranians usually employed spotter aircraft to locate shipping targets. They sortied from Lavan Island east of Bandas. Spotter planes used included high-winged C-130E and H Hercules turboprop transports, P-3s, and a variety of light commercial aircraft. One or two Phantoms that could fire rockets at short range responded to location reports. There is some evidence that the Iranian fighter-bombers also used French-manufactured AS-12 anti-ship missiles but this has not been fully documented. Maverick missiles, definitely used, had warheads which proved too small to consistently do significant damage to tankers. The heat-seeking missiles usually homed in on a ship's "hot spots." These were the funnels, ventilators, and engine room. When the Mavericks started fires in engine rooms or messing and berthing areas, resulting blazes could gut ships if not put out quickly. When fires did not follow missile strikes, structural damage was quickly repaired.[28]

Iraq's SÉ missions were also not as effective as they could have been. Analysts have attributed this to the limited number of aircraft available, Iraqi tactics, hitting power of the Exocets, and characteristics of the tanker targets. Having leased only five Super Étendards, the Iraqis were reluctant to commit them en masse or expose them to counter-air measures. When their radars located a potential target within the exclusion zone, the SÉ pilots (like the Iraqi helicopter fliers) frequently launched their weapons at targets up to 30 miles away. In most cases, the distance from launch to an intended victim prevented target identification. This meant that the air-to-surface missiles homed in on the largest radar image present, without regard to what it might be. The Iranians were thus often able to divert the Exocets from real targets by using decoy radar targets towed behind small tugs. Large oil-carrying ships often proved resistant to critical damage even when hit by powerful missiles. This was a consequence of the relatively small size of the Exocets' explosive charge, the tankers' extensive compartmentalization, and the dampening effect of crude oil cargoes on explosions. However, even large ships could be seriously damaged by the missiles. When the Iraqis hit smaller targets with Exocets, the missiles were more effective. Of thirty-three ships other than supertankers or very large tankers hit in 1984, seven sank as a result of Exocet strikes. Another nineteen were heavily damaged. The Iraqi Air Force used its Russian-built light and medium jet bombers only sporadically in shipping attacks. They usually achieved unsatisfactory results. Analysts have attributed this to two factors. First, Iraq's squadrons of Soviet-built aircraft were used as a source of crews for more modern aircraft being acquired from France. This left the Tu-16 and Il-28 squadrons with undertrained and inexperienced crews. Second, the Soviet planes suffered from poor maintenance and a shortage of spare parts.[29]

Iran waited two months after the renewed Iraqi attacks on shipping before retaliating. Between May 13 and May 16, 1984, missiles, rockets, and cannon fire from Iranian Phantoms inflicted severe damage on three oil tankers. One of these ships was Saudi Arabian and two were Kuwaiti. All of the strikes occurred south of the previously announced exclusion zone. At the same time, Iran notified the world that it would stop and search all ships passing through the Strait of Hormuz.[30]

An Iranian F-4 used rockets to set the Liberian flag tanker *Chemical Venture* afire on May 24. The 29,427-ton ship was twenty-one miles north of Al Jubayl on Saudi Arabia's eastern coast. Iraq announced on May 25 that its air force had destroyed a convoy of eight vessels in the channel between Khor Musa and the Iranian mainland. Fifteen days later, the Iranians fired two air-to-surface missiles into the Kuwaiti supertanker *Kazimah*. Each Maverick plunged into a separate oil storage compartment. The crew was able to put out the ensuing fire. Despite a common low level of fire fighting experience, this became a not unusual accomplishment for the sailors on stricken tankers. In this and other cases, the crews were able to extinguish fires and sail their ships into the nearest ports for repairs.[31]

The intensifying tanker war did provoke international response. Shipping insurers raised their war risk premium from 0.25 to 7.5 percent of a ship's value. This added $1 to $1.50 to the cost of each barrel of oil exported from the Gulf. The increasing danger to merchantmen in the Persian Gulf also led the Japanese Shipowners Association to state that Japanese-crewed tankers would no longer steam into the northern half of the Gulf. American Secretary of State George Schultz announced that the U.S. and the Soviet Union had a joint concern over freedom of navigation in the Gulf. The United States flew hundreds of Stinger missiles to Saudi Arabia and sent tanker aircraft to support the Saudi Air Force. American officials also proclaimed that the United States Navy would provide air warning and a defense screen for United States-flag ships under charter to its Military Sealift Command. This consisted of a radar picket line of two or three destroyers or frigates. It provided a radar surveillance corridor for tankers transiting the Persian Gulf. The Gulf Cooperation Council (GCC) decided to provide air cover for ships coming to or from their ports while the vessels were in international waters of the Persian Gulf. The council consisted of Saudi Arabia, Kuwait, Oman, Qatar, Bahrain, and the United Arab Emirates. Although they provided air cover against both Iranian and Iraqi attacks, the GCC members at the same time lent Iraq some $35 billion during the course of the Iran-Iraq War. They all feared that Iran would spread its Islamic fundamentalist revolution into their states.[32]

In June 1984, the Iraqi Air Force shifted the focus of its maritime campaign to Iran's Kharg Island oil terminal. Super Étendards sent two Exocets into the Turkish tanker *Buyuk Hun* on June 3. The ship was at the southern end of the exclusion zone for the terminal. Resulting explosions and fire killed three crew members, injured several others, and seriously damaged the oil carrier. A raid on the 24th left the terminal partially closed and limited the size of tankers that could be served to 300,000 tons or less. Iran's oil export capacity fell temporarily to 50 percent of its prewar level. These and subsequent attacks led Iran to provide aerial as well as surface escorts for convoys its navy was shepherding. In fighting from August 9 to 10, Iraq claimed to have shot down three Iranian F-4s and sunk five merchant ships.[33]

The intensification of the tanker war served Iraq well. Its air raids on shipping and marine terminals hurt Iran's economy. Iraqi and Iranian attacks on vessels in the Persian Gulf also entangled other gulf nations and world military powers. When an Iraqi aircraft attempted to attack a target in Saudi waters on June 4, 1984, a Saudi fighter shot it down. A Saudi Air Force AWACS aircraft with U.S. Air Force crew members on board assisted in the kill. A June 20, 1984 Saudi Arabian-United States joint announcement followed. In it, the two nations reporting creating a Saudi Air Defense Identification Zone (ADIZ). Within the ADIZ Saudi Arabian F-15s with United States Air Force AWACS support would intercept any aircraft threatening shipping.[34]

The tempo of the Tanker War decreased temporarily in the second half of 1984. A June 11 end to a renewed "War on Cities" negotiated under United Nations' auspices

gradually grew to include oil facilities. Iranian exports from Kharg Island increased to 1.6 million bpd. On June 15, 1984, the Speaker of the Iranian Parliament suggested expanding the ban on attacking population centers to include a cessation of attacks on Persian Gulf shipping. Iraq responded with a demand that it be allowed to repair its own marine oil terminals, which had been destroyed at the beginning of the war. As a result, nothing came of the proposal to halt attacks on shipping.[35]

Instead, Iraq renewed its air raids on ships in the Gulf. Between June 23 and July 25, the Iraqi Air Force conducted four shipping attacks. On July 24, the Iraqis also hit the Iranian oil terminal at Kharg Island again. Iran responded by with a Phantom strike against the Liberian-flagged, Japanese-owned supertanker *Primrose* on July 5.[36]

Delivery of new model Mirage F1-EQ5s and 6s from France in October 1984 expanded Iraq's capacity to wage naval warfare with its land-based aircraft. Although the F1Bs and Es already in the Iraqi Air Force inventory could have been modified to launch Exocets, this had not been done. When the Mirage F1-EQs became operational, they gave Iraq additional Exocet capability in aircraft also equipped for air-to-air refueling. The Iraqis first used the faster, better armed, longer-range Mirages F1-EQs in shipping raids in December 1984.[37]

Although the tempo of Iraqi shipping attacks waned in the latter part of 1984, Iran began to explore alternatives that would make interdiction of shipping routes to its marine oil terminals more difficult. It started developing new oil tanker ports at Sirri and Larak islands in the southern Persian Gulf. Iran used either its own tankers or chartered ships to shuttle oil from Kharg Island to Sirri and Larak. In relation to Kharg Island, the new facilities were, respectively, 320 miles and 435 miles further from Iraqi airfields. On November 24, Iraqi pilots flew their Super Étendards on a 1,560-mile round trip to strike the oil terminal on Larak Island on the Iranian side of the Strait of Hormuz. The raid damaged both tankers and loading facilities. Iran complained that the SÉs must have refueled at a base in another gulf country in order to reach Larak.[38]

When 1984 ended, Iran's oil exports had been reduced to one million bpd. This was due in part to Iraq air strikes, but also to price fluctuation. Ironically, there was never a shortage of vessel owners and crews willing to risk damage and destruction transporting Persian Gulf oil. Coincident with increasing dangers was an increasing worldwide surplus of oil tankers.[39]

The two belligerents made a total of sixty-seven air strikes on civilian ships during 1984, the first year of the second phase of the Tanker War. This compared to a total of thirty-five merchantmen subjected to attack between May 1981 and January 1984. The Iraqis had generally bombed, launched missiles at, or strafed ships steaming between thirty and seventy miles south of Kharg Island and between ten and sixty miles off the Iranian coast. The Iranians had assailed freighters and tankers in the southern part of the Persian Gulf.[40]

The fifth year of the Iran-Iraq War was, for Iraq, the "Year of the Pilot."[41] Iraqi Air Force daily sortie capacity doubled from 150 to 300. Iraqi pilots trained in France and India were said by their instructors to be, after training, as good as any French or Indian flier. Saddam Hussein reportedly relented and allowed more aircraft to fly each mission and allowed those sent to take higher risks. For maritime attacks Iraq could send out groups of four or six aircraft, once the Mirage F1-EQs acquired from France became fully operational. The year began with Iraqi Air Force planes making an average of one maritime strike every three days in January 1985.[42]

In early May 1985, Iraqi Mirages hit two large tankers. They were the *Superior* and the *Energy Mobility*, which Iran shuttled from Kharg Island to Sirri, an island in the south-

central Persian Gulf. In all, Iraq sent nearly ten raids a month during May and June 1985 against the oil terminal at Kharg.[43]

An F1 attack on a tanker in August 1985 caused sixteen deaths. This was the highest single-ship casualty count in the war on civilian vessels. Iraq renewed its attacks on Kharg Island on August 15. Eight raids against the terminal followed between that date and September 17. These left the T-jetty with only two to four serviceable berths. On September 18 a tenth air strike set a North Korean tanker afire at the J-jetty. After the raid the ship either sank or was beached in a position blocking the pier. Kharg Island's civilian employees subsequently evacuated and the terminal was all but closed.[44]

Also in August 1985, the Iraqi Air Force demonstrated its expanded capability. It launched the first of a series of "thousand-mile" missions against Sirri and followed in November with a raid on Larak. To enable the Mirages to reach their targets, the Iraqis refueled them from turboprop An-12 transports equipped with palletized bladders. At the time of the first attack almost all of Iran's 1.4 million bpd export was going through the Sirri Island terminal. In that raid, on August 12, six Mirages used Exocets and laser-guided bombs. They destroyed the 233,788-ton Iranian supertanker *Azarpad*. Their attack also set fires on two other ships and the six-mile-long island that took two days to control. Iran responded by moving its tanker transfer site about fifteen miles northeast of Sirri where it was closer to coastal air defenses. The Khomeini government chartered the world's largest tanker, the 564,730-ton *Seawise Giant*, to provide a stable transfer platform. Since Iraq had hit five out of eleven of the tankers it was using in the Kharg-Sirri shuttle by August 8, Iran chartered nine more vessels and sent three major transfer ships to Larak, 125 miles further down the gulf. This moved these prime targets further away from Iraqi air bases.[45]

Achieving an aerial refueling capacity for its Exocet-equipped Mirages enabled Iraq to strike regularly the Sirri and Larak Island terminals and the ships loading there. At same time, the Iraqi Air Force retained the ability to strike at closer maritime targets such as the Kharg Island terminal and Iranian offshore oil platforms. By the end of 1985, Iraq claimed to have sent seventy-seven missions against Kharg Island. As a result, the island's preferred export level of 1.6 million bpd dropped to one million bpd. The shuttle from Kharg to Sirri could move only 300,000 bpd. This impact on Iran's economy was compounded because in the face of a worldwide oil glut and the difficulties buyers faced in obtaining its oil. Iran had to offer prices of $25 per barrel compared to an official price of $28. These factors in combination resulted in Iran receiving only 60 percent of its expected income from oil exports in 1985.[46]

Iran's initial reply to the devastating Iraqi assault on the foundations of its economy was to announce that it would diversify its oil export facilities by using terminals south of Busheir. It also purchased offshore mooring buoys to install northwest of Kharg Island, announced plans to open at new oil terminal at Ganaveh (northeast of Kharg), and to build pipelines to Lavan or Jask near the Strait of Hormuz. In June 1985 some of Iran's F-4 Phantoms previously used in shipping attacks relocated to Busheir. This enabled them to range farther north over the Gulf. The Khomeini regime also began boarding and searching all ships passing through the Strait of Hormuz. If its shipping was interrupted, said Iran, everyone else's maritime trade in the Gulf would suffer too. President Khomeini threatened on September 20, 1985, to close the Strait of Hormuz but this was never carried out. During October 1985 Iranian boarding parties inspected nearly 300 cargo ships. This harassment proved insufficient to create the international pressure needed to halt Iraq's raids on Iran's oil terminals and shipping.[47]

The renewed attacks on Kharg had cut temporarily the island's loading capacity by 30 percent. Iraqi Air Force pressure on the Kharg and Ganaveh terminals, coupled with

continued strikes on tankers carrying Iranian oil, reduced Iran's exports to 800,000 bpd. It also cost the Khomeini regime an estimated $60 million for chartered tankers used to store oil at various locations and ply the Kharg-Sirri shuttle route. The interdiction effort additionally demonstrated the versatility of the Exocet-equipped Mirages. In mid-September 1985, Iraq announced that the Mirages met all of its needs and returned its leased Super Étendards to France.[48]

Iraq used precision-guided munitions in four large-scale August 1985 air raids on the Kharg oil terminal. These were probably French ASM-30 laser-guided and radar-homing missiles. Contemporary reports indicated that the Iraqis attacked in two waves. The first aircraft to arrive over the island used French and Soviet electronic countermeasures equipment and anti-radiation missiles to suppress its Hawk batteries and Shilka surface-to-air missiles. The AS-30 flies at less than 300 feet above the earth's surface, has a 528-pound high explosive warhead, and is effective against hardened targets. Iraq had received AS-30s and their associated laser designator pods in November 1984. Waves of Iraqi fighter-bombers following the ECM aircraft launched these stand-off missiles at ranges of six to eight kilometers. Other aircraft each fired up to 144 68mm Brandt pre-fragmented rockets at other ground targets.[49]

Iraq struck at Iran's oil terminals and tanker shuttle again in September and October. By early November, air strikes had reduced oil shipments via the Kharg-Sirri shuttle by 30 to 50 percent. This forced Iran to start shipping oil from its strategic reserve of about fifteen million barrels held at Sirri and an additional 250,000 barrels held at Larak.[50]

