A Companion for Aspirant Air Warriors

A Handbook for Personal Professional Study

David R. Mets, PhD

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Dedicated to Maj Lilburn Stow, USAF, and his C-130 crew,
who lost their lives over the A Shau Valley, Vietnam, 26 April 1968,
while supporting their Army countrymen on the ground

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Foreword

Many defense professionals have commented that too often those military officers arriving at the strategy-making level are not sufficiently prepared. The road to the top requires excellence in one's tactical or technical specialty. Development of this quality is punctuated by many periods of deployment to acquire the experience that is the foundation of that expertise. Usually, that includes only a couple of widely separated years at the professional schools where strategy is one of many subjects covered. Some of the greatest strategists founded their expertise on a lifetime program of personal professional study. Napoleon, Carl von Clausewitz, Alfred Thayer Mahan, George Patton, Omar Bradley, and Dwight Eisenhower are only a few of the exemplars of that. Had any of them waited until they arrived at the colonel level, it would have been too late. This companion to personal professional study is intended to promote the early development of such a lifetime program and to serve as a tool to facilitate its planning and execution.

All of the great captains named above argued that military history and biography are among the tools for the desired study. But until fairly recently, those focused on air war were rather scarce. By now, the discipline is maturing, and the instruments for your study have become so numerous that a well-founded guide can expedite your program. Each of the entries that follow is arranged in a chronological sequence. They can collectively create a structure for the historical study of airpower to include some insights into aviation in the Army, Navy, and some foreign air forces as well. A few of the entries are topical treatments of subjects of special current interest, as is the case with those on diversity and remotely piloted vehicles. Each entry suggests more reading that would expand on the introduction of the subject to yield more depth to your understanding. These are in no way comprehensive or even authoritative but only suggestions for starting points.

One of the requirements that the great Dr. Samuel Huntington identified for the professional is a lifetime of study to maintain and develop a special expertise that rises above the level of the craftsman. The Airman's profession is not flying airplanes—it is the preparation for and the conduct of air, space, and cyberspace war. The occupational specialty is important and must be mastered, but it is only a part of the preparation. The doctor is generally responsible for the life of just one patient at a time. The lawyer can serve only one client at a time. But the lives of many thousands of citizens can be at stake in the decision-making process of a single air warrior. In that sense, your study of your profession is a heavier burden than those for doctors and lawyers—and a good outcome can be even more rewarding for you than it is for them.

Dr. John Shaud
Director, Air Force Research Institute
General, USAF, Retired

About the Author

Dr. David R. Mets is a military defense analyst at the Air Force Research Institute at Maxwell Air Force Base. He is responsible for doing research and writing studies on strategic and historical matters as directed. Dr. Mets was commissioned in the Air Force upon graduation from the US Naval Academy in 1953. He served as a navigator (Military Air Transport Service), instructor pilot (Air Training Command), aircraft commander (Strategic Air Command and twice in the Pacific Air Forces), squadron commander, assistant professor at the Air Force Academy and West Point, and editor of the *Air University Review*. He also served in a civilian capacity as a historian at Eglin Air Force Base and as a professor for the first 13 classes of the School of Advanced Air and Space Studies.

Acknowledgments

The basic idea for this work came from Drs. Daniel Mortensen and Chris Cain, both of the Air Force Research Institute. They were of great assistance in improving the draft as well as inspiring the project. Whatever defects remain are the sole responsibility of the author.

Introduction

This handbook provides a compact overview of the evolution of military airpower for young company-grade Airmen. It is designed as a primer and perhaps as a companion to a lifetime study of the profession. Military power has three main elements: ideas, people, and materiel. Each chapter follows that model. The narrative describes the main ideas, and a biographical sketch introduces someone who played a key role in that area. The illustrations portray some of the people and materiel involved. On the assumption that most Airmen know who airpower icons like Billy Mitchell and Hap Arnold were, the illustrations show some of the other important but less well-known figures. Of course, no short work can cover all the ideas, people, and materiel associated with each airpower topic, so each chapter also suggests some further reading that will start the officer on the lifetime study of his or her profession. The library call numbers of each work are given at the end of each entry.

Chapter 1

The Infancy of Airpower

For as long as there has been war, men have longed to get a height, range, or mobility advantage over their enemies so that they might observe or strike their adversaries without exposing themselves to danger. For eons, they could only use high terrain or build towers. The Montgolfier balloons of the late 1700s initiated manned flight, and Napoleon actually took some balloons to Egypt in 1798 in the hope of getting a military advantage. The Austrians attempted to use unmanned free balloons to bomb Venice in 1849, but the wind did not cooperate. Observing the enemy from balloons was tried again in the American Civil War by Prof. Thaddeus Lowe and others and yet again in the Spanish-American War. But balloons were cumbersome to use in combat zones, and their mobility was limited. Even when free, they could not be steered prior to the development of airships. Even before the coming of aircraft, some had been brought down by ground fire. Balloons for a time did have the advantage of reliable communications with the ground through telegraph or telephone wires.

Long before the Wright brothers, men witnessing the birds yearned for a better means to get a military advantage from above. Early advocates of airpower seem to have envisioned using aircraft for military purposes in place of cavalry. The old shock value of cavalry had long been ended by the invention of the Minié ball and repeating rifles. The advent of mass armies, the telegraph, and railroads made the field-of-view and mobility limitations of horse-borne reconnaissance prohibitive. Aircraft would have a much wider field of view from above, and their speed would enable them to cover territory much more quickly than could be done on horseback. At first, it seemed that they would be able to do so with little fear of enemy counteraction. The Wright brothers sold their machines to the Army based on their perceived utility for reconnaissance. Balloons had already been envisioned as aids to artillery in spotting the fall of shot. Range errors were difficult to estimate from behind the gun, and it was clear that from a height the observer would have a better angle for doing so. That was quickly perceived as another use for aircraft, although for a time communicating the error to the battery commander would be more difficult from an aircraft than from a balloon.

The achievement of the Wright brothers at Kitty Hawk, North Carolina, in 1903 was neither a sudden bolt from the blue nor a result of their work alone. Men had long wished to emulate birds, and many of them experimented with the idea through the nineteenth century, often trying to mimic the motion of the wings of birds, but seldom coming close. In part, the ability to fly with fixed-wing aircraft depended upon the advance of engine technology in the latter part of the century. The steam engines common from the beginning of the century were inherently too heavy for the purpose. But the progress in internal combustion engines increased as the century neared its end. Simultaneously, a gradual understanding of aerodynamics grew both in Europe and America. Sometimes dangerous experiments were conducted with gliders. Otto Lilienthal died as a result of a glider crash. Many people successfully flew model (unmanned) aircraft in the years before the Wrights using various sources of power. Samuel P. Langley was one of them. His

experiments with manned versions showed some promise, but they were costly and did not succeed. Wind tunnels were developed, and the Wrights built one of their own that was effective. Some innovators like Octave Chanute willingly shared their ideas, and the Wrights benefitted from them. Finally, on 17 December 1903, the Wright brothers succeeded. The revolutionary impact on commerce and war was not immediately apparent to everyone, but some, like Theodore Roosevelt, were early advocates.

There seems to be an instinctive longing among warriors to be part of the decisive elements of the military. Before World War I, the decisive elements were the infantry units; both reconnaissance and artillery spotting were auxiliary to infantry combat. However, the notion that airplanes could also be decisive in fighting quickly gained currency. The idea of bombing had been thought of and actually tried from balloons. American airplanes fired Lewis machine guns at ground targets in College Park, Maryland, in 1911, and bombs dropped from Army aircraft not long after. The Hague Peace Conference of 1899 prohibited the bombing of cities, though that did not last. The Italians actually used aircraft bombing in Tripoli before World War I. Even aerial evacuation had been conceptualized to rescue political leader Leon Gambetta from the Prussian siege of Paris during the Franco-Prussian War. Carrier pigeons and balloons had long been used to carry messages out of isolated places. Thus, we can see that most of the military airpower missions had been envisioned before the first air war started in 1914.

Prof. Thaddeus S. C. Lowe, 1832–1913

President Lincoln established the first army air force in America in 1861 by founding the US Army Balloon Corps under Prof. Thaddeus S. C. Lowe. Lowe was born in New Hampshire to a Pilgrim family in 1832 and worked on balloon development prior to the outbreak of the Civil War. He was learned in both meteorology and chemistry and made many successful balloon ascents before the conflict. On the eve of the war, he launched in a balloon in Ohio, planning to utilize the westerly winds to fly to the Atlantic. Unhappily, he flew southeast instead of due east and landed in South Carolina just after Virginia seceded from the Union. He was arrested briefly as a suspected spy but later freed to go back home. In the spring of 1861, he demonstrated a balloon flight in Washington, DC, during which he sent a telegraph message to the ground. That so impressed the secretary of war and President Lincoln that the latter ordered the formation of the Balloon Corps under Lowe's command as a contracting agency. There was a good deal of skepticism among the Soldiers, but Lowe did some pioneering work both in artillery spotting and in reconnaissance. He left Army service in the middle of the war, but his work attracted a good deal of attention overseas, and he actually arranged for Count Ferdinand von Zeppelin to take a flight.

Lowe's systems were superior to others in that he devised mobile means to generate hydrogen while others were still trying to use hot air. The launching and gas-generating apparatus were cumbersome, however, which limited their usefulness in fluid military situations. Lowe went to California after the war, and his many innovations made him a millionaire, though he ultimately lost his fortune in a railroad scheme.