The coming of 1986 did not ease Iran's situation. Saudi Arabia increased oil production to increase its own revenues and a crash resulted. The official price of oil plummeted from $28 to $14 per barrel between January and March of 1986. During the same period Iraqi-made air strikes against thirty tankers compared to seven attacked by Iran. On May 30 an Iraqi air raid against Kharg Island set new fires at the terminal's sixty-mile-square tank farm. Iraq's long-range air missions against Iran's oil facilities continued with strikes against Sirri Island on August 12, Lavan on September 7, and Kharg Island on September 16. Additional raids went to Kharg on September 29 and October 6. The latter mission temporarily closed the last two functional berths at the island's fourteen-tanker jetty. This again cut Iran's oil exports to about 800,000 bpd. Shuttle shipments fell so that twenty-five to thirty long-haul tankers were usually anchored off Larak waiting to load. In addition, Iran was forced to begin importing about 100,000 to 300,000 bpd of refined petroleum products. The result of the reinvigorated Iraqi air attacks was that at the end of 1986 Iran had an estimated oil revenue of $400 million per month versus $1.2 billion per month a year earlier. Iran began experimenting with tanker passive defense measures such as non-reflective paint. One ship, converted for oil transloading and with about $500,000 of defensive equipment, was destroyed even before it reached Larak. Its protective devices included reflective paint, radar reflectors at either end of the ship, chaff dispensers, and an electronic decoy system. Attacks on gulf shipping in 1986 totaled 105. This compared to 152 anti-ship strikes during the years 1981 through 1985.[51]

Iran responded to the Iraqi air attacks in several ways. It mined international waters. It began mounting night attacks on tankers using its small surface combatants to launch Sea Killer missiles. These sea skimmers had been sold to Iran before the fall of the Shah and could be mounted both on helicopters and surface ships. They accounted for several ships in night attacks made during throughout 1986. Besides its Phantoms and missile boats, Iran also used helicopters for shipping attacks. These were usually made in daylight by some of the Iranian Navy's rotary-wing aircraft based on Rostam Island, Abu Musa, and Sassan

Island just to the east of the Strait of Hormuz. The Agusta-Bell AB-212 helicopters had a combat radius of about sixty miles and could be adapted to fire AS-12, Maverick, or Sea Skimmer missiles. Iran also acquired a limited night air warfare capability in June 1986 when the AB-212 pilots got night vision goggles. This enabled them to fire their short-range wire-guided AS-12 missiles at maritime targets under the cover of darkness. The helicopters attacked a Greek freighter off Dubai in August and the British *Pawnee* in same vicinity on September 25, 1986. The helicopter threat was limited, however, because of the AB-212s' short range and endurance. In early November 1986, Kuwait asked Britain, China, France, the Soviet Union and the United States for help in dealing with this threat. The Kuwaitis wanted to either charter vessels from these nations or put their own ships under another country's flag. The Soviets said "yes." Three Soviet tankers began Persian Gulf operations under charter to Kuwait. Three Soviet minesweepers convoyed them. Earlier, the Soviets had sent fifty combat aircraft into Iran's airspace after a May 6 Iranian attack on a Soviet-flag vessel. Britain also chartered three tankers to the Kuwaitis and France said it would seriously consider Kuwait's request. The Chinese said that they would try to help, but had no tankers or warships in the Persian Gulf area. Then the United States, to keep Soviet influence in the Gulf from growing, offered to assist Kuwait. Both the U.S. and the U.S.S.R. declared that they would protect ships under their flags. This effectively put the two superpowers on Iraq's side, since only Iran was attacking shipping that was not en route to or from one of the two belligerents' ports.[52]

In 1987 the Iraqi Air Force continued its campaign against Iran's oil terminals and the tankers associated with them. On May 17, 1987, Iraqi aircraft attacked two tankers. The vessels were about thirty to forty miles north of the United States Navy frigate *Stark*, which was on radar picket duty in the southern Gulf. A few hours later another Iraqi Mirage launched two Exocets at the *Stark* from a distance of ten to twelve miles. A U.S. AWACS aircraft with a joint American-Saudi crew had tracked the F1-EQ as it flew south along the western edge of the Gulf toward the destroyer. Its track was not remarkable. During the previous nine months, more than 330 Iraqi missions had followed the same path before turning to search for or strike Iranian targets on the eastern side of the gulf. The AWACS aircraft alerted the *Stark* to the presence of the Iraqi plane. Standing operating procedures called for both Iranian and Iraqi aircraft to be considered potentially hostile, but the *Stark* did not immediately prepare for anti-air warfare. The frigate's air search radar acquired the F1 when it was only seventy miles away, although a passive electronic warfare (EW) device had identified the F1's Cyrano-4 target acquisition radar at about 9:05 p.m. local time. At this point the ship's Tactical Action Officer (TAO) ordered the *Stark's* own fire control system to lock on to the approaching plane but the ship's superstructure blocked the system's primary radar. The TAO then directed that a secondary radar to be used. When the Watch Supervisor alerted him that the Mirage had come within Exocet range, the TAO ordered the ship's Phalanx close-in weapons system, three-inch gun, Standard missile system, and Harpoon missiles to lock on to the aircraft. After the EW operator reported at 9:11 p.m. that the Cyrano had switched from search to lock mode, the TAO approved a request to prepare the ship's chaff launchers. The Cyrano radar switched from lock to search mode and back. About ten seconds after the Mirage's radar switched back to lock mode, the first Exocet hit the ship. A lookout spotted the missile. He later recounted seeing a small blue dot that became a fireball approaching from an angle of ten to thirty degrees to port off the bow. The sailor screamed "Inbound missile, inbound missile!" and hit the deck. When he did not hear an explosion, he got to his feet, only to be knocked down by the denotation of an Exocet's warhead. Both missiles fired on May 17 struck the *Stark* about 9:12 p.m. The first Exocet

entered the hull about six feet above the waterline. It hurtled through the forward berthing area, barber shop, mail room, radar and Combat Information Center equipment compartment, and punched its way out through the starboard side of the hull. A majority of the sailors killed in the missile attack died in the forward berthing compartment. The second missile hit the ship's superstructure below the bridge about thirty seconds later and exploded. The blast ruptured a fire main, made it impossible to steer the ship from the bridge, and threw several crew members overboard. Rescuers retrieved only five from the water. Iraq claimed that the attack, which left thirty-seven American sailors dead, was unintentional.[53]

This and Iranian counterattacks on neutral shipping led the United States, in May 1987, to reflag eleven Kuwaiti tankers. The reflagging provided a rationale for active American Navy protection of the ships as they plied Persian Gulf waters. At this point, Iran announced that it could make a distinction between the land war, which it would continue until victorious, and the "tanker war." It would halt the latter, if Iraq would stop assailing its oil assets. After a lull during which its air force briefly resurrected the "War of the Cities," Iraq renewed tanker attacks. On June 19-20 Iraqi aircraft hit the Iranian shuttle tanker *Tenacity* with an Exocet. This occurred just as Iranian oil exports had begun to approach Iran's Organization of Petroleum Exporting Countries (OPEC) authorized level of 2.3 million bpd for the first time and when tanker insurance premiums had been slightly reduced. The first U.S. Navy close escort of Kuwaiti-flagged tankers began on July 22, 1987. Tankers carrying Iranian oil continued to suffer. The shipping war intensified in early September. Iraqi planes struck tankers, oil facilities in the Gulf, and Iranian shore facilities and factories between August 29 and September 1. In one twenty-four-hour period, Iraq attacked seven ships while Iran hit two tankers. In all, twenty ships fell victim to air and surface attack between August 27 and September 3, 1987. On October 5, Iraq began a new series of raids on tankers loading near Larak. They hit the *Seawise Giant*, used as a transfer point, and may have damaged four more tankers. Between October 5-8, Iraq sent out up to fifty sorties a day in its maritime economic campaign. Both sides continued to attack shipping in November and December. These raids comprised 60 percent of all vessel attacks conducted by both sides in 1987. A United States Senate report subsequently estimated that a total of 162 ships was attacked in 1987. Other postwar analyses produced varying estimates of Iranian oil exports in 1987. The most conservative suggested that Iran was limited to shipping about 800,000 barrels of oil per day. This amount could not produce enough revenue to sustain the nation's infrastructure, much less finance a war.[54]

The Tanker War continued into 1988. About ninety ships suffered air attacks between January 1 and July 20, 1988. A notable one came on March 19 when Iraqi aircraft raided Kharg, burned two tankers, and killed forty-six sailors. On May 14, 1988, Iraqi aircraft hit five tankers at Larak. Fifty-three sailors died in the raid. On July 31, 1988, Iraq announced an end to its attacks on shipping, but a final strike occurred on August 4. Since the beginning of the "Tanker War" in May 1981, both sides had attacked a total of about 540 ships.[55]

The eight-year war had exhausted the two belligerents. Both Iraq and Iran probably welcomed the international pressure that pushed them into a grudging armistice in the summer of 1988. On August 20, a United Nations-sponsored cease-fire went into effect. A United Nations observer group took up stations along the Iran-Iraq border. Direct talks between Iran and Iraq began in Geneva on August 25.[56]

Neither Iran nor Iraq achieved their war aims. Iraq had anticipated a brief two-week campaign in 1980 that would take advantage of an Iran in chaos. Instead, its invasion provoked an exhausting and expensive conflict. At times it threatened Iraq's national survival. The Hussein regime ended the war with more than $40 billion in war debts, but as

one of the strongest military powers in the region. On August 2, 1990, Iraq would move into Kuwait, trying once again to use its military for invasion of a neighbor. Again, the results were catastrophic for Iraq. Iran was, at the end of the Iran-Iraq War, more than $650 billion in debt, absolute poverty had spread to between 65 and 75 percent of its total population, and 40 to 60 percent of its military equipment which it had at the outset of the war was destroyed, captured, or damaged. Equipment purchased up to 1979 from the United States by the Shah's government that was not otherwise damaged had become unserviceable and needed to be replaced. The cost of rebuilding its oil installations alone was estimated to exceed $25 billion.[57]

The Iraqi air campaign against Persian Gulf shipping achieved its two goals: disruption of Iran's economy and internationalization of the war. One analyst described it as the only instance in which air power alone conducted a successful economic blockade.[58]

The execution of that blockade, however, must be evaluated in context. One of the most important factors influencing Iraq's success was attaining air supremacy. By 1984, when the "Tanker War" was initiated in earnest, the Iranian Air Force no longer had the resources to contest attacks on marine oil terminals and shipping in the Persian Gulf. Four years of war also brought Iraq to the point of acquiring at least twenty Mirage F-1s configured for anti-shipping work and employing them efficiently. The helicopters armed with precision munitions led the way, but were limited by range and endurance. The five Super Étendards leased from France in 1983 provided additional role models. They were not present in sufficient numbers or employed effectively enough to achieve all that was desired. The Iraqis used the SÉs very conservatively. Students of the conflict give two reasons for this. The first was political control that inhibited exposing the aircraft to high risks. The second was the state of training in the Iraqi Air Force. It took an almost concurrent relaxation of political controls, French and Indian training of Iraqi pilots, and acquisition of new aircraft to provide Iraq with a potent land-based aerial force that could be consistently effective in a maritime campaign. Even then, Iraq applied the force in an "on-again, off-again" manner that took into consideration the sensibilities of its covert supporters in the Arab world. The air-sea campaign reflected the escalation techniques that had failed the United States so miserably in the Vietnam War. Nevertheless, it did succeed (in combination with assaults on inland oil facilities) in devastating Iran's petroleum-based economy. The strategy also drew the world's strongest military powers into the conflict as covert supporters of Iraq and intensified international pressure to end the war.

Endnotes to Chapter VII

1. Sreedhar Kapil Kaul, *Tanker War: Aspect of Iraq-Iran War 1980-1988* (New Delhi, India: ABC Publishing House, 1989), p. 1. Kaul developed his estimate of the total number of 437 ships attacked from a review of *News Review on West Asia* and *Middle East Economic Survey*. Lloyds Shipping Corporation estimated “more than 500 ships.” Cmdr (JAG) David L. Peace, USN, "Major Maritime Events in the Persian Gulf War," *Proceedings of the 82nd Annual Meeting of the American Society of International Law* (Washington, D.C.: American Society of International Law, 1990), p. 147.
2. Capt Thomas M. Daly, USN, "The Enduring Gulf War," *United States Naval Institute Proceedings, Naval Review* (1985): 152.
3. Tom Baranuskas, "Air Power in the Iran-Iraq War," *Asian Defence Journal* 3 (March 1987): 52; Victor Flintham, ed., *Air Wars and Aircraft*: *A Detailed Record of Air Combat*, 1945 to the Present (New York: Facts on File, 1990), p. 171.
4. Baranuskas, "Air Power in the Iran-Iraq War," p. 54; Richard P. Hallion, *Storm Over Iraq* (Washington, D.C.: Smithsonian Institution Press, 1992), p. 128; Maj. Douglas A. Kupersmith, USAF, *The Failure of Third World Air Power: Iraq and the War with Iran* (Maxwell AFB, Ala.: Air University Press, 1993), p. 20.
5. Kupersmith, USAF, *The Failure of Third World Air Power: Iraq and the War with Iran*, p. 2.
6. *Ibid*., p. 20.
7. Baranuskas, "Air Power in the Iran-Iraq War," p. 54; William O. Staudenmaier, "A Strategic Analysis," in Shirin Tahir-Kheli and Shaheen Auybi, eds., *The Iran-Iraq War: New Weapons, Old Conflicts* (New York: Praeger, 1983), p. 42.
8. Robert Gaunt, "War in the Shallow Seas-Maritime Air Operations in the Iran-Iraq War," *Defense & Foreign Affairs* 13 (October 1985): 28-29.
9. Cmdr William L. Dowdy III, USNR, "Naval Warfare in the Gulf: Iraq Versus Iran," *United States Naval Institute Proceedings* (June 1981): 114.
10. *Ibid*., p. 115. Iraq claimed to have destroyed six of Iran's eight frigates, but Iran subsequently had as many as three patrolling the Strait of Hormuz simultaneously. Iran claimed to have destroyed 20 Iraqi missile patrol boats, but Iraq started the war with only 14 of these craft. Confusion over the types of vessels engaged and the results of combat, are not unusual in naval battles, particularly when some of the reporting is provided by aerial forces not trained for air-sea warfare.
11. Shahram Chubin and Charles Trip, *Iran and Iraq at War* (Boulder, Colo.: Westview Press, 1988), p. 134.
12. Raphael Danziger, "The Persian Gulf Tanker War," *United States Naval Institute Proceedings, Naval Review* (1985): 163; Dowdy, "Naval Warfare in the Gulf: Iraq Versus Iran," p. 115; Daly, "The Enduring Gulf War," p. 153; Peace, "Major Maritime Events in the Persian Gulf War," p. 147; David Segal, "The Iran-Iraq War: a Military Analysis," *Foreign Affairs* 66 (5) (1988): 959. Middle East politics, however, resulted in Kuwait selling 400,000 bpd of oil on behalf of Iraq. Saudi Arabia and Jordan also allowed cargo bound for Iraq to pass through their ports.
13. Segal, "The Iran-Iraq War: a Military Analysis," p. 959; Anthony H. Cordesman, *The Iran-Iraq War and Western Security: Strategic Implications and Policy Options* (New York: Jane's Publishing, Inc., 1987), p. 81.
14. Cordesman, *The Iran-Iraq War and Western Security*, pp. 55-65.

15. John D. Morocco, "Missile Attack, Kuwait Pact Could Draw U.S. Into Gulf War," *Aviation Week & Space Technology* 126(21) (May 25, 1987): 23-24.
16. Danziger, "The Persian Gulf Tanker War," p. 161.
17. Chubin and Trip, *Iran and Iraq at War*, pp. 292-94; Peace, "Major Maritime Events in the Persian Gulf War," p. 147.
18. John Bulloch and Harvey Morris, *The Gulf War: Its Origins, History, and Consequences* (London: Methuen, 1989), p. 173; Anthony J. Watts, "The Gulf War: Economic War at Sea," in A. J. Ambrose, ed., *Jane's Merchant Shipping Review* (New York: Jane's Publishing, Inc., 1985), p. 99.
19. A. D. Bartlett III, "Combat Fleets," *Naval Institute Proceedings* 122 (10/1,112) (October 1996): 94; *Military Technology* 12 (January 1988): 247. The Italian Navy eventually took over the four frigates while Italian courts turned over custody of the other vessels to Fincantieri, the shipbuilder.
20. Watts, "The Gulf War: Economic War at Sea," pp. 97-98; Chubin and Trip, *Iran and Iraq at War*, p. 209; Gaunt, "War in the Shallow Seas-Maritime Air Operations in the Iran-Iraq War," p. 159; United States Congress, House of Representatives, Committee on Foreign Affairs, *Overview of the Situation in the Persian Gulf: Hearings and Markup on the Committee on Foreign Affairs*
and Its Subcommittees on Arms Control, International Security, and Science and on Europe and on the Middle East (Washington, D.C.: United States Government Printing Office, 1987), p. 5.
21. Thomas J. Abercrombie, "The Persian Gulf," *National Geographic* 173 (5) (May 1988): 653; Daly, "The Enduring Gulf War," pp. 150, 155-56.
22. Daly, "The Enduring Gulf War," p. 152; United States Congress, House of Representatives, Committee on Foreign Affairs, *Overview of the Situation in the Persian Gulf*, pp. 1, 5.
23. Cordesman, *The Iran-Iraq War*, p. 66; Edgar O'Ballance, *The Gulf War* (London: Brassey's Defence Publishers, 1988), p. 154.
24. Ambrose, *Jane's Merchant Shipping Review*, p. 99; Nick Cook, "Iran-Iraq, the Air War, *International Defense Review* (November 1984): 1605. Cook explains that translation from Arabic to English resulted in confusion of terms, as "bahria," which in Arabic literally means "of the sea" was usually translated Iraqi State Radio shipping attack reports as "naval," which is only one of its meanings.
25. Ambrose, *Jane's Merchant Shipping Review*, p. 100; Jan S. Breemer, "The Persian Gulf: The Tanker War," *Sea Power* 28 (April 15, 1985): 53.
26. Ambrose, *Jane's Merchant Shipping Review*, pp. 100-1; Cordesman, *The Iran-Iraq War*, p. 66; Daly, "The Enduring Gulf War," p. 157; Capt John Moore, RN, ed., *Jane's Naval Review* (New York: Jane's Publishing, 1985), p. 58. Some accounts state that the *Filikon L.* was a tanker, but *Jane's*, which identifies the ship as a bulk carrier, has been accepted as authoritative.
27. Kaul, *Tanker War: Aspect of Iraq-Iran War 1980-1988*, p. 7; United States Congress, House of Representatives, Committee on Foreign Affairs, *Overview of the Situation in the Persian Gulf*, p. 8.
28. Ambrose, *Jane's Merchant Shipping Review*, pp. 100-1; Baranauskas, "Air Power in the Iran-Iraq War," p. 55; Breemer, "The Persian Gulf: the Tanker War," p. 53; Cordesman, *The Iran-Iraq War*, p. 107; Danziger, "The Persian Gulf Tanker War," p. 165; Gaunt, "War in the Shallow Seas-Maritime Air Operations in the Iran-Iraq War," p. 30; Moore, *Naval Review*, 1985, p. 58.

29. Baranuskas, "Air Power in the Iran-Iraq War," p. 55; Breemer, "The Persian Gulf: the Tanker War," pp. 55-56; Cordesman, *The Iran-Iraq War*, p. 68; Danziger, "The Persian Gulf Tanker War," pp. 166-67.
30. Breemer, "The Persian Gulf: the Tanker War," p. 50; Cordesman, *The Iran-Iraq War*, p. 66.
31. Breemer, "The Persian Gulf: the Tanker War," pp. 55-56.
32. *Ibid*., pp. 50, 55; Dilip Hiro, *The Longest War: The Iran-Iraq Military Conflict* (New York: Routledge, 1988), pp. 129, 166; Lisa Manetti, *Iran and Iraq: Nations at War* (New York: Franklin Watts, 1986), p. 50.
33. Ambrose, *Jane's Merchant Shipping Review*, pp. 101-2.
34. Bullock and Morris, *The Gulf War: Its Origins, History, and Consequences*, p. 172; Cordesman, *The Iran-Iraq War*, p. 67; Hiro, *The Longest War*: *the Iran-Iraq Military Conflict*, p. 131.
35. Cordesman, *The Iran-Iraq War*, p. 67.
36. *Ibid*..
37. Bullock and Morris, *The Gulf War: Its Origin, History, and Consequences*, p. 176; Danziger, "The Persian Gulf Tanker War," p. 162.
38. O'Ballance, *The Gulf War*, pp. 184-85.
39. Chubin and Trip, *Iran and Iraq at War*, p. 135.
40. Gaunt, "War in the Shallow Seas-Maritime Air Operations in the Iran-Iraq War," p. 30.
41. Cordesman, *The Iran-Iraq War*, p. 85.
42. Baranuskas, "Air Power in the Iran-Iraq War," p. 55; Cordesman, *The Iran-Iraq War*, p. 100; Maj. Stephan C. Pelleiter, USA, and Lt. Col. Douglas V. Johnson III, *Lessons Learned from the Iran-Iraq War* (Carlisle Barracks, Pa.: Army War College, Strategic Studies Institute, 1991), p. 108; United States Congress, House of Representatives, Committee on Foreign Affairs, *Overview of the Situation in the Persian Gulf*, p. 6.
43. Cordesman, *The Iran-Iraq War*, pp. 100-1.
44. G. H. Jansen, "Taking Out Kharg," *Middle East International*, No. 259 (Sep. 27, 1985), no page number.
45. Baranuskas, "Air Power in the Iran-Iraq War," p. 59; Cordesman, *The Iran-Iraq War*, p. 106; "In Harm's Way; Iraqi Pilots Strike Hard at Iran," *Time* 128 (Aug. 25, 1986), p. 40.
46. Chubin and Trip, *Iran and Iraq at War*, p. 135.
47. *Ibid*.; Cordesman, *The Iran-Iraq War*, pp.84-85; O'Ballance, *The Gulf War*, p. 171.
48. Chubin and Trip, *Iran and Iraq at War*, p. 136; Cordesman, *The Iran-Iraq War*, p.75, p. 81; Gaunt, "War in the Shallow Seas-Maritime Air Operations in the Iran-Iraq War," p. 31.
49. Cordesman, *The Iran-Iraq War*, pp. 81-82.
50. *Ibid*., p. 84; Chubin and Trip, *Iran and Iraq at War*, p. 173; 51. Sharough Akhavi, "Institutionalizing the New World Order in Iran," *Current History* 86 (571) (February 1987): 55; Frederick W. Axelgard, "Iraq and the War with Iran," *Current History* 86 (571) (February 1987): 59; Cordesman, *The Iran-Iraq War*, pp. 111-12.
52. Bullock and Morris, *The Gulf War: Its Origins, History, and Consequences*, pp. xxii-xvii; Cordesman, *The Iran-Iraq War*, p. 107, p. 132; Anthony Cordesman, *The Gulf and the West: Strategic Relations and Military Realities* (Boulder, Colo.: Westview Press, 1988), p. 347; O'Ballance, *The Gulf War*, pp. 182-83, 204-5; United States Senate, Subcommittee on Defense, Committee on Appropriations, *U.S. Presence in the Persian Gulf: Cost and Policy Implications* (Washington, D.C.: United States Government Printing Office, January 1988), pp. 8-9.

53. John D. Morocco, "Missile Attack, Kuwait Pack Could Draw U.S. Into Gulf War," p. 24; United States Senate, Committee on Foreign Relations, *War in the Persian Gulf: the U.S. Takes Sides: A Staff Report* (Washington, D.C.: United States Government Printing Office, 1987), pp. 12-19; United States Congress, House of Representatives, Committee on Foreign Affairs, *Overview of the Situation in the Persian Gulf* (Washington, D.C.: United States Government Printing Office, 1987), pp. 3-13.
54. Cordesman, *The Gulf and the West*, pp. 395, 410, 421; Pelletiere and Johnson, *Lessons Learned from the Iran-Iraq War*, p. 108; United States Senate, Subcommittee on Defense, *U.S. Presence in the Persian Gulf: Cost and Policy Implications*, p. 6.
55. Ami Ayalon and Haim Shaked, eds., *Middle East Contemporary Survey*, Vol. XII (1988) (Boulder, Colo.: Westview Press, 1990), p. 211; Chubin and Trip, *Iran and Iraq at War*, p. 61, pp. 299-300; Cordesman, *The Gulf and the West*, p. 430.
56. "Iran-Iraq Cease-fire: UN Conducts Peace Talks in Geneva, New York," *UN Chronicle* 25(4) (December 1988): 1.
57. Dariush Zahedi and Ahmad Ghoreishi, "Iran's Security Concerns in the Persian Gulf," *Naval War College Review* XLIX, No. 3 Sequence 355 (Summer 1996): 76, 82; "Inshalla, it's over," *The Economist* 308 (7563) (August 13, 1988): 33.
58. Segal, "The Iran-Iraq War: A Military Analysis," p. 960.

CHAPTER VIII

COLD WAR APPLICATIONS

The Union of Soviet Socialist Republics and the United States both ultimately developed significant applications of land-based aerial forces to maritime operations during their long and bitter Cold War (1947-1990). They did so in varying ways, for different purposes and historical reasons. This examination focuses on the development of land-based aerial forces for surveillance of and strikes against surface ships. Antisubmarine warfare, in an era of true submersibles, requires coordinated surveillance in three dimensions and lies beyond the scope of this chapter.

The USSR was a continental power. Its fundamental naval requirement was to prevent hostile naval forces from approaching close enough to its shores to launch aircraft that could raid or amphibious forces that could invade the homeland. Soviet naval missions of force projection and presence were secondary to that basic requirement. These conditions had existed since the founding of the Soviet Union in 1917. Because of that background, the USSR historically had little impetus to develop sea-based aviation. There is little evidence to suggest that this past lack of involvement with sea-based aviation would have prevented the USSR from developing an aircraft carrier force if it had needed one.

The United States, in contrast to the USSR, was and is a maritime power. Its fundamental naval requirement is multifaceted. US naval elements have not only to protect sea lanes of communication that connect it with allies, but also to project force in areas of the world that are inaccessible to its land-based air and ground units. These geopolitical conditions have been present for most of the United States' existence. Because of them, the United States took the lead in developing sea-based aviation almost from the inception of military aviation. The precedent set by the great carrier battles of World War II in the Pacific and the postwar struggles to define and establish an independent air force did influence the composition of US forces during the Cold War. The United States could, if national survival required it, have developed more extensive land-based aerial forces for maritime operations.

The Cold War rarely involved direct combat between armed forces of the two superpowers. Instances that occurred were usually limited to destruction of reconnaissance aircraft that violated national air space. The Cold War did entail included constant search, surveillance, and simulated strike and defense exercises between land-based air and naval units. For a variety of reasons, however, the lessons of World War II about the usefulness of land-based aviation in maritime operations were not immediately applied to the Cold War by either side.

Soviet Land-Based Maritime Aerial Forces

It was only in the early 1950s, several years after the onset of the Cold War, that analysis of the nuclear threat posed by U.S. fast carrier groups triggered an expansion of Soviet Naval Aviation (SNA) and the maritime capabilities of Soviet Long Range Aviation (SLRA). Prior to this time SNA consisted of fighters and light bombers suitable for coastal defense. In the face of the new nuclear threat, the Soviets searched for alternative defenses. They decided to rely on long-range cruise missiles launched from small-to-medium size surface ships, diesel submarines, and land-based aircraft to destroy American carriers. In 1954 Soviet Premier Nikita Khrushchev and Marshal Georgii Zhukhov agreed to transfer several hundred land-based bombers to the Soviet naval air force.[1]

After the U.S. launched its first *Forrestal*-class carrier in 1955 and assigned carrier aircraft a nuclear strike mission, the Soviets carried out the Khrushchev-Zhukhov decision. That year SNA received its first regiment of Tu-16 (Badger) twin-jet medium range bombers and their aircrews from Long Range Aviation. The slender and graceful Badgers thereafter became a familiar sight to NATO naval personnel. The Tu-16s initially had the capacity only to drop free-fall bombs. By 1961, some (Badger Bs) carried AS-1 Kennel anti-ship cruise missiles with ranges of more than 50 miles. Each Badger B could carry two missiles. Other Tu-16s (Badger Ds) had electronic gear that enabled them to guide air-to-surface missiles. The Badgers had a combat radius of about 2,000 miles unrefueled. Four-engine Tu-95 Bear D turboprop aircraft (range 7,800 miles) and M-4 Bison C turbojet aircraft (range 7,000 miles) dedicated to maritime reconnaissance complemented the Tu-16 strike force. The huge Bears, reminiscent of an enlarged World War II-vintage bomber, proved to be an effective and durable aircraft. The Bison, with two jet engines mounted on each wing, first flew in 1953. Soviet Naval Aviation received its first Tu-95 Bears in the early 1960s. Although they could have been armed with AS-2 (Kipper) air-to-surface missiles like the Badger C, the Tu-95s were not. Instead, the Soviet Union's naval air force focused them on reconnaissance, surveillance, and mid-course targeting for missiles launched from the Badgers. Other SNA aircraft included twin-engine Be 10 and 12 amphibians configured for antisubmarine warfare (ASW), Il-28 light jet bombers equipped to carry torpedoes, helicopters with an ASW role, and a number of transports. Fighter and light attack aircraft, which had formerly constituted SNA's main strength, transferred to the Soviet Air Force's air defense command.[2]

In the 1960s SNA had about 750 aircraft committed to anti-carrier and antisubmarine warfare. Of these, approximately fifty fixed-wing and 100 helicopters were dedicated to ASW. Another 100 fixed-wing aircraft had long-range reconnaissance and refueling missions. By 1969, the total number of Soviet naval aircraft had declined to 350, but many were armed with AS-4 (Kitchen) air-to-surface missiles, which had ranges of up to 285 miles at high altitude and 185 miles at low altitude. The nearly ten-foot-long Kitchen could carry either a 350-kiloton nuclear warhead or a 2,200-pound high explosive warhead at a maximum speed of Mach 4.6.[3]

Soviet naval aviation personnel totaled about 59,000. SNA personnel trained in Soviet Air Force schools. A year's orientation at Nikolayev Naval Air Base, on the Black Sea, followed graduation. Naval air units organized as regiments, which reported to an air division commander. That officer, in turn, reported to a Fleet Commander of Naval Aviation whose superior was the Fleet Chief of Staff. Most SNA strike aircraft were assigned to the Northern Fleet and based on the Kola Peninsula. They were primarily a threat to North Atlantic Treaty Organization (NATO) operations in the Norwegian Sea.[4]

SNA aircraft gradually assumed a worldwide role. Tu-16s flew to Egypt's Cairo West airfield for the first time in April 1968. Il-38 May ASW aircraft also operated after that from Cairo West and Mersa Matruh on the Mediterranean coast. The four-engine turboprop Mays looked much like a civilian airliner except for the large radar dome under the forward fuselage and a Magnetic Anomaly Detector (MAD) stinger protruding from the tail. Before Egyptian President Anwar Sadat canceled Soviet basing rights in Egypt in July 1972, the Soviets used the Egyptian airfields to conduct reconnaissance and surveillance over the eastern Mediterranean. Guinea, on Africa's west coast, gave Soviet Naval Aviation landing rights in 1973. Pairs of Tu-95s deployed periodically to Conakry, Guinea's capital, from the Kola Peninsula. Bears also operated out of Luanda, Angola, beginning in 1977. Luanda was beyond nonstop range for the Tu-95s, so Bears deploying to Angola after SNA rights in Guinea were canceled staged through Cuba. A pair of An-12 Cubs carrying spare parts, repair

equipment, and specialist personnel supported the deployed Bears. Doors in the bottom of the fuselage that allowed loading from trucks on the ground or air dropping of supplies characterized the four-engine turboprop transport. When the long-range reconnaissance aircraft flew simultaneously from Olenegorsk, Cuba, and Angola, the Soviets had comprehensive coverage of NATO naval activity in the North and South Atlantic.[5] The SNA also received basing rights in Somalia, on Africa's east coast. The Somalis asked the Soviets to leave in 1977. Thereafter Soviet Naval Aviation deployed reconnaissance aircraft to Aden and Ethiopia for Indian Ocean patrols.[6]