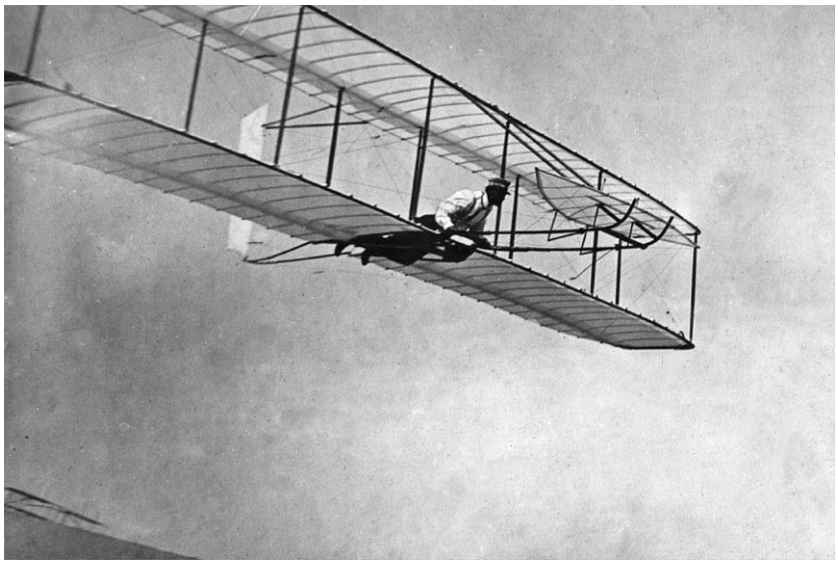

Figure 1. Wright Glider. (USAF photo)

Figure 2. Lt Myron Crissy and Phil Parmalee: The first bomb drop from an airplane, Los Angeles, 1911. (USAF photo)

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Chapter 2

Naval Aviation

Observers from the US Navy were present at Fort Myers, Virginia, when the first Wright brothers airplane passed its acceptance tests. The sea service had recently undergone a number of technical innovations that made airplanes at least as alluring to Sailors as they were to Soldiers. Security at sea had always been a concern, and the crow's nest on high was created precisely to give the observer a broader field of view. New gun and propellant technology had recently given battleship weapons the ability to fire over the horizon, but the fire control systems could not hope to hit an inbound target without seeing it. Sailors tried putting observers aloft in kites and balloons, but the ship's speed made that impractical. The airplane's potential was quickly apparent. With battle fleets steaming toward each other at around 23 knots, if the spotter had even a four- or five-nautical-mile advantage, major damage could be done to enemy fleets before they could return fire effectively. Also, flying at 70 knots with a field of view much greater than that aboard 30-knot cruisers on the surface, aircraft offered yet another huge scouting advantage to the possessor.

Flight training started at Pensacola, Florida, as early as 1914 and was conducted by the Wright brothers and Glen Curtiss even before that. The USS *Mississippi* arrived off Pensacola in January 1914 with a load of aviation equipment and an array of the first generation of Navy pilots. Their mission was to set up the great training station that is still in operation. The initial cadre included John Towers, Henry Mustin, and Patrick Bellinger. Washington interrupted their work almost immediately by ordering the *Mississippi* to deploy with an aviation detachment to Vera Cruz, Mexico. The cruiser *Birmingham* was also ordered to deploy there with another flying detachment. The mission was to help with the occupation of that port. The Mexicans were in the midst of a revolution, and the rebel José Victoriano Huerta had usurped power. The immediate cause of the deployment was information that a German ship was inbound to Vera Cruz with a load of military equipment for Huerta. The United States decided to prevent its landing. The *Mississippi* served as a floating base for flying boats and seaplanes. The aircraft provided scouting ashore and aerial photography and searched for mines in the water around the port. Bellinger flew one mission during which his aircraft received battle damage from small arms fire—the initial aircraft combat experience of US forces. Mustin, the first commander at Pensacola, died of heart disease in 1923, but both Bellinger and Towers lived to become admirals.

The problems of launching and recovering aircraft at sea as well as communicating with them in flight were daunting. The Navy participated in World War I in a couple of ways. It deployed its flying boats to France, where they engaged in antisubmarine patrols. It also had a role in the fight over land at the northern end of the front. Though the US Navy (USN) led the way with landing and taking off on vessels before the war, it did not bring its aircraft to sea aboard ships during the conflict. The British navy led the way on that. At the end of the Great War, it had three aircraft carriers at sea, and the American Navy men knew it. Kenneth Whiting and the others returned to America and

succeeded in persuading the Navy to convert a new collier into an aircraft carrier as the USS *Langley.* Selling aircraft carriers to skeptics in the Navy was not an easy task. Some thought that scouting could be provided by seaplanes catapulted from existing capital ships. Others felt that flying boats could provide the necessary scouting service without requiring a whole new line of specialized vessels. In the end, neither catapulted aircraft nor flying boats could reliably provide air superiority over the sea battle, and a consensus formed around the carrier option. Whiting was a prime mover in the *Langley's* development and later was her commander. She lasted until February 1942, when the Japanese sank her off Java.