Soviet Naval Aviation maritime reconnaissance and surveillance also quickly moved into the Western Hemisphere. In April 1970, a pair of Bear Ds flew nonstop from their base on the Kola Peninsula above the Arctic Circle to Cuba. This initial deployment to North America took place in connection with the Soviet Navy's first worldwide exercise, "Okean 70." The first two Bears landed at Havana's Jose Marti Airport on April 18. A second pair of Bears landed in Cuba on April 25 and a third pair landed on May 13. Other Bears followed to establish a reconnaissance route off North America's Atlantic coast. Typical missions departed Olenegorsk on the Kola Peninsula, flew over the Norwegian Sea and through the Greenland-Iceland-United Kingdom (GIUK) gap. They penetrated the U.S. Atlantic Coastal Air Defense Identification Zone (ADIZ) near Newfoundland. During these flights the Soviet crews monitored electronic signals and radio transmissions, took photographs, and recorded radar images. They also noted U.S. response time, type of responding aircraft, and significant markings and other data of interceptor aircraft. After the initial deployments, Olenegorsk-Cuba reconnaissance flights occurred during times of increased U.S.-USSR tensions or major U.S. or NATO naval exercises. Once in Cuba, Soviet naval air force planes operated from San Antonio de los Banos military airfield southwest of Havana. From there they conducted tactical reconnaissance missions along the east coast of the United States and over the Caribbean. The tactical flights reflected interest in the activities of U.S. Navy surface ships, particularly aircraft carriers. In the mid 1970s a possibility arose that Chile might allow Soviet naval aircraft to stage from there, but it disappeared when a coup overthrew the Allende regime. Bears began conducting surveillance missions of the U.S. Seventh Fleet from Vietnam's Cam Rahn Bay and Da Nang airfields in the late 1970s.[7]

The 1970s saw a significant increase in Soviet Naval Air Force capabilities. In 1973, SNA received Tu-142 Bear Fs. This updated ASW version of the Tu-95 had a radius of 3,500 miles unrefueled. New submarine detection devices, advanced sonobuoys, and magnetic anomaly detection (MAD) equipment enhanced its capabilities.[8]

The Tu-22M[****] Backfire bomber joined the SNA inventory in late 1974. For the first time, Soviet Naval Aviation received delivery of a new aircraft at the same time as Long Range Aviation. Aircraft coming off the production line were split equally between SNA and LRA. By May of 1976, eighty Backfires were operational. Deliveries of Backfires to naval aviation continued at the rate of about fifteen per year. Those sent to SNA had a primary anti-ship mission, while those sent to LRA had a collateral anti-ship mission. The swept-wing twin-engine jets could operate at low altitude, attain transonic dash speed, and reach an unrefueled range of 3,240 miles. The Backfire's top speed at high altitude was 1150 knots and 600 knots at sea level. Its armament included two AS-4 or AS-6 (Kerry) cruise missiles. The Kerry had speeds between Mach 2.5 (2,500 miles-per-hour) to 3.5 and a range of at least 300

[****]U.S. intelligence analysts first designated the Backfire as "Tu-26," but later accepted the Soviet nomenclature of "Tu-22M" as presented in arms control talks.

nautical miles. The Kitchen could fly as a drone, skimming across the water, or as a ballistic missile with a rocket's trajectory. The Kerry had an active radar homing system and could carry either nuclear or conventional warheads in its anti-ship configuration.[9]

Air refueling offered the possibility of extending a Backfire's radius by as much as 1,000 miles. This would have permitted interdiction of European sea lanes from northern Russia via the Denmark Strait. A typical scenario proposed by defense writers of the time suggested that Backfires could depart bases on the Kola Peninsula and climb to an optimum cruising altitude and speed of 30,000 feet and about 500 knots. As they approached the gap between the Faeroes and Iceland, they would drop to 8,000 feet to avoid radar detection. On reaching a rally point preparatory to launching an attack on a satellite, Badger, or Bear-located NATO convoy, the Backfires would quickly climb to 45,000 feet and power-up to a speed of 1,000 knots. At a range of 150 nautical miles, a formation of thirty Backfires could fire sixty missiles that would quickly overwhelm a convoy's point defense weapons. As the missiles traveled toward their targets at supersonic speed, the Backfires could reverse course and outrun any intercept aircraft launched from a convoy's escort carrier. In the Pacific, Backfires could roam almost at will over the sea lanes between North America and Japan, beyond the reach of any land-based intercept aircraft.[10]

Halfway through the 1970s Soviet naval aviation had 1,200 aircraft, 50,000 people, and a greater combat strength than Britain's Royal Air Force. In "Okean 75," Soviet commanders used satellites and global communications to move their air and naval units against simulated naval and land forces worldwide. The exercise involved more than 200 Soviet nuclear submarines, a number of surface ship task groups, and 400 aircraft. The aircraft operated from bases in the Soviet Union, Cuba, Guinea, and Somalia. While Badgers flew close to Eurasian shores, Bears conducted long-range reconnaissance missions. Soviet naval aircraft flew over the North Atlantic, the North Pacific, and the northeastern part of the Indian Ocean. Soviet Naval Aviation had demonstrated its ability to reach ships almost anywhere in the Indian Ocean, Mediterranean, Norwegian Sea, and North Sea. Tactics used in its exercises reflected plans for coordinated mass air strikes and submarine attacks against Allied carrier battle groups. Tu-126 Moss airborne command, control, and communications (AWACS) aircraft enhanced the capabilities of the SNA aircraft. The AWACS planes belonged to the Soviet Air Force, but frequently operated over water in maritime reconnaissance missions.[11]

The North Atlantic phase of Okean '75 began with aircraft and satellite reconnaissance. Then Il-38 Mays flew antisubmarine patrols to clear the way for a cruiser group supported by naval aircraft that entered the Norwegian Sea from the north. Another Soviet force sailing northeast from Iceland simulated NATO forces. The mock combat ended when Soviet Naval Aviation strike aircraft launched live missiles that received in-flight guidance from other planes. In the Pacific, Okean '75 was primarily a command, control, and communications exercise. Bears, Mays, and satellites communicated data to Berbera, Somalia, Soviet naval vessels in the Indian Ocean, and Moscow.[12]

By 1977 Soviet Naval Aviation deployed more than 600 combat aircraft. Of these, 275 to 280 were Badgers configured for strike missions. The majority carried the AS-5 Kelt missile with a range of 176 nautical miles. About fifty were the new Tu-22M Backfires armed with AS-4 Kerry missiles. The remainder of SNA's strike planes was a mix of short-range Il-28 Beagle and Tu-22 Blinder bombers, long-range Tu-95 Bears, and Su-19 Fencer and Mig-23 Flogger fighter-bombers. The Blinders, of which there were about forty, carried free-fall bombs. Another 200 Badgers and Bears equipped for tanker, reconnaissance, and electronic warfare missions supported the attack aircraft. Some 170 fixed wing and 270 rotary wing

aircraft fulfilled antisubmarine warfare requirements. The open ocean component of the Soviet Naval Air Force's ASW effort consisted of about fifteen Tu-95s, fifty-five Il-38s, and 100 Be-12s. About 200 land-based helicopters provided ASW coverage close to Soviet coasts.[13]

The Soviet Naval Air Force deployed all but a quarter of its attack aircraft and their supporting cohorts in the Northern, Baltic, and Black Sea Fleets. The Northern Fleet had 80 strike aircraft; the Baltic Fleet 130 fighter and strike aircraft; the Black Sea Fleet had 110 fighter and strike aircraft; and the Pacific Fleet had 100 strike aircraft.[14] Addition of the Su-17 Fitter C strengthened SNA's fighter inventory in late 1977 or early 1978. Western analysts suggested that this swing-wing jet fighter-bomber, able to carry about carry 8,000 pounds of ordnance and capable of Mach 2-plus speed, might be used for support of Soviet naval infantry in operations on the Baltic. The Fitters, armed with missiles and rockets, were also capable of short-range anti-ship strikes. They could carry ten AS-7 air-to-surface missiles, or thirty-two 57-mm rockets, or bombs, in addition to two 30-mm cannon. Their laser range finders and automatic fire control systems gave them the capability to operate in conditions of low ceilings and poor visibility.[15]

Soviet Naval Aviation's primary mission remained the destruction of NATO carrier task groups which could threaten its homeland. Secondary missions included destruction of other enemy surface ships, interdiction of sea lanes, and destruction of maritime facilities such as ports and naval bases. It was impossible by the end of the 1970s for ships to sail from the United States to northwestern Europe or Japan without coming within reach of Soviet Naval Aviation's Backfires and Bears.[16]

SNA's expanded capabilities enabled it not only to increasingly threaten Western naval forces and shipping. They provided expanded protection for Soviet Navy vessels as they maneuvered all over the globe. In the Far East, Japanese Self Defense Force planes scrambled nearly 650 times between 1976 and 1980 when Soviet planes penetrated the Japanese Air Defense Identification Zone. Many of these penetrations occurred as SNA aircraft escorted Soviet Pacific Fleet surface ships and submarines from their bases on the Kamchatka Peninsula to the open sea.[17]

The last decade of the Cold War saw even more maritime activity by Soviet land-based aerial forces. By 1981, Soviet Naval Aviation had about seventy-five Backfire aircraft. Western defense writer and naval expert Norman Polmar announced that they were the "major Soviet threat to the US surface fleet." At this time only the U.S. Navy's F-14 Tomcat coupled with the Phoenix/AWG-9 missile and Aegis shipboard radar/missile system were considered likely to be effective against the Backfires. But only seven of the Navy's thirteen carriers had F-14 squadrons and the first Aegis ship was not expected to be completed until 1982. When Aegis cruisers (and later Aegis destroyers) did come on-line in the mid-1980s, a carrier battle group's defense scenario against Backfires and ALCMs was complex. Aegis radar operators watched for contacts at a distance of 400 miles from the center of the battle group. The Backfires had to be detected far enough away for contact information to be processed, decisions made, orders issued, and, if needed, the launch of additional intercept planes. F-14 Tomcats flying combat air patrol (CAP), directed by one or two airborne E-2C Hawkeyes, had to intercept the incoming aircraft before they could launch their missiles at a distance of 200 miles or more from the battle group. If the intercepting aircraft failed to prevent the launch of Soviet air-to-surface missiles, the Aegis cruisers and other vessels escorting the battle group's carrier could fire Standard SM2 anti-aircraft missiles. The SM2s, with a range of sixty miles, could knock down incoming missiles. Other SNA medium and long-range aircraft in 1981 included 410 Tu-16 Badgers, 113 Tu-95 Bears, seventy-four M-4 Bisons, sixty Il-38 Mays, and twelve Tu-126 Moss (AWACS).[18]

Western intelligence analysts had predicted that the Soviet Navy would conduct "Okean 80," an updated worldwide naval exercise which would expand on the activity of "Okean 75." It did not take place. Instead, in 1981, the Soviets conducted "Zapad 81." This exercise took place in the Baltic during July and August. It drew participants from all Soviet fleets and the Soviet Air Force. Air operations involved Backfires, Badgers, and Fitter Cs plus Forgers from the Soviet VSTOL (Vertical/Short Takeoff and Landing) carrier *Leningrad*. The maneuvers emphasized inter-service mutual support, amphibious assault, and testing of new hardware under simulated combat conditions.[19]

Also in 1981, Bear Ds deployed permanently for the first time to Cuba. This increased the ease and frequency with which they could conduct electronic-intelligence gathering and reconnaissance missions along America's Atlantic coast. This was the year, too, that SNA aircraft flew for the first time to Syria. After an initial deployment in June, Badgers, Mays, Cubs, and Classics (Il-68 electronic warfare planes) continued to operate from Syrian fields. Soviet naval air force Badgers and Mays staged from Syria in July 1981 to participate in a Soviet-Bulgarian air and naval exercise west of Crete. In the same month, two Mays flew from Syria to Libya, marking SNA's first deployment to that country.[20]

The Soviet's Union's Pacific Fleet appeared by 1982 to have acquired a regiment of the capable Backfires.[21] A Soviet Naval Aviation training evolution that year involved eight Backfires that staged two practice attacks on the U.S. carriers *Enterprise* and *Midway* as they steamed across the North Pacific. The Tu-22Ms made a high speed approach to the carriers and simulated the launch of their air-to-surface missiles at a distance of more than 120 miles.[22] On September 14, 1982, Japanese radar located a flight of eleven Backfires over the Sea of Japan, about 250 miles northwest of Tokyo. Of the eleven, Japanese Air Self Defense Force fighters managed to intercept five.[23]

In 1983, Badger C strike aircraft deployed for the first time to Vietnam's Cam Rahn Bay air base. After that the Soviets maintained a force of sixteen Badgers, eight Bears, and twelve to sixteen Mig-23s at the base. From there the bombers could threaten the Philippines, Guam, and far-distant Yap in Micronesia. In a Soviet global readiness evolution that same year, Backfires operated for the first time from the Kurile Islands. A worldwide "Homeland Defense" exercise featured integration of aircraft, submarines, and surface ship operations. As Soviet naval vessels emulating enemy carrier battle groups approached the Soviet Union, submarines carrying cruise missiles and torpedoes engaged them. Then Soviet Naval Aviation planes simulated stand-off missile launches. Finally, large surface warships and missile-firing patrol boats completed the demonstration of a defense in depth.[24]

Japanese Self Defense Agency analysts concluded that by 1983 the Soviet Naval Aviation inventory of Backfires in the Far East had increased to ninety aircraft. They appeared to be based at Komosolmolsk, about 500 miles north of Vladivostok on the Kamchatka Peninsula. In 1984, Japanese fighters intercepted a flight of at least twenty Backfires 167 miles off Japan's west coast. Over the North Atlantic, more than fifty Backfires and Badgers conducted mock attacks on Soviet surface ships. In April 1984, the Soviet Navy conducted its largest exercise to date in the Atlantic.[25]

In 1985 training operations the Soviet carrier *Novorossiysk* assumed the role of an enemy carrier approaching the Kurile Islands. About twenty Backfires responded with simulated attacks. Simultaneously, Soviet submarines began torpedo and missile training runs against the carrier. United States Navy officials described the exercises as "the most extreme and realistic ever conducted by the Soviet Navy in the Pacific."[26]

According to two noted air power analysts, the basing of Backfires, Badgers, and Bears at either end of the Soviet Union meant that "the long reach of the Soviet Naval Air Force

has . . . overcome many of the geographical handicaps which have vexed Russian admirals since the time of Peter the Great." From their bases on the Arctic Ocean, Baltic Sea, Black Sea, and Pacific Ocean, regiments of strike aircraft working with long-range reconnaissance planes and airborne command, control, and communication platforms could concentrate naval air power in a theater faster than surface units or submarines could assemble.[27]

Soviet Naval Aviation strike tactics seemed to change in the mid-1980s. Soviet exercises observed by NATO previously suggested that unescorted Badgers and Backfires would mass for anti-carrier strikes coordinated with missile-firing submarines. Surveillance of Soviet training missions over the Norwegian Sea in 1987 showed that Su-27 Flanker fighters had begun to escort Backfires and Badgers practicing anti-ship strikes. The Flankers, with a range of about 600 miles, appeared capable of escorting the Soviet bombers to points from which they could launch their cruise missiles against NATO ships or naval bases in Iceland or on the Shetland or Faeroe Islands. The potential of the Flankers caused reevaluation of NATO tactics designed to counter the Soviet Naval Aviation strike planes. Their presence would mean that NATO fighters patrolling the GIUK gap to protect Allied carrier battle groups, convoys, and surface action groups had first to engage Soviet fighters before attacking bombers threatening ships. The Flanker threat also caused reevaluation of plans for Harpoon missile strikes and sea mine-laying by NATO aerial forces operating on NATO's northern flank. Harpoon missiles could carry a 500-pound conventional warhead and were effective against ships because of terminal radar guidance.[28]

At the end of the Cold War, Soviet Naval Aviation had transformed itself from a combination of fighters and light bombers suitable for inshore coastal defense to a worldwide strike force. Its inventory at the end of the 1980s was extensive and capable. SNA's 290 long and medium-range land-based strike aircraft included 130 Backfires, 135 Badgers, and twenty-two Blinders. Short-range land-based strike aircraft included ninety-five Su-17 Fitters. Land-based combat support aircraft assigned to SNA included forty-eight Tu-16 Badger tankers; 130 Badgers, forty Tu-95 Bear Fs, five Tu-22 Blinders, and ten Su-24 Fencer Es configured for reconnaissance, second-party targeting, and electronic warfare. Antisubmarine warfare planes on SNA roles included fifty-five Tu-142 Bear Fs, forty-five Il-38 Mays, ninety Be-12 Mays, and nearly 300 helicopters. In 1990, Admiral of the Soviet Fleet V. N. Chernavin stated "the Navy has considerable firepower, high mobility, and the capability to conduct combat operations in various areas of the World Ocean. Its main strike force is submarines and cruise missiles and also missile-armed naval aircraft."[29]

American Land-Based Maritime Aerial Forces

The B–17 Flying Fortress, the long-awaited tool for delivery of strategic air power, was in fact the result of a pre-World War II U.S. Army Air Corps design competition for an offshore anti-shipping bomber. Despite these origins of the Air Corps' premier 1940s bomber, maritime operations took a back seat to other priorities for the Air Corps and its successors ;the U.S. Army Air Forces and the United States Air Force (USAF).[30] Development of United States long-range land-based aircraft for maritime operations was further complicated by the USAF-United States Navy (USN) arguments over an independent air force, assignment of strategic missions, and allocation of resources that had begun prior to, continued through, and went on after World War II. Although USAF forces had a collateral maritime mission for many years, it received little attention. Only in the 1970s, when the U.S. Navy determined that it needed help in meeting the threat of a resurgent Soviet fleet, were formal USAF-USN agreements on aerial maritime missions drafted. The agreements generally restated the

importance of sea lanes of communication to national security. They usually envisioned expanded joint training in aerial maritime operations. They were always carefully worded to prevent encroachment on carefully guarded service prerogatives.[31]

The controversial but visionary Chief of Naval Operations Admiral Elmo Zumwalt asked the Air Force in 1971 to update its plans for the use of B–52s Buffs in laying sea mines. The high-winged multi-engine jet bombers had the capacity for long range flights and large weapons loads that made them attractive candidates for this role. Zumwalt also proposed that the Air Force install the Navy's Harpoon anti-ship missiles on its bombers and wanted Air Force tactical air wings to become carrier qualified. The Navy at this time was modifying its P-3 Orion antisubmarine warfare aircraft to carry Harpoon missiles. The P-3, a four-engine turboprop similar in appearance to the Lockheed airliner from which it was developed, had a combat radius of 1,400 miles. When armed, it was supposed to enhance the Navy's capacity to wage war against the Soviet's powerful surface fleet. By the early 1980s, the Navy had equipped eighty P-3s, all in its twenty-four active duty squadrons, with Harpoons. The P-3s, however, did not have the range, speed, or weapons capacity that B–52s offered. A Fiscal Year 1979 program to give the latest P-3 version, the P-3C, an air-to-air refueling capacity was terminated in early 1981. Navy opponents said that the program was unnecessary, impractical, and likely to cause crew fatigue problems. The Air Force responded favorably to Zumwalt's 1971 request for an update of aerial mine-laying plans, took longer to adapt its bombers to carry Harpoons, and dismissed the idea of Air Force squadrons becoming carrier-qualified.[32]

Both the USAF and USN had long had serious doubts about the capability of Air Force planes to contribute to maritime operations. Doubts continued in 1975 when the two services executed another memorandum of agreement. This one set up a concept of "mutual reinforcement" imposed by Secretary of Defense James R. Schlesinger. This theory assigned each of the services collateral missions in support of sister services. The Air Force received the collateral mission of training forces to interdict enemy sea power, protect shipping, conduct antisubmarine warfare, and conduct aerial mine laying operations. The agreement stipulated that the Air Force would train for "tasks (a) which will complement and supplement sea control operation, and (b) for which an inherent Air Force capability already exists."[33]

Three factors, however, prevented vigorous pursuit of the Air Force's collateral maritime mission in the 1970s. First, there was a perceived overwhelming superiority of the U.S. Navy compared with the Soviet Navy. Second, the Air Force was little interested in diverting resources from its primary mission. Secretary Schlesinger offered a $96 million plan to buy Harpoons for the Force, but when the Air Force requested $12 million to develop a B–52 capability to launch the missiles it was turned down. Third, both the Navy and the Air Force doubted that USAF aircraft and munitions were particularly well suited for maritime operations. Air Force bombers (the B–52 and FB–111) had been developed for strategic bombing. Air Force fighter-bombers (the F-4, F-15, F-16, and A-10) had been developed for battlefield interdiction, close air support, and air superiority missions. Except for a few Air Force pilots who had completed exchange tours with the Navy, there weren't any Air Force personnel trained for maritime missions. Defense experts concluded that although the Air Force had the potential to interdict Soviet naval forces and shipping in the North Atlantic, Mediterranean, Northwest Pacific, South China Sea, and Bay of Bengal. But, they said, to be effective in this role the Air Force needed special weapons, equipment, and training. In particular, Air Force crews needed training in low-level flying over water, navigation over water, recognition of naval vessels, and target acquisition at sea. Without these, the experts

said, "the Air Force role [in maritime operations] would be marginal at best, and, at worst, counterproductive."[34]

By the 1970s the Air Force's expertise in maritime operations, earned painfully in combat with German and Japanese forces from 1941 to 1945, had withered away. In the period immediately following World War II the Strategic Air Command's 307th Bomb Group at MacDill Air Force Base, Florida, had practiced aerial mine-laying, antisubmarine warfare, and sea searches in its B–17s. This came to a halt when the 307th deployed to England in 1948 in response to the Berlin crisis. Two years later, the 307th went to Korea. When the U.S. Navy asked the Air Force for mining support, the Air Force replied that "bombers for maritime roles could not be counted on in the initial stages of a war, only later."[35] When it returned to the United States in 1954, the group transitioned into the new B–47 medium jet bomber. The United States was entering the era of massive retaliation and the 307th's maritime capabilities were not resurrected.[36]

The Air Force was preoccupied first with developing an intercontinental strategic bombing and missile force and then with Vietnam. It did not again pay serious attention to its collateral maritime mission until the mid-1970s. In December of 1974 the Air Force published its final report on four Busy Harbor flights in which B–52G and H models and FB–111s tested their capabilities for sea surveillance and naval attack roles.[37] With the B–1 bomber expected to assume the manned bomber role in delivery of strategic nuclear weapons, Air Force leaders planned to rededicate SAC's large B–52 force to conventional bombing, force projection, and maritime missions. After the 1975 inter-service memorandum of agreement had been executed, SAC Operations Plan 28-76 started two maritime programs. In Busy Observer I, B–52 aircrews went on training missions every six months to search for, locate, and identify designated United States Navy ships. In Busy Observer II, B–52 aircrews cooperated with the USN's Second Fleet in the Atlantic and Third Fleet in the Pacific to search for Soviet Navy ships. The scope of the plan required certain B–52 squadrons to fly four ocean reconnaissance missions every six months.[38]

Concurrently, the Air Force searched for the right munitions to use in maritime operations. After Defense officials turned down its request for a Harpoon experiment, the Air Force selected the GBU-15 glide bomb as its maritime munition. The GBU-15 could lock onto a target before launch, or be remotely flown into a target. A modular unit, it could be fitted to various warheads. But the GBU-15's range of only seven miles led to questions about its effectiveness. Since an aircraft launching the GBU-15 would have to come well within range of Soviet ships' surface-to-air missiles, there were also questions about the survivability of any aircraft that launched it. Several B–52s were modified to carry and test the GB–15 in 1976. In 1978, experiments with B–52 aerial laying of sea mines began. The Air Force and Navy conducted mine-laying tests with a B–52D from Pease Air Force Base, New Hampshire. Although a B–52D unit at Andersen Air Force Base, Guam, had a mine-laying plan at this time, the Pease trials were the first actual use of a B–52 to drop mines.[39]

In 1979 SAC had a chance to apply its sea surveillance capabilities in a "real world" situation. The Iranian crisis and the Soviet invasion of Afghanistan increased interest in the waters off Southwest Asia. The U.S. Navy's Seventh Fleet, based in the Philippines and responsible for the Indian Ocean, asked SAC for assistance with aerial reconnaissance there. SAC launched B–52 sea surveillance missions from Guam and from Darwin, Australia. These were the first of what became routine SAC reconnaissance flights for the duration of the crises.[40]

An evaluation of SAC's ocean surveillance capabilities in early 1979 concluded that the Strategic Air Command had great potential in this area, but saw a few problems. An

experienced U.S. Navy patrol plane commander flew on a Busy Observer mission with a SAC B–52 crew in February 1979. He found that few B–52 crew members flew more than two Busy Observer missions per year. As a result, the level of pertinent training was low. It took some time into the mission for the B–52's radar operator to become adept at distinguishing surface ships from rain showers and other weather phenomena. The naval officer also concluded that the B–52's bomb damage cameras could not be adjusted for external lighting conditions and that their focal length was not ideal for the altitudes at which ship recognition and identification flyovers usually needed to be conducted. Hand-held camera photography, like radar image interpretation, he though would improve with more frequent sea surveillance training. The evaluator also determined that SAC crews were not receiving all the support they needed. There was little feedback to them from intelligence analysts on the information they collected. The SAC crews also had little opportunity for contact with United States Navy ocean surveillance air crews.[41]

In addition to SAC's burgeoning role in maritime operations, Tactical Air Command (TAC) implemented a Sea Flirt ocean surveillance program with its F-111s and RF-4s. TAC aircrews also participated in joint reconnaissance, electronic warfare, and strike exercises. Ninth Air Force units worked with Second Fleet, while Twelfth Air Force units worked with Third Fleet.[42]

The Air Force's renewed interest in the maritime mission coincided with a United States Navy effort to deal with its increasingly capable Soviet counterpart. America's joint service commanders, the commanders-in-chiefs (CINCs) of geographical theaters such as Atlantic Command and Pacific Command were already asking the air and naval forces they controlled to work together in joint exercises. Another push came from the Armed Services Committee of the United States Senate, which was asking how the Air Force could contribute to maritime operations. In addition, Secretary of Defense Caspar Weinberger issued defense guidance that ordered the Air Force to equip its B–52s with radar and stand-off weapons suitable for attacking Soviet warships and naval ports. A resulting Pentagon study recommended that B–52s be armed first with Harpoon missiles and, when they became available, with Tomahawk air-to-surface missiles. After the Air Force completed an internal review of the study, Department of Defense officials approved it in early 1982.[43]

At a July 1982 luncheon Secretary of the Air Force Verne Orr, Secretary of the Navy John Lehman, Air Force Chief of Staff General Charles A. Gabriel, and Chief of Naval Operations Admiral James D. Watkins "agreed to agree." This led to Gabriel and Watkins signing a memorandum of agreement outlining parameters for joint maritime operations. Gabriel said concerning the signing, "As the Falklands conflict demonstrated, air power is a critically important part of successful maritime operations." The Air Force Chief of Staff announced that his service would put more emphasis on collateral roles such as sea lane protection, aerial mine laying, and ship attack.[44]

An Air Force test program for Harpoon missiles began in January 1982. The Air Logistics Test Center in Oklahoma City received responsibility for integrating the B–52 with the Harpoon. SAC provided a test director, aircraft, and crews. The Air Force provided five million dollars for a thirty-eight-week test and adaptation program. Two B–52G models, one from the 2d Bomb Wing and one from the 320th Bomb Wing, became test platforms. In March 1983, the B–52s successfully fired three Harpoon missiles while over the Navy's Pacific Missile Test Range. Maritime surveillance radars were temporarily installed in two E-3A AWACS planes that provided target acquisition services for the B–52s.[45]

While the test program was going on, the Air Force issued a statement of operational need for Harpoon-equipped B–52s. The service asked Congress for a $40.4 million

appropriation in Fiscal Year 1985 (October 1, 1984-September 30, 1985) to buy fifty Harpoons based on the Navy's estimated cost of $800,000 per missile. In the event, however, the Air Force bought eighty-five Harpoons originally ordered by Iran and embargoed. These cost only about $300,000 each.[46]

The Navy and Strategic Air Command executed a memorandum of agreement in 1984. It specified that SAC's B–52s would operate in support of commanders-in-chief worldwide, presumably under the control of theater air component commanders. SAC's commander-in-chief said at this time that B–52s would be used for follow-on forces attack and for maritime missions.[47]

Air Force authorities designated two of Strategic Air Command's B–52 squadrons to train for the maritime mission. B–52Gs were modified to carry the Navy's Harpoon anti-ship missile. The 60th Bombardment Squadron of fifteen planes at Andersen Air Force Base, Guam, and the 69th Bombardment Squadron at Loring Air Force Base, Maine, also with fifteen aircraft, became SAC's maritime specialists. Manufacturers' technical representatives took about one week working with each aircraft to install missile rails under the wings, a power distribution box, and a removable data processing computer. The modified B–52Gs could each carry twelve missiles, six under each wing, and fire them from a stand-off range of about fifty miles. The 69th Bombardment Squadron achieved limited operational capability in October 1983 and declared full operational status in December 1984. On June 30, 1985, SAC declared its new maritime strike aircraft fully operational. In addition, four E-3A AWACs planes were scheduled for modification to support the B–52Gs in their maritime role.[48]

The B–52s seemed to have inherent capabilities for anti-ship attacks. Their 6,500-mile-plus range and cruising speed of 442 knots gave them the endurance and speed required for timely intervention over most of the world's oceans. Adaptation of the strategic workhorse to a new role proved difficult for several reasons. The Navy was supposed to develop tactical doctrine, which with the Air Force was supposed to agree, for use of the B–52 in an anti-ship role. As SAC explored that role, limitations became evident. It turned out that the B–52's radar could not positively identify a sea surface target beyond a range of about fifty miles. This meant that the B–52s needed either the assistance of target radar on another platform or a new radar to take advantage of the Harpoon's capabilities. Otherwise, a B–52 would have to fly within range of a target's air defenses to launch its missiles. An Air Force plan to develop a new radar for its thirty maritime capable B–52Gs foundered when it seemed that a new radar could not be ready before all B–52s were to be retired in 1992. Besides radar problems, the B–52Gs had limited ability to communicate with U.S. Navy and NATO ships. A Buff had only one high frequency (HF) radio transceiver installed, but the Navy's Tactical Data System operated on HF channels. Thus the malfunction of a single radio could cause a B–52 maritime mission to abort. When technical problems did not interfere with USAF-USN tactical communications, long-standing differences in communications procedures required some getting used to, a process that did not always go smoothly. By 1990, tactical doctrine development had progressed only to the point of a draft "Joint Chiefs of Staff Test Publication, Doctrine for Joint Maritime Operations (Air)." It had been officially neither approved nor released.[49]