As with the US Army, the initial role perceived for aircraft in the Navy was an auxiliary one. They were to enhance the effectiveness of the main striking arm: the battleship line. However, a subdued thought was already present. Bombing practice at Glenn Curtiss's school at Hammondsport, New York, used the outline of a battleship on the ground as a target. Naval officers like Adm William Sims, Capt Henry Mustin, and Cdrs Jerome Hunsaker and Kenneth Whiting were attentive observers of aviation progress in Europe during the war and brought their ideas back to America immediately after the armistice. The thought was germinating that one day aircraft would become the main striking force in place of traditional battleships.

Kenneth Whiting, 1881–1943

Kenneth Whiting was born in Massachusetts in 1881 and went to the Naval Academy in 1901. Initially, he served in submarines and commanded four of them: the *Porpoise*, *Shark*, *Tarpon*, and *Seal.* He pioneered an underwater escape method from submarines by experimenting with leaving his submerged vessel through a torpedo tube. Whiting was one of the relatively rare officers who went from submarines to aviation, and in 1914 Orville Wright himself taught Whiting to fly at Dayton, Ohio. Whiting was the officer-in-charge at Pensacola for the next two years. In 1917, early in the United States' participation in World War I, he went to Europe in command of a naval air unit in France. He witnessed combat there and learned of aviation efforts in the British navy. He conducted the early negotiations with the French for naval aviation facilities and for training services. He came back to America to testify repeatedly to the Navy General Board and influence the development of naval aviation in this country. He served on the staff of the Bureau of Aeronautics immediately after its creation in 1921. Having served as executive officer on both ships in the 1920s, in the 1930s Whiting commanded the first American aircraft carrier, the USS *Langley*, and later the third one, the USS *Saratoga.* He retired a captain in 1940 but was recalled for active duty after Pearl Harbor. He died in 1943, and Whiting Field, Milton, Florida, is named in his honor. In 1944 a seaplane tender, the USS *Whiting,* was also named after him; she went on to serve in the closing campaigns in the Pacific and then again in the Korean War.

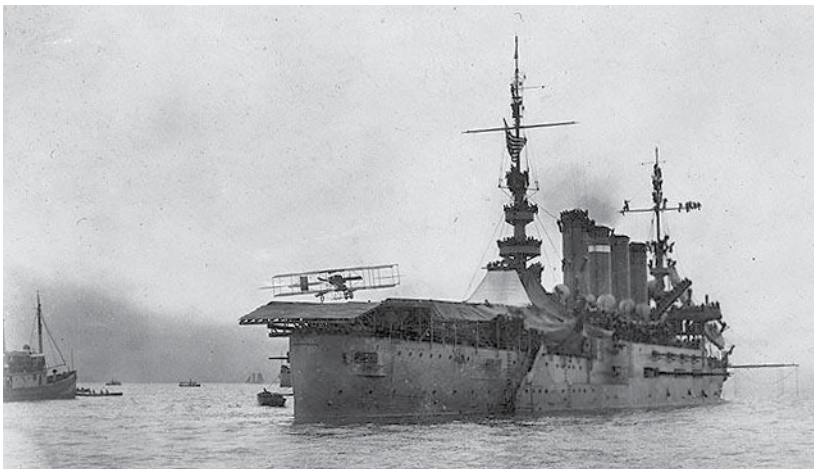

Figure 3. Eugene Ely landing on board the USS *Pennsylvania*, in San Francisco Bay, 18 January 1911. (USN photo)

Figure 4. Cdr Kenneth Whiting, trained by the Wright brothers, 1914. (Naval Historical Center photo)

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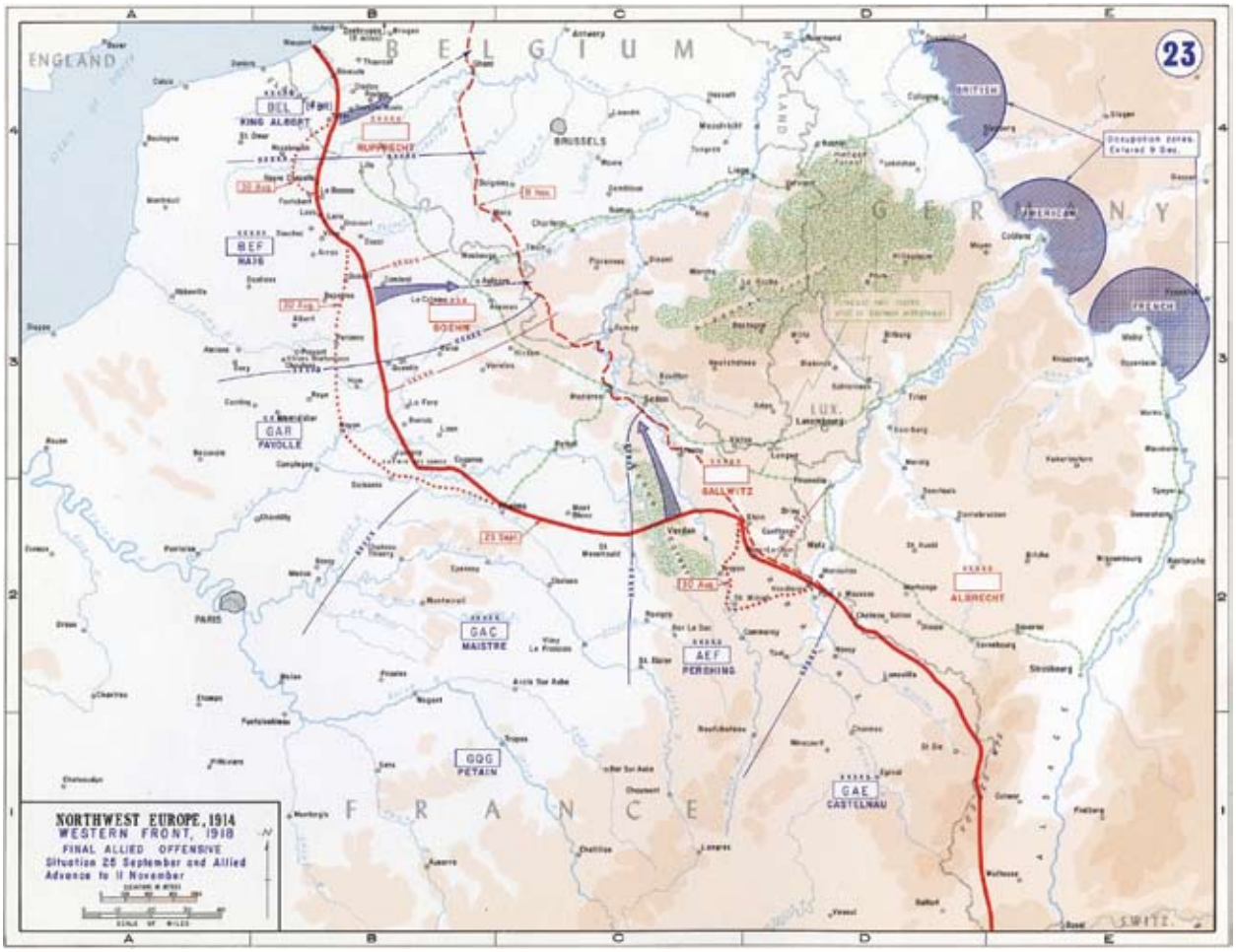

Figure 5. World War I Western Front map. (Courtesy of US Army)

Chapter 3

Airpower in World War I

Airpower was hardly out of its infancy when World War I broke out. The European powers, threatened by neighboring major powers, had advanced much more rapidly in military aviation than had the United States. In the American case, the initial combat deployment of both Army and Navy airpower came against Mexico between 1914 and 1917. The appropriations for the new arms were ungenerous, and the Army Air Service's deployment of its 1st Aero Squadron with Pershing's Punitive Expedition was close to a fiasco. But it did loosen the purse strings of Congress a bit, albeit at a late hour. In the Punitive Expedition, the aircraft sometimes carried rifles and pistols but not for use in the air. Many aircraft were lost. The Army Air Service attempted to use the aircraft for scouting, and one of their important missions was to carry General Pershing's Christmas cards back to the United States for mailing. The maintenance and supply support had been motorized, but often their vehicles were detailed to other parts of the Army which still relied on horses and mules.

Presidential politics intervened. As Woodrow Wilson was campaigning on a platform of "He Kept Us Out of War," not much could be done before November 1916. However, the United States soon shifted to a preparedness campaign and started to rebuild her forces for war. The declared objective was to darken the skies of Germany with a cloud of American war planes. But such a mobilization was easier said than done. The first million US Soldiers did not arrive in France until June 1918, though the second million were there three months later. As for the air, the cloud of military aircraft was harder to generate than imagined. In the end, the only American-designed and -built aircraft to arrive in Europe were small Curtiss flying boats. Even the British-designed, American-built DH-4s arrived only in the last weeks of the war, and there were fewer than 1,000 on the line. The vast majority of planes flown by Americans were manufactured by the French.