Despite the problems in adapting B–52Gs for a sea control role, there were also other Air Force capabilities applicable to maritime missions. These included bomb–carrying B–52s; F-16 light attack aircraft; and F-15 interceptors and fighter-bombers. The B–52 bombers could drop the GBU-15 tactical guided bomb in an anti-ship role or carry up to eighteen CAPTOR (encapsulated torpedo) antisubmarine mines. B–52s sea surveillance capability was

first demonstrated during the Cuba Missile Crisis of 1962. The Buffs had the capacity to conduct ocean surveillance of areas of 112,000 square nautical miles in two and one-half hours. Surveillance missions could last up to seventeen hours. The light attack planes had potential for anti-ship strikes. The Air Force had developed precision guide munitions with high single hit probabilities during the Vietnam Conflict. These weapons had shown their ability to hit moving targets on land, a quality that could be put to good use against naval targets. The F-15s, working in concert with E-3As to identify aerial targets and KC-135s to refuel them in long range missions, could enhance organic Navy anti-air warfare capabilities. The E-3As could also use their radars, in tandem with Signals Intelligence (SIGINT) and satellite observation, to identify naval targets.[50]

To put these capabilities to use, the Air Force had to solve several problems. In general, they were similar to the obstacles encountered in adapting the B–52Gs for a maritime role. The Air Force had limited communications, command, control, and intelligence (C^3I) operability with the Navy. Some Air Force planes lacked suitable navigation equipment for long over water flights. The Air Force weapons inventory did not include stand-off anti-ship missiles or active antisubmarine warfare weapons. There were also no Air Force/Navy joint doctrine and tactics for conduct of maritime operations.[51]

The Air Force found it difficult to resolve these problems. In an era of rising costs and decreasing defense budgets, the service was overcommitted with its primary missions of strategic air power and battlefield interdiction. It did not have the money to obtain additional force structure or acquire new equipment for a maritime role. Its maritime role was a collateral function and Department of Defense policy precluded the services from requesting new appropriations based on collateral mission requirements.[52]

By the time the Cold War ended in 1990, Strategic Air Command had developed six B–52 squadrons with maritime capabilities. As noted above, two of the squadrons were two equipped with Harpoon anti-ship missiles. All six squadrons were trained in sea surveillance and aerial laying of sea mines. Pacific Air Forces (PACAF), based in Hawaii and responsible for equipping and training Air Force units in the Pacific theater, was adapting one of its F-16 squadrons to use Harpoons. The end of the Cold War, however, saw the start of a decrease in the Air Force's capability for maritime operations. In 1990, the B–52 unit at Andersen Air Force Base, Guam, deactivated. This left only fourteen B–52Gs and their crews at Loring Air Force Base tasked and trained for maritime missions. Other Air Force reductions left only thirty-three B–52Gs Air Force-wide capable of delivering conventional weapons.[53]

The Soviet and American uses of land-based aerial forces for anti-ship warfare during the Cold War should not be compared directly. They were intended to serve different purposes. Each can, however, be assessed on its own merits.

The Soviet Navy developed an effective land-based aerial threat to its American and allied NATO counterparts. Soviet Naval Aviation's aircraft became familiar sights over most of the world's oceans. Their potent air-to-surface missiles offered Soviet aircrews the possibility of firing from beyond the effective range of anti-air defenses. The missiles themselves carried warheads large enough to assure significant damage when they hit their targets. Even if their warheads did not detonate, the kinetic energy of the large and high-speed ASMs were enough to devastate many modern warships. The size of the Soviet missiles meant that even large, multi-engine aircraft could carry only two. This increased the number of planes needed. On the other hand, an increased number of launch platforms might have meant more weapons being delivered had Soviet Naval Aviation's Tu-16s and Tu-22Ms been used in combat.

Agreements imposed during the struggle for an independent Air Force restricted the United States Navy as to the uses to which it could put land-based aircraft. As a result, when the Navy needed land-based planes to supplement sea-based aviation, it turned first to its own maritime patrol aircraft. Attaching the short-range Harpoon missile with its relatively small warhead to the slow P-3 Orion provided a capacity to attack unarmed merchant vessels, but not much else. When the Navy asked the United States Air Force for the assistance of land-based aerial forces, it encountered what it had feared. The Air Force's finite resources and priority on strategic missions limited the help it could provide. The training that selected SAC aircrews received from flying maritime surveillance missions every six months probably had a short shelf life. The Air Force started to develop a maritime strike capability only in the face Congressional pressure and Department of Defense directives. When it did so, the service chose to hang short-range Harpoons on aging 1950s-vintage airframes. That may have been a good choice because the B–52s had a long combat radius and huge weapons capacity. The Buffs probably would have been effective in anti-ship strikes, but had little chance of surviving determined opposition. Soviet naval forces, when operating within reach of land bases, also had to be prepared for strikes by USAF tactical units. Aircraft such as the F-15 and F-16 posed a significant threat to warships when equipped with ASMs and precision guided munitions. Unlike Soviet Naval Aviation, however, US land-based aircraft never became the principal threat to enemy warships during the Cold War.

Endnotes to Chapter VIII

1. Paul B. Ryan, *First Line of Defense: The U.S. Navy Since 1945* (Stanford, Calif.: Hoover Institute Press, 1981), p. 136; U.S. Congress, Committee on Commerce, 94th Congress, 2d Sess., *Soviet Oceans Development* (Washington, D.C.: Government Printing Office, 1976), pp. 60, 81-82.
2. The Center for Strategic and International Studies, *Soviet Sea Power*, Special Report Series; No. 10 (Washington, D.C.: Georgetown University, Jun. 1969), p. 51; Floyd D. Kennedy Jr., "Zapad 81 ;Successor to Okean," in *Seapower* 25 (January 1982): 4; R. A. Mason and W. R. Taylor, *Aircraft, Strategy, and Operations of the Soviet Air Force* (New York: Jane's, 1986), pp. 102-3; William D. O'Neil, "Backfire ;Long Shadow Over the Sea Lanes," in *U.S. Naval Institute Proceedings*, Vol. 103 (March 1977): 28; Edward Wegner, *The Soviet Naval Offensive* (Annapolis, Md.: Naval Institute Press, 1975), pp. 24-25.
3. The Center for Strategic Studies, *Soviet Sea Power*, p. 51; Robert W. Clawson and Lawrence S. Kaplan, eds., *The Warsaw Pact ;Political Purposes and Military Means* (Wilmington, Del.: Scholarly Resources, Inc., 1982), p. 117; John W. R. Taylor, "Gallery of Soviet Aerospace Weapons," in *Air Force Magazine* (March 1990): 86.
4. The Center for Strategic Studies, *Soviet Sea Power*, p. 269.
5. U.S. Navy, Director of Naval Intelligence and Chief of Information, *Soviet Naval Developments*, 2d ed. (Annapolis, Md.: Nautical & Aviation Publishing Company of America, 1981), p. 19.
6. *Ibid*., pp. 20, 250.
7. Mason and Taylor, *Aircraft, Strategy, and Operations of the Soviet Air Force*, p. 108; U.S. Navy, Director of Naval Intelligence and Chief of Information, *Soviet Naval Developments*, pp. 248-49; Admiral Elmo R. Zumwalt, USN-Ret., *On Watch* (New York: Quadrangle, 1976), pp. 322-23.
8. Mason and Taylor, *Aircraft, Strategy, and Operations of the Soviet Air Force*, pp. 105-6.
9. Walter Pincus, "Our Carrier Armadas Could Sink the Budget," in *The Washington Post*, Mar. 25, 1984, Section C, p. 1.
10. Donald D. Chipman, "The Transformation of Soviet Maritime Air Operations ;Implications for U.S. Maritime Strategy," in *Airpower Journal* (Summer 1990): 67; O'Neil, "Backfire: Long Shadow Over the Sea Lanes," pp. 28, 30-32. Refueling probes were later removed from some Backfires because the Soviets did not want them
counted as strategic weapons for arms control purposes.
11. Chipman, "The Transformation of Soviet Maritime Air Operations," p. 68; O'Neil, "Backfire: Long Shadow Over the Sea Lanes," p. 31; Norman Polmar, "Soviet Naval Aviation," in *Air Force Magazine* (Mar. 1976): 70-71; Ryan, *First Line of Defense ;the U.S. Navy Since 1945*, p. 139; U.S. Congress, Committee on Commerce, *Soviet Oceans Development*, p. 584.
12. Peter Hertel Rasmussen, "The Soviet Naval Air Force Since 1945," MA Thesis, 1978, Det Kongelige Garnisonbibliotek, Copenhagen, Denmark, 1978, pp. 12, 22. Document No. 20, Reel No. 8732, Microform Center, University of Wisconsin-Madison.
13. Paul Nitze, Leonard Sullivan Jr., and the Atlantic Council Working Group on Securing the Seas, *Securing the Seas* (Boulder, Colo.: Westview Press, 1979), pp. 105-6; Dov S. Zakheim, *The U.S. Sea Control Mission: Forces, Capabilities, and Requirements* (Washington, D.C.: U.S. Congress, Congressional Budget Office, 1977), pp. 7-9.
14. Defense Intelligence Agency, *Unclassified Communist Naval Orders of Battle*, DDB–1200-124-79, (Washington, D.C., 1979), p. 5.

15. Norman Polmar, "Soviet Naval Aviation," in *Air Force Magazine* (March 1978): 67. Polmar estimated Soviet Naval Aviation's strength at this time to include 325 missile attack aircraft (Badgers, Backfires), 50 medium bombers (Badgers, Blinders), 100 reconnaissance planes (Badgers, Bear Ds), several electronic warfare aircraft (Badgers, An-12 Cub Cs), 150 ASW planes (Bear Fs, Mays, Mails), 50 attack fighters (Forgers, Fitter Cs), 350 helicopters (Hormones, Hazes, Hounds), 80 tankers (Badgers), and 150 transports and trainers. Kenneth Vernoski, "Soviet Naval Aircraft," in Bruce and Susan W. Watson, eds., *The Soviet Navy: Strengths and Liabilities* (Boulder, Colo.: Westview Press, 1986), pp. 119-20.
16. Nitze, *et al.*, *Securing the Seas*, p. 106; Zumwalt, *On Watch*, p. 62.
17. Kenneth Vernoski, "Soviet Naval Air Operations," in *The Soviet Navy: Strengths and Liabilities*, p. 251.
18. Quoted in Roger A. Beaumont, "Between Two Stools: Very Long-Range Aircraft in Sea Control," in *Air University Review* Vol. 32, No. 6 (September-October 1981): 48. Strength figures are also those given by Beaumont, p. 48; Pincus, "Our Carrier Armadas Could Sink the Budget;" Polmar, "Soviet Naval Aviation," March 1978, p. 67.
19. Kennedy, "Zapad 81: Successor to Okean," p. 4; Vernoski, "Soviet Naval Air Operations," p. 250.
20. Vernoski, "Soviet Naval Air Operations," p. 250.
21. Clawson and Kaplan, *The Warsaw Pact: Political Purposes and Military Means*, p. 270.
22. Donald D. Chipman, "Rethinking Forward Strategy and the Forward Blockade," in *Armed Forces Journal International* (August 1987): 82; Donald D. Chipman and David Lay, "Sea Power and the B–52 Stratofortress," in *Air University Review*, Vol. 37, No. 2 (Jan.-Feb. 1986): 46.
23. Vernoski, "Soviet Naval Air Operations," p. 252.
24. "Organization of the Soviet Armed Forces," in *Air Force Magazine* (March 1990): 71; Geoffrey Till, *Modern Seapower: An Introduction* (London: Brassey's, 1987), pp. 130-31.
25. John W. R. Taylor,"Gallery of Soviet Aerospace Weapons," in *Air Force Magazine* (March 1982): 97; Chipman, "Rethinking Forward Strategy and the Distant Blockade," p. 82; Mason and Taylor, *Aircraft, Strategy, and Operations of the Soviet Air Force*, pp. 108, 110-12; Michael L. Ross, "Disarmament at Sea," in *Foreign Policy* (Winter 89/90): 97.
26. Chipman, "Rethinking Forward Strategy and the Distant Blockade," p. 82; Ross, "Disarmament at Sea," p. 97.
27. Mason and Taylor, *Aircraft, Strategy, and Operations of the Soviet Air Force*, p. 112.
28. Chipman, "The Transformation of Soviet Maritime Air Operations," pp. 67-71.
29. "Organization of the Soviet Armed Forces," p. 69; Adm. V. N. Chernavin, quoted in Peter Haydon, "The Legacy of the Soviet Navy ;Will a Phoenix Rise?" in *Canadian Defence Quarterly* (April 1992): 29.
30. Beaumont, "Between Two Stools: Very Long-Range Aircraft in Sea Control," p. 41.
31. Nitze, *et al.*, *Securing the Seas*, p. 184. The Air Force and Navy executed joint agreements in 1971, 1974, 1975, and 1979. Bert H. Cooper, *Maritime Roles for Land-Based Aviation* (Washington, D.C.: Congressional Research Service, Aug. 1, 1983) discusses the content of each agreement and presents the unclassified text of the 1975 agreement in an appendix.
32. Cooper, *Maritime Roles for Land-Based Aviation*, p. CRS-22; Lt. Col. Thomas L. Wilkerson, USAF, "Two If By Sea," in *United States Naval Institute Proceedings* (November 1983): 35; Zumwalt, *On Watch*, p. 70.
33. Jan S. Breemer and SSgt Todd Hoover, USAF, "SAC Goes to Sea with Harpoon," in *National Defense* (February 1987): 42; Maj. Gen. Robert N. Ginsburgh, USAF-Ret., "A New Look at Control of the Sea," in *Strategic Review* (Winter 1976): 87.