At first, aircraft armament was made up of adapted ground weapons. The early bombs were very often rejected artillery shells fitted with makeshift fins and dropped over the side by the observer in the rear cockpit. Hiram Maxim first developed the machine gun in America in the nineteenth century, but Europeans designed and manufactured most of the fixed guns used on aircraft. By the time America got into the war, the synchronizer had been developed to fire bullets between the blades of the propeller. This was a major advance because the guns and ammunition of the day were so unreliable that it was handy to have the weapon within reach of the pilot so he could do in-flight maintenance. The synchronizer made this possible. The flexible weapon most commonly used by the observers, and sometimes the pilots, was the Lewis Gun. It was designed by a retired US Army officer, Isaac Newton Lewis, and was a highly reliable piece—it was fired from an Army airplane at College Park, Maryland, in 1911 and actually shot down a V-1 Buzz Bomb over England in 1944.

The American Army Airmen arrived in some numbers and finished their training at centers in France. The one for fighters was at Issoudon, which had 5,000 students and 1,000 aircraft at its height. Many of its graduates got into the fight before the end, and

they claimed some 700 victories in combat. Ideas suggesting strategic bombing were already surfacing, but General Pershing was quick to quash them. Some Americans flew with the British and French before the United States entered the war, and some of them, along with the later arrivals, achieved their "acedom." Also, they established personal contacts with junior British and French airmen that paid important dividends 20 years later in World War II.

Brig Gen William Mitchell was in charge of combat aviation at the front. There were two major air operations before the armistice. First was the St. Mihiel offensive in September 1918. The objective was to reduce a German salient on the American front. The air component under Mitchell included some 1,500 airplanes, many of them loaned by the British and French. Many young Airmen involved later become famous, among them George Kenney and Carl Spaatz. Once that operation was completed, the Army was turned to the left for the Argonne offensive, which was a tough slog. The end of the war came soon after, and there was no way to claim that airpower had been decisive. However, it was clear that airpower, along with barbed wire, new and deadly artillery, and machine guns, had made the war into a long defensive stalemate that exhausted the Germans.

Maj Gen Benjamin Delahauf Foulois, 1879–1967

Benjamin Delahauf Foulois came from humble roots in Connecticut to the US Army during the Spanish-American War. He rose from private in the infantry to the major general in charge of the Air Corps in 1931. He saw his first combat in the Philippines and rose through the ranks to second lieutenant by 1901. He flew with Orville Wright at Fort Myers during the acceptance trials of the first Army airplane. Soon after, he was in charge of Army aviation at Fort Sam Houston, Texas, where he taught himself to fly. In 1913 Foulois was sent to San Diego to organize the first air tactical unit in the Army, the 1st Aero Squadron. He commanded the first combat deployment with Pershing's Punitive Expedition to Mexico in 1916, which had disappointing results but generated important lessons learned on the eve of war. He deployed to Europe in the fall of 1917 and found Billy Mitchell already in place. They became rivals, and Pershing put Foulois in charge of logistics and training in the rear and Mitchell in charge of aviation at the front. Foulois spent much of the early twenties in a diplomatic assignment in Europe and was out of the spotlight during the Mitchell trial. Afterwards, he returned to the Air Staff and ultimately became chief in 1931. That turned out to be an unhappy time because of the apparent failure of the airmail effort in 1934 and because of contracting difficulties in the following year. Foulois retired without fanfare at the end of 1935. He lived in retirement in New Jersey and spent the last part of his life on Andrews Air Force Base, Maryland, until he died in 1967, mourned by many of the earliest Army Airmen.

Figure 6. Fokker Dr 1. (USAF photo)

Figure 7. American Eugene Jaques Bullard, who flew fighters for the French in World War I (Blacks could not fly in US Army aviation until the eve of World War II). (USAF photo)

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Chapter 4

Laying the Intellectual Foundations, 1919–1931

The briefness of the American experience, as well as immature wartime aerodynamic and engine technologies, inhibited the emergence of solid lessons on military airpower. That, along with the postwar need for governmental economy and the peace movements, made the 1920s years of intellectual ferment. This theorizing could not be inductive because the database was simply not wide enough or old enough to yield an adequate sample size. Consequently, contemporary thinking was mostly deductive, based on reason more than experience.

Edgar Gorrell of the US Army put together the final reports of the Air Service of the American Expeditionary Forces (AEF). There is much in the reports that anticipated the future, but that did not get a lot of attention until recent times. The most famous airpower thinker of the 1920s was an Italian, Giulio Douhet, whose book *Command of the Air* was published in 1921. The work has had an enormous influence, both negative and positive. Douhet argued that future navies and armies would fight only on the defensive, while inherently offensive air forces would attack enemy vital centers—enemy populations. Once Douhet's airpower destroyed that of the enemy on the ground, then it would turn to attacking enemy civilians. He assumed that civilian morale was inherently fragile and that civilians under attack would soon force their governments to capitulate. His bombers would always get through, and if any force protection were needed, it would be provided by bomber airframes loaded with many machine guns. Douhet was not always revered in his own country and actually spent some time in jail.

William C. Sherman graduated third in a class of 83 at West Point in 1910. One of the early Airmen, he was known to the Wright brothers and was a member of the 1st Aero Squadron in San Diego. He participated with it in the Punitive Expedition in 1916. He served with the First Army in France in World War I, working for a schoolmate, Thomas de Witt Milling, another of the early flyers. At the end of the war, Sherman tarried in France to help Gorrell assemble the final report of the Air Service in World War I. He was assigned to write the tactical history of the Air Service as a part of that report. He and Milling helped set up the Air Service Field Officers' School at Langley Field, Virginia, right after the war, and Sherman had a major role in providing the written material for instruction there. In the mid-1920s, he moved on to teach at the US Army Command and General Staff College, Fort Leavenworth, Kansas, and there wrote his book *Air Warfare*, published in 1926. It provided a more balanced view of airpower than was common among the early Airmen, containing articulate chapters on tactical airpower (then called "attack"), pursuit, bombardment, naval aviation, and logistics. Many of the Air Service and Air Corps pioneers went through the school using the text in the 1920s; thus they got instruction in what has become tactical air doctrine much earlier than is often supposed. Sherman was well known to Mitchell as well and possibly was an early influence on him. Sherman died prematurely in November 1927.

American Brig Gen William "Billy" Mitchell visited the leader of the British airmen, Air Marshal Hugh Trenchard. Mitchell came home with the conventional view that airpower

is most useful in achieving command of the air and then in supporting the infantry, deemed the "queen of battle." His early controversial point was that all airpower ought to be gathered under a separate air force, reporting as a coequal to the Army and Navy in a department of defense. As the 1920s progressed, his confrontational methods got him ever more deeply into trouble, until he was court-martialed in late 1925. He was found guilty as charged and resigned. In his declining years, he became more attracted to strategic bombing. The US Army Air Corps Act of 1926 resulted from the controversy Mitchell fomented.

One of the factors disturbing the tranquility of the early twenties was that the Airmen were a flamboyant group of people not much given to self-effacement. That did not endear them either to the Navy or the Army General Staff. Pershing referred to them in France as a lot of good men running around in circles and managed the Mitchell-Foulois rivalry by bringing in his West Point classmate, Mason Patrick, to take charge of both. Patrick was not a pilot, but to his eternal credit he handled it well.

For a time after the war, Mitchell remained in Europe, and an infantry man, Maj Gen Charles T. Menoher, commanded the Air Service in America. Menoher did not have a lot of luck when Mitchell did return because the latter thought he should be chief. So Menoher went back to the infantry where he prospered, and Pershing brought Patrick back for another shot. That worked fairly well, but the confrontational Mitchell could not be contained and wound up bringing about the famous court-martial in 1925.

Maj Gen Mason Patrick, 1863–1942

Mason Patrick was born in West Virginia during the American Civil War. He attended West Point and graduated first in the class that also contained John J. Pershing. He devoted most of his career to the Army Engineers, commanding units in Cuba before the First World War and deploying to Europe in command of an engineer unit in the summer of 1917. When Pershing had difficulty controlling the Airmen in the AEF, he reached out for Patrick and made him their chief as a major general. Patrick did that job well. His first love was engineering though, and when the war was over, he reverted to his permanent rank of colonel and went on to service in New Orleans. That did not last, for Pershing was now chief of staff and reached out for him again to come to Washington to command the Airmen. Patrick did so, and in the process, he learned to fly and got his wings. His ideas were largely the same as Mitchell's, but his approach was much less confrontational, and those ideas affected the Air Corps Act of 1926 in important ways. He did pretty well in controlling Mitchell until the secretary of the Army refused to reappoint Mitchell as assistant chief and sent him back to San Antonio as a colonel. Without Patrick's steadying hand, Mitchell lashed out and brought on his court martial and conviction. Patrick retired in 1927 and died in 1942.

Figure 8. DeHavilland DH-4, mainline Army Air Service aircraft of the 1920s. (USAF photo)

Figure 9. Maj Gen Mason Patrick. (USAF photo)

Figure 10. Brig Gen William Mitchell. (USAF photo)

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Chapter 5

An Age of Innovation, 1931–1941

The Depression was an age of great aviation progress and sweeping changes in international politics. Poverty was widespread. The disarmament progress of the 1920s ended. Peace movements were still noisy. Isolationism governed the policy of the United States. Germany, led by Hitler after 1933, started an aggressive march in Europe. The moderates in Japan lost control, and she resumed her imperialistic advance. Mussolini's Italy went on the march in Africa.