34. Breemer and Hoover, "SAC Goes to Sea," pp. 42-43; Cooper, *Maritime Roles for Land-Based Aviation*, p. CRS-36, p. CRS-47; Ginsburgh, "A New Look at Control of the Sea," pp. 87-88; Nitze, *et al.*, *Securing the Seas*, pp. 194-85.
35. Quoted in Lt Col V. Frank Vollmar, USAF, *The Conventional Bomber Force, War-Horses for Global Conflicts ;Capabilities, Limitations, and Modernization*, Research Report No. AU-ARI-91-6 (Maxwell AFB, Ala.: Air University Press, Oct. 1992), p. 47.
36. Breemer and Hoover, "SAC Goes to Sea," p. 42.
37. Lt. Cmdr. J. R. Thompson, USN, *USN-USAF Interaction for Ocean Surveillance Using Land-Based Aircraft* (Newport, R.I.: Naval War College, Center for Advanced Research, June 1979), p. 15.
38. *Ibid*., p. 15.
39. Lt. Col. Donald G. Cook, USAF, Cmdr Charles H. Horne, USN, and Cmdr. Walter W. Manning, USN, *B–52 Maritime Operations: The Anti-Surface Warfare Mission* (ASUW), Air War College Research Report No. AU-AWC-87-043 (Maxwell AFB, Ala.: Air University, Air War College, 1987), p. 15; Vollmar, *The Conventional Bomber Force*, War-Horses *for Global Conflicts: Capabilities, Limitations, and Modernization*, p. 48.
40. Vollmar, *The Conventional Bomber Force*, War-Horses *for Global Conflicts ;Capabilities, Limitations, and Modernization*,, pp. 48-49.
41. Thompson, *USN-USAF Interaction for Ocean Surveillance Using Land-Based Aircraft*, pp. 75-77.
42. Cooper, *Maritime Roles for Land-Based Aviation*, p. CRS-37.
43. Clifton F. Berry Jr., "A Carrier Aviation Primer," in *Air Force Magazine* (Nov. 1982): 60; Breemer and Hoover, "SAC Goes to Sea," pp. 42- 43; Cook, *et al.*, *B–52 Maritime Operations ;The Anti-Surface Warfare Mission* (ASUW), p. 16; Wilkerson, "Two If By Sea," p. 39.
44. Berry, "A Carrier Aviation Primer," p. 60; Chipman and Lay, "Sea Power and the B–52 Stratofortress," p. 45.
45. Berry, "A Carrier Aviation Primer," p. 61; Breemer and Hoover, "SAC Goes to Sea," p. 43; Cooper, *Maritime Roles for Land-Based Aviation*, p. CRS-30.
46. Breemer and Hoover, "SAC Goes to Sea," p. 43.
47. Vollmar, *The Conventional Bomber Force*, War-Horses *for Global Conflicts ;Capabilities, Limitations, and Modernization*, p. 49.
48. Breemer and Hoover, "SAC Goes to Sea," p. 43; Chipman and Lay, "Sea Power and the B–52 Stratofortress," p. 46; Cook, *et al.*, *B–52 Maritime Operations: The Anti-Surface Warfare Mission (ASUW)*, pp. 18-19.
49. Breemer and Hoover, "SAC Goes to Sea," p. 44; Cook, *et al.*, *B–52 Maritime Operations: The Anti-Surface Warfare Mission (ASUW)*, p. 20, p. 32; Lt. Col. Robert C. Kuhlo, *Attacking Ships ;Command and Control of Joint Antiship Operations*, Research Report No. AU-ARI-89-3 (Maxwell AFB, Ala.: Air University Press, October 1990), p. 4.
50. Ginsburgh, "A New Look at Control of the Sea," pp. 88-89; Wilkerson, "Two If By Sea," p. 37.
51. Wilkerson, "Two If By Sea," p. 37.
52. *Ibid*., p. 38.
53. Kuhlo, *Attacking Ships: Command and Control of Joint Antiship Operations*, pp. 12-13. Kuhlo states that even in 1990, Air Force "aerospace maritime operations" terminology and Navy maritime air operations terminology differed completely. Vollmar, *The Conventional Bomber Force, War-Horses for Global Conflicts*; *Capabilities, Limitations, and Modernization*,, pp. 49-50.

CHAPTER IX

REFLECTIONS

As the preceding case studies show, the employment of land-based air power in maritime operations was neither always a panacea nor always a failure in the period from 1939 to the end of the Cold War. Air power, both land- or sea-based, has added a new dimension to naval warfare. It has not, as some enthusiasts predicted, made naval vessels, whether surface or undersea, and merchant ships obsolete in time of war.

The effectiveness of land-based aerial forces in maritime war has, like the performance of all air power, depended largely on organization of forces, equipment, training, doctrine, command decisions, and tactics. The ultimate determinants of effectiveness, however, have been the courage, dedication, and imagination of the men flying planes into danger.

As one looks back at the case studies in this book, common themes that have retarded the use of land-based aerial forces in maritime warfare are evident. These include the following: (1) when other missions are available, only in rare cases have those in control of land-based air power given priority or even equality to its employment in maritime operations; and (2), despite more than a half century of experience proving their usefulness in maritime battle, land-based aerial forces have seldom been optimally organized, equipped, and trained for air-sea warfare when hostilities began.

The history of military aviation repeatedly illustrates the first point, regarding priority accorded the use of land-based aerial forces in maritime operations. Examples that can be cited begin with World War I, when in 1918 Britain's newly-established Royal Air Force gave preference in allocation of long-range aircraft to bombing squadrons over aerial antisubmarine units. This bias has existed even when land-based air forces have sought and been given maritime missions. Later instances of this trend occurred during World War II in the competition within and between Allied air and naval forces for assignment of long-range and very long-range aircraft. Most recently, the phenomenon existed in the Cold War, as United States Air Force multi-engine jet B–52 bombers were stingily assigned to and scantily trained for maritime work only when other weapons systems assumed the B–52s' previous missions.

The condition of most belligerents' air forces at the outset of World War II documents the second point, regarding the organization, equipment, and training of land-based aerial forces for maritime missions. Despite the experiences of World War I, during which aircraft proved to be effective weapons when used against naval surface combatants and submarines, the 1939-1945 conflict began with the air arms of all major contestants except Japan ill-prepared in various ways to prosecute war at sea. For numerous reasons, as discussed earlier, the aircraft and munitions available for naval fighting were initially neither as efficient nor as adequate in number as similar forces had been at the end of the 1914-1918 conflict. This theme cropped up again in post World War II air-sea warfare. During the Falklands War of 1982, pilots of Argentina's land-based aircraft (except those of the naval air arm) opposed the Royal Navy's task force with the handicaps of hasty training for over water flights, inadequate navigational tools, improvised intelligence collection methods, and munitions intended for land attacks. During the Iran-Iraq War of 1980-1988, it was only at the conflict's midpoint that Iraq's Air Force acquired land-based fixed-wing aircraft (first Super Étendards and later Mirage F-1EQs) capable of decisive action in a campaign to interdict shipping that carried Iran's oil to market. Likewise, during the Cold War of 1947-1990, the preponderance of American land-based aerial forces which focused on maritime operations did so only briefly

in the years immediately following World War II and near the end of the Cold War, when it appeared that the B–52 bomber had lost most of its other missions because of new technologies and evolving national security requirements.

Contrasting with the common themes that have retarded the use of land-based air aerial forces in maritime warfare, are their notable successes. Despite impediments to its fully effective employment, land-based air power did make unparalleled contributions to maritime warfare between the outbreak of World War II in 1939 and the end of the Cold War in 1990. United States Air Force Historian Richard G. Hallion, in a 1995 paper entitled "Left Dead in the Water: Naval Forces Versus Air Power in the Second World War," has synthesized and summarized statistics on the use of aerial forces in maritime operations during World War II. He reports that, overall, Allied land-based aircraft accounted for 41 percent of all U-boats sunk. Land-based aerial forces likewise exacted heavy tolls by direct air attack on maritime surface targets: German combatants from minelayers to battleships sunk (40 percent of all destroyed), Italian warships and merchant ships in the Mediterranean (37 percent of all destroyed), and Japanese vessels in the Pacific (56 percent of all destroyed).[*****]

Land-based air power's role in the Allied victory in the Battle of the Atlantic was, without a doubt, its the most notable World War II maritime achievement. Whether using naval authorities' criterion of ships safely arrived, or air specialists' measure of U-boats sunk, the significance of aerial forces in the battle cannot be questioned. Using the first measure, statisticians have documented that ship losses were minimal in convoys with air escorts. Using the second measure, those same data analyzers have determined that aircraft accounted for a plurality of U-boats sunk in the Atlantic. Without the participation of aerial forces, particularly land-based aerial aircraft, victory might have eluded the Allies in the contest for the sea lanes between Britain and North America. The successful outcome of that struggle, in turn assured Britain's continued participation in the war and the Allies' ability to launch an invasion of the European continent from England in 1944.

Equally impressive demonstrations of the utility of land-based aerial forces in naval warfare occurred in the air-sea battles for control of the English Channel and in Nazi efforts to interdict Allied convoys traveling to Arctic ports with war materiel for the Soviet Union. On the Allied side of the fight in European coastal waters, land-based aircraft were generally successful in keeping Germany's large surface combatants damaged enough to prevent them from sortieing into the Atlantic and raiding Allied convoys. When a few Nazi capital ships did get into the Atlantic, land-based aerial forces cooperated with sea-based aviation, surface ships, and submarines to track the Kriegsmarine vessels down and destroy them. Conversely, Luftwaffe planes based in Norway proved able to inflict sufficient losses on British and American ships bound for the Soviet ports of Murmansk and Archangel so that the Allies suspended Arctic convoys until they could be accompanied by aircraft carriers.

In the case of air operations over the English Channel, Luftwaffe planes could not stem the evacuation of British and French troops from Dunkirk, but they did sink sank scores of ships, inflicted thousands of casualties, and made the withdrawing troops abandon all weapons but their small arms. The German air effort was conducted in the face of strong Royal Air Force opposition. Poor weather conditions during several days of the Dunkirk

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[*****]Hallion also gives impressive summaries for shipping losses caused by sea mines, but a case study of sea mining by land-based aerial forces has not been possible with the secondary sources to which this study was limited.

evacuation also hampered the Luftwaffe's efforts. In subsequent air attacks, German planes nearly achieved complete interdiction of Britain's coastal shipping corridors, but many of the units devoted to this task went on to other duties after only two months of effort.

In the Mediterranean theater, both Allied and Axis land-based aerial forces significantly influenced the naval war. On the Allied side, planes based at Malta and North Africa cooperated with submarine and surface naval forces to interrupt the flow of enemy troops and war supplies, particularly petroleum, flowing from Italy to North Africa. This had a profound effect on the ability of German and Italian formations in North Africa to conduct both defensive and offensive operations. On the Axis side, German and Italian aircraft based in southern Italy, Greece, North Africa, and on Mediterranean islands cost the British badly needed ships, sailors, and soldiers as they withdrew from Greece and as they attempted to resupply their strategically critical air and naval forces based on Malta. Once again, withdrawal of German squadrons to other fronts may have kept Axis land-based air power from being decisive in this fight as it had in the struggle for control of the English Channel.

North Pacific operations of Allied, predominately American, land-based air formations illustrated how versatile such forces can be. Although atrocious flying conditions caused operational losses that exceeded combat tolls, land-based air units in the North Pacific opposed one invasion and covered another, interdicted sea lanes necessary to resupply Japanese troops occupying forward outposts on North American soil, and by raiding shipping in Japan's home waters played important parts in strategic deception.

In the Indian Ocean in December 1941, the employment of Japanese land-based naval air units to sink the battleship *Prince of Wales* and battlecruiser *Repulse*, two of the Royal Navy's most powerful ships, had two important effects. First, it eliminated any possibility that the British could defend Singapore or evacuate its 100,000-plus defenders to fight again. Second, it drove home the maxim that warships without air cover sufficient to assure local air superiority should not operate within range of enemy aircraft. That lesson was repeated during late 1942 and early 1943 as American and Australian aircraft decimated Japanese convoys attempting to resupply Japanese forces attempting to secure New Guinea. This precluded the Japanese from using the world's largest island as a base from which to invade Australia and or to block Allied efforts to drive north toward the Philippines.

In the years following World War II, land-based aerial forces failed to achieve their objective in one war and succeeded in another. In the Falklands War (April-June 1982), Argentine Air Force and naval air arm planes operated from bases on the South American continent to oppose a British amphibious task force intent on recapturing the Falkland Islands. Despite the necessity of operating hundreds of miles from their home bases against formidably-armed fast moving targets provided with a vigorous sea-based air cover, the Argentines inflicted serious losses on the Royal Navy. In the end, however, attrition caused by high operational and combat losses halted the influence of Argentine air units on the campaign.

In the Iran-Iraq War (1980-1988), Iraqi land-based air power achieved two strategic objectives by raiding shipping that carried Iranian oil. The first objective, that of internationalizing the war, was achieved by air attacks on neutral flag tankers. These provoked other Persian Gulf states to pressure Iran into negotiating an armistice in the war that Iraq had started. The second objective, that of diminishing Iran's economic base, was achieved by desultory air raids on marine terminals and shipping. Despite their sporadic nature, these assaults decreased Iran's oil revenues by as much as half a billion dollars annually during some years of the war.

The Cold War (1947-1990) saw development of the strongest-ever land-based aerial force intended for maritime operations. During forty-seven years of confrontation between the Soviet Union and the United States and their respective allies, the Soviets developed a missile-carrying, long-range air fleet designed to counter the strongest navy in the world. Since the prolonged confrontation never escalated into open warfare, the success of the Soviet effort can only be measured by the fact that American naval planners found Soviet Naval Aviation and those Soviet Long Range Aviation forces trained for sea attacks to be a credible threat. This is evidence that the Soviets achieved their purpose. On the American side, the use of land-based aerial forces for maritime operations was all but ignored (except for United States Navy antisubmarine squadrons) until the 1980s. Even then, efforts to adapt obsolescent long-range bombers for air-sea warfare were minimal.

On balance, land-based aerial forces accomplished remarkable achievements in maritime operations from 1939 to 1990 despite restrictions imposed by limited resources, doctrine, competing missions for aircraft with appropriate capabilities, and evolving technology. The question in the late 1990s is “How will the first year of the next naval war differ from 1939 with regard to capabilities of land-based aerial forces for maritime operations?”

BIBLIOGRAPHIC ESSAY

Internet access, from a small fishing port on the western edge of the United States, facilitated the initial search for materials relevant to the preceding case studies. This was particularly the case since the concept for the project envisioned a synthetic work based on secondary sources. The wonders of cyberspace allowed me to screen the catalogs of libraries worldwide for likely sources. In practice, however, most of the sources used came from or through the United States Air Force's Air University Library at Maxwell Air Force Base, Alabama, which granted me unusual direct long-distance loan privileges, and the Timberland Regional Library consortium of Western Washington. In the latter, I am particularly indebted to reference librarians Kim Mallory, Martha Hill, Emily Popovich, Sandy Lauritzen at Aberdeen and branch librarian Kathleen Ringenberger at Westport.

Publishers issued a few of the books particularly helpful to me when I was well along with research and writing. R. D. Layman, *Naval Aviation in the First World War*: *Its Impact and Influence* (Annapolis, Md.: Naval Institute Press, 1996) falls into this category. Other works that provide a context helpful in understanding the use of land-based aviation in maritime operations include Paul G. Halpern, *A Naval History of World War I* (Annapolis, Md.: Naval Institute Press, 1994) and Lee Kennett, *The First Air War* (New York: The Free Press, 1991) and John H. Morrow Jr., *The Great War in the Air*: *Military Aviation from 1909 to 1921* (Washington, D.C.: Smithsonian Institution Press, 1993).

As was true for the World War I era, new and useful books continued to appear even when I thought research and writing for later periods had been completed. Clay Blair, *Hitler's U-Boat War, The Hunters, 1939-1942* (New York: Random House, 1996), has been the last of these to arrive. Blair, who expects to publish a second volume covering the period 1943-1945, delved deeply into published and unpublished sources to offer new conclusions about the seriousness of the U-boat threat and the effectiveness of Allied antisubmarine measures. Pending publication of the second volume of Blair's study, his sources are available on the World Wide Web at http://www.randomhouse.com /uboat /biblio.html. In addition to Blair, Terry Hughes and John Costello, *The Battle of the Atlantic* (New York: Dial Press, 1977) and David Syrett, *The Defeat of the German U-Boats*: *The Battle of the Atlantic* (Columbia: University of South Carolina Press, 1994) give overall perspectives on the German effort to interdict the trans-Atlantic sea lanes and the Allied response. Horst Boog, "Luftwaffe Support of the German Navy," pp. 302-22, in *The Battle of the Atlantic 1939-1945*, Stephen Howarth and Derek Law, eds. (Annapolis, Md.: Naval Institute Press, 1994) provides a critical review of his topic, while Henry Probert, "Allied Land-Based Anti-Submarine Warfare," pp. 371-87 in the same publication, offers a summary of Allied air antisubmarine organization and efforts. The several volumes of Capt. S. W. Roskill, RN, *The War at Sea, 1939-1945* (London: Her Majesty's Stationary Office, various dates) remain as fundamental works. Volumes of the official United States Navy history of World War II (*History of United States Naval Operations in World War II*) by Rear Adm. Samuel Eliot Morrison, USN, serve the same purpose, particularly *The Battle of the Atlantic September 1939-May 1943* (Boston: Little, Brown and Company, 1975). A more recent work, J. Rowher and G. Hummelchen, *Chronology of the War at Sea, 1939-1945: The Naval History of World War Two* (Annapolis, Md.: Naval Institute Press, 1992) gives a day-by-day account of naval warfare during the period covered. On the air side, Denis Richard and Hilary St. George Saunders, *Royal Air Force 1939-1945*, in three volumes (London: Her Majesty's Stationary Office, 1953) is the RAF's official history. John Herington, *Air War Against Germany and Italy 1939-1945* (Canberra: Australian War Memorial, 1954) focuses on the dominion's aviators but, perhaps because many of those

aviators found their way to Coastal Command, is a rich source on maritime air operations against the Axis. Many of the earlier histories, however, contain gaps because all of the contributions of signals intelligence to the Allied victory were not disclosed until sometime after their publication. John L. Winton, *Ultra at Sea* (New York: William Morrow and Company, 1988) fills some of these gaps. John Terraine, *A Time for Courage*: *The Royal Air Force in the European War, 1939-1945* (New York: Macmillan Publishing Company, 1985) is a more recent synthesis. Len Deighton, *Blood, Tears, and Folly*: *An Objective Look at World War II* (New York: Harper Perennial, 1994) is a scathing commentary from a World War II veteran writing with the benefit of hindsight. With regard to Axis air activity, Air Ministry [United Kingdom], *The Rise and Fall of the German Air Force (1939-1945)*, Air Ministry Pamphlet No. 248, reprint ed. (New York: St. Martin's Press, 1983) offers a brief synthesis. Cajus Bekker, *The Luftwaffe War Diaries*: *The German Air Force in World War II*, Frank Ziegler, ed. and trans., 1964, (New York: Da Capo Press, 1994) gives detailed accounts of Luftwaffe campaigns followed by half-page summaries and conclusions for each. Williamson Murray, *Strategy for Defeat 1933-1945* (Maxwell AFB, AL: Air University Press, 1983) [also issued in 1985 at Baltimore by the Nautical & Aviation Publishing Company of America as *Luftwaffe*] traces the development of the Nazi air arm beginning with the Third Reich's rearmament in 1933 to its defeat in 1944-1945.