In the United States, the Army came on hard times. It had a few overseas deployments, but there was no fighting there. Funding was minimal, and the service was actually put on mandatory furlough for a short while in the early thirties. Little or nothing was being done with armored warfare or mechanization. Still, the Air Corps, notwithstanding its many complaints, received more funding than any other branch of the Army. And within the air arm, there *were* substantial advances in both ideas and technologies. Franklin D. Roosevelt came into office in 1933, and his administration started additional spending on naval ships and on infrastructure improvements on Army and Navy bases using relief appropriations. But isolationism remained America's foreign policy, and austerity continued at home.

The Air Corps Act of 1926 promised substantial advancement in the Army's air arm, but when it came to appropriations, those fell short of the perceived promise. At first, the coming of the Great Depression only made things worse. The Morrow Board had been convened in connection with the Mitchell troubles of 1925, and though it did recommend the creation of an air corps, it also declared that there was no foreseeable air threat to the United States. Early in the administration of President Roosevelt, the government got into a controversy with the airlines contracted to carry airmail. Searching for an alternative, the postmaster general asked the chief of the Air Corps, Benjamin Foulois, whether the Army could carry the mail. In his usual self-confident manner, he assured the administration that it could be done. Thus the postmaster cancelled the airmail contracts and assigned the work to the Air Corps. The effort turned out to be a bit of a fiasco and severely dimmed the luster of Foulois. There were many crashes, and several Airmen were killed. The administration convened the Baker Board to consider the problems of aviation. Headed by former secretary of war Newton Baker, its membership included Jimmy Doolittle among others. It too did not see an immediate air threat to the United States, but it did recommend centralizing the control of all Army airpower (except observation aircraft) under the control of a General Headquarters (GHQ) Air Force. Some Airmen thought this was an important step towards an independent air force and the recognition of the potential of strategic bombing. The airmail crisis, then, had some beneficial effect in organization and also loosened the purse strings a little.

The Air Service Tactical School became the Air Corps Tactical School in 1926 and moved from Langley to Maxwell Field, Alabama, in 1931. The stature of pursuit and air fighting diminished, and the prestige of bombing grew in the years after Mitchell resigned. Still, neither the pursuit nor the ground-attack course ever disappeared from the school's

curriculum. However, there is no doubt that long-range strategic bombing dominated the thought there, though not all the students agreed with the conventional wisdom. The growing importance of long-range bombing was expressed in the wake of the airmail crisis (1934) when the GHQ Air Force was established the next year at Langley under the command of Maj Gen Frank Andrews. It contained all Army aviation except the observation units, and all of the heavy bombers were assigned to its 2nd Wing at Langley. Both Oscar Westover and Frank Andrews were graduates of the same class at West Point. The former became Foulois's successor as chief of the Air Corps, and Andrews took command of the GHQ Air Force. Westover's function was the training and equipping of people for the air arm; Andrews' was to run the operational part of the Air Corps including unit training.

Meanwhile, the advance in materiel was also rapid. The Air Corps converted from biplanes to monoplanes, with all-metal construction, internal wing bracing, enclosed cockpits, retractable landing gear, supercharging, better bomb sights, and substantially more powerful engines. Its four-engine bombers were the most advanced in the world. Instrument flying was under development, along with electronic communications and navigation equipment. By and large, aircraft guns were deemed adequate, and not much was done with them. However, as more and more bombs were carried internally to improve the aerodynamic performance of long-range bombers, weapons shapes were redesigned for compact package into bomb bays. Perhaps because practically all Airmen thought it impractical to develop fighter escorts that would have the tankage to give them ranges comparable to the bombers and yet retain the agility to tangle with enemy interceptors, the Airmen were becoming ever more favorable to daylight, long-range attack with self-defending bombers. Perhaps it was wishful thinking.

Maj Gen Oscar Westover, 1883–1938

Oscar Westover graduated from West Point in 1906. He spent his initial years in the infantry and was not reassigned to the Air Service until just after World War I. At first he was qualified in balloons and airships, and he won his wings as an airplane pilot in 1923. Assigned to the Air Staff in the early 1920s, he was not then a fan of Billy Mitchell. He attended the Air Service Tactical School while it was still at Langley Field and later became its commandant. Westover was again on the Air Staff at the time of the airmail crisis of 1934, by then a brigadier general. There were many accidents during the crisis, along with some perceived contracting irregularities, that led to the retirement of General Foulois and the creation of the GHQ Air Force. Both Westover and Andrews spent a good deal of time with the ground army before becoming pilots; one became the chief of the Air Corps and the other the commander of the GHQ Air Force in 1935. Some of the most zealous Airmen thought that was an effort to get more ground-army-sympathetic Airmen in charge and also to stimulate the rivalry between them. The argument was that would make the "unruly" flyers easier to manage than they had been in the Mitchell era. General Westover crashed and died while flying an A-17 at the Burbank, California, airport in 1938. He was succeeded by Maj Gen Henry