Much material on coastal warfare and air-sea campaigns in the Mediterranean is to be found in some of the comprehensive sources previously cited. In addition, Peter Smith, *Hold the Narrow Sea*: *Naval Warfare in the English Channel, 1939-1945* (Annapolis, Md.: Naval Institute Press, 1984) is valuable, as—to a lesser extent—is his *The Stuka at War* (New York: Arco Publishing Company, 1971). Nathan Miller, *The War at Sea*: *A Naval History of World War II* (Annapolis, Md.: Naval Institute Press, 1995) provides another good summary of naval warfare in World War II. Ralph Bennett, *Ultra and Mediterranean Strategy* (New York: William Morrow and Company, Inc., 1988) gives a geographic focus to the intelligence war, while Bernard Ireland, *The War in the Mediterranean 1940-1943* (London: Arms & Armour Press, 1993) provides a similar perspective on the air, ground, and sea war fought along the coasts of North Africa, Southern Europe, and on the islands in between. Christopher Shores, *et al.*, *Air War for Yugoslavia, Greece, and Crete 1940-41* (London: Grubb Street, 1987) is another detailed account of great interest. Marc' Antonio Bragadin, *The Italian Navy in World War II* (Annapolis, Md.: United States Naval Institute, 1957) provides some information on a service whose contributions to the Mediterranean war have been underrated.

With regard to the air-sea campaign in the North Pacific, John Hail Cloe, *The Aleutian Warriors*: *A History of the Eleventh Air Force & Fleet Air Wing 4* (Anchorage: Alaska Chapter, Air Force Association, and Pictorial Histories Publishing Co., Inc., 1990) is the most comprehensive account. A more recent compendium, *Alaska at War*, Fern Chandonnet, ed. (Anchorage: Alaska at War Committee, 1995) gives the most recent thinking of a number of Japanese and American scholars who have studied the North Pacific campaign. Paul S. Dull, *A Battle History of the Imperial Japanese Navy (1941-1945)* (Annapolis, Md.: United States Naval Institute, 1978) puts the campaign in context from the perspective of the Japanese navy. As is true for all work on World War II, official histories provide a foundation. These include Wesley Frank Craven and James Lea Cate, eds., *The Army Air Forces in World War II*, Vol. IV, *The Pacific*: *Guadalcanal to Saipan, August 1942 to July 1944* (Washington, D.C.: Office of Air Force History, 1983, reprint ed.), Samuel Eliot Morrison, *History of the United States Navy in World War II, Volume VII, Aleutians, Gilberts, and Marshalls June 1942-April 1944* (Boston: Little, Brown and Company, 1951), Stetson Conn, Rose C. Engleman, Byron

Fairchild, *U.S. Army in World War II-Western Hemisphere, Guarding the United States and Its Outposts* (Washington, D.C.: Office of the Chief of Military History, Department of the Army, 1964). In addition to the official histories and the scholarly analyses, resources for the North Pacific campaign include veterans' memoirs and reprints of World War II era documents, many of which were compiled or republished in connection with the fifty-year commemorations of World War II. Notable among these are Charles L. Scrivner, *The Empire Express* (Temple City, Calif.: Historical Aviation Album, 1976) and Naval Historical Center, *U.S. Naval Experience in the North Pacific During World War II, Selected Documents* (Washington, D.C.: Naval Historical Center, 1989). Special interest publications such as *Cryptolog*, the periodical of the [U.S.] Naval Cryptologic Veterans' Association, supplement more general works on the role of signals intelligence with details such as those provided by James McIntire, "Radio Intelligence in the North Pacific Naval and Air Operations," and George McGinnis, "COMNNORPAC Radio Intelligence Unit (RIU) Support," in *Cryptolog* 12(5) (Special Edition, 1991).

As is true for coverage of the air-sea war in the North Pacific, campaigns employing land-based aerial forces in maritime operations in the Indian Ocean and Southwest Pacific areas do not enjoy the plethora of sources available on the Battle of the Atlantic. Nonetheless, good information on the sinking of the *Prince of Wales* and the *Repulse* is available in Deighton, Dull, Richards and Saunders, and Roskill previously cited, in Arthur Hezlet, *Aircraft and Sea Power* (New York: Stein and Day/Publishers, 1970), and Douglas Gillison, *Royal Australian Air Force 1939-1942* (Canberra: Australian War Memorial, 1962). H. P. Willmott, *Empires in the Balance*: *Japanese and Allied Pacific Strategies to April 1942* (Annapolis, Md.: Naval Institute Press, 1982) and United States Army, *Reports of General MacArthur, Volume II-Part I, Japanese Operations in the Southwest Pacific Area*, 1950 (Washington, D.C.: United States Government Printing Office, 1966), are valuable in understanding motives for these campaigns. Official histories particularly relevant to the Southwest Pacific campaigns are Wesley Frank Craven and James Lea Cate, eds., *The Army Air Forces in World War II*, Vol. I, *Plans and Early Operations, January 1939 to August 1942* (Washington, D.C.: Office of Air Force History, reprint ed., 1983), *Volume IV*, cited above, of the same series, and Samuel Eliot Morrison, *History of United States Naval Operations in World War II, Volume VI, Breaking the Bismarcks Barriers* (Boston: Little, Brown and Company, 1968 reprint). Edward J. Drea, *MacArthur's Ultra*: *Code-Breaking and the War Against Japan, 1942-1945* (Lawrence: University of Kansas Press, 1992) supplements the official histories with signals intelligence data not available earlier. George C. Kenney, *General Kenney Reports*: *A Personal History of the Pacific War* (Washington, D.C.: Office of Air Force History, reprint ed., 1987) recounts the efforts of Allied air forces in the Southwest Pacific to interdict Japanese shipping as one who directed the campaign. Herman Wolk, "George C. Kenney," in *We Shall Return! MacArthur's Commanders and the Defeat of Japan*, William M. Leary, ed. (Lexington: University of Kentucky Press, 1988) furnishes a retrospective assessment of Kenney. Gerhard Krebs, "The Japanese Air Forces," pp. 228-34, in *The Conduct of the Air War in Second World War, An International Comparison*, Horst Boog, ed. (New York: Berg Publishers Limited, 1992) discusses Japanese aerial resources brought to the fight. Lex McAulay, *Battle of the Bismarck Sea* (New York: St. Martin's Press, 1991) provides good background and fulsome detail about the aerial destruction of a specific Japanese convoy.

A number of sources document Argentine use of land-based aviation to oppose the Royal Navy's recapture of the Falkland Islands. Martin Middlebrook, *Task Force*: *The Falklands War* (New York: Penguin Books, rev. ed., 1987) and *The Fight for the "Malvinas"*:

The Argentine Forces in the Falklands War (New York: Viking, 1989) are the most comprehensive accounts. The latter, in particular, is supported by oral history and access to documents not granted to other authors. David Brown, *The Royal Navy and the Falklands* (Annapolis, Md.: Naval Institute Press, 1987) is a thorough recounting of the Royal Navy experience, while Commander "Sharkey" Ward, commanding officer of one of the Navy's Harrier squadrons and Rear Adm. Sandy Woodward with Patrick Robinson, *One Hundred Days*: *The Memoirs of the Falklands Battle Group Commander* (Annapolis, Md.: Naval Institute Press, 1992) give unique views of the campaign from their respective vantage points. Roger A. Burden *et al.*, *Falklands: The Air War* provides another specialized look at the campaign as is Jeffrey Ethell and Alfred Price, *Air War South Atlantic* (New York: Macmillan, 1983). The *Falklands Campaign*: *The Lessons,* issued by the United Kingdom's Secretary of State (London: Her Majesty's Stationary Office, 1982) is Britain's official public after action report. Bryon Perrett, *Weapons of the Falklands Conflict* (New York: Sterling Publishing Co., Inc., 1982) focuses on Argentine and British hardware used in the war. Two articles in James A. Brown and William P. Snyder, eds., *The Regionalization of Warfare* (New Brunswick, N.J.: Transaction Books, 1985) are particularly thoughtful. These are John F. Guilmartin Jr., "The South Atlantic War: Lessons and Analytical Guideposts-A Military Historian's Perspective," and Dov S. Zakheim, "The South Atlantic War: Evaluating the Lessons." Also of value is Robert W. Duffner, "Conflict in the South Atlantic: the Impact of Air Power," in *Air University Review* 35(3) (April-May 1984). Another helpful article is that of Commodore José O'Dorico, FAA-Ret, "La Fuerza Area Argentina," in *Air University Review* 37(5) (July-August 1986).

The confusion of war at sea is evident in accounts of the "Tanker War," wherein even the number of ships attacked is not agreed upon. Sreedhar Kapil Kaul, *Tanker War*: *Aspect of Iran-Iraq War 1980-1988* (New Dehli: ABC Publishing House, 1989) has made the most concerted effort to arrive at a definitive list of ships attacked. Tom Baranuskas, "Air Power in the Iran-Iraq War," *Asian Defence Journal* 3 (March 1987), and Robert Gaunt, "War in the Shallow Seas - Maritime Air Operations in the Iran-Iraq War," *Defense & Foreign Affairs* 13 (October 1985) provide good background as do Anthony H. Cordesman, *The Iran-Iraq War and Western Security*: *Strategic Implications and Policy Options* (New York: Jane's Publishing, Inc., 1987) and Shahram Chubin and Charles Trip, *Iran and Iraq at War* (Boulder, Colo.: Westview Press, 1988). Maj. Douglas A. Kupersmith, USAF, *The Failure of Third World Air Power*: *Iraq and the War With Iran* (Maxwell AFB, Ala.: Air University Press, 1993), concentrates on air power applied against armies, but gives some information useful in understanding the campaign against tankers. The belligerents' execution of the war against shipping is discussed in several good pieces. These analyze included Raphael Dandier, "The Persian Gulf Tanker War," *United States Naval Institute Proceedings, Naval Review* (1985), David Segal, "The Iran-Iraq War: A Military Analysis," *Foreign Affairs* 66(5) (1988), Anthony J. Watts, "The Gulf War: Economic War at Sea," in A. J. Ambrose, ed., *Jane's Merchant Shipping Review* (New York: Jane's Publishing, Inc., 1985), and Maj. Stephen C. Polluter, USA, and Lt. Col. Douglas V. Johnson III, *Lessons Learned from the Iran-Iraq War* (Carlisle Barracks, Pa.: Army War College, Strategic Studies Institute, 1991). Three documents issued by the United States Congress represent the best public U.S. government effort to understand the Tanker War. These publications are A United States Senate, Committee on Foreign Relations, *War in the Persian Gulf*: *the U.S. Takes Sides*: *A Staff Report* (Washington, D.C., United States Government Printing Office, 1987), United States Congress, House of Representatives, Committee on Foreign Affairs, *Overview of the Situation in the Persian Gulf* (Washington, D.C.: United States Government Printing Office, 1987), and

United States Senate, Subcommittee on Defense, *U.S. Presence in the Persian Gulf*: *Cost and Policy Implications* (Washington, D.C.: United States Government Printing Office, January 1988).

Material on the role of land-based aerial forces in the Cold War is available, but in annual summaries of Soviet and American strength, reports on particular airframes and weapons systems, and—in the case of American forces—essays touching on how long-range American aircraft might be useful in naval warfare.

Sources especially worth consulting on Soviet Naval Air include The Center for Strategic Studies, *Soviet Sea Power*, Special Report Series: No. 10 (Washington, D.C.: Georgetown University, June 1969), Norman Polmar, "Soviet Naval Aviation," *Air Force Magazine* (March 1976), Peter Hertel Rasmussen, "The Soviet Naval Air Force Since 1945," MA Thesis, 1978 Det Kongelige Garnisonbibliotek, Copenhagen, Denmark, (available as Document No. 20, Reel No. 8732, Microform Center, University of Wisconsin - Madison), R. A. Mason and W. R. Taylor, *Aircraft, Strategy, and Operations of the Soviet Air Force* (New York: Jane's, 1986), and Donald W. Chipman, "The Transformation of Soviet Maritime Air Operations: Implications for US Maritime Strategy," *Airpower Journal* (Summer 1990). In addition, reports on Soviet air and naval orders of battle such as those appearing in *Air Force Magazine* and *Naval Institute Proceedings* give yearly reports on newly-acquired weapons systems and aircraft inventories.

With regard to American forces during the Cold War for the application of land-based air power to maritime operations, pieces such as that of Bert H. Cooper, *Maritime Roles for Land-Based Aviation* (Washington, D.C.: Congressional Research Service, August 1, 1983), Donald D. Chipman and David Lay, "Sea Power and the B-52 Stratofortress," *Air University Review* 37(2) (January-February 1986), and Jan S. Breemer and SSgt Todd Hoover, USAF, "SAC Goes to Sea with Harpoon," *National Defense* (February 1987) predict capabilities never fully realized. Closer looks at the realities of equipment and training are provided by Lt. Cmdr. J. R. Thompson, USN, *USN-USAF Interaction for Ocean Surveillance Using Land-Based Aircraft* (Newport, R. I.: Naval War College, Center for Advanced Research, June 1979), Lt. Col. Donald G. Cook, USAF, Cmdr. Charles H. Horne, USN, and Cmdr. Walter W. Manning, USN, *B-52 Maritime Operations*: *The Anti-Surface Warfare Mission (ASUW)*, Air War College Research Report No. AU-AWC-87-043 (Maxwell AFB, Ala.: Air War College, 1987), Lt. Col. Robert C. Kuhlo, *Attacking Ships*: *Command and Control of Joint Antiship Operations*, Research Report No. AU-ARI-89-3 (Maxwell AFB, AL: Air University Press, October 1990), and Lt. Col. V. Frank Vollmar, USAF, *The Conventional Bomber Force, War-Horses for Global Conflicts*: *Capabilities, Limitations, and Modernization*, Research Report No. AU-ARI-91-6 (Maxwell AFB, Ala.: Air University Press, 1992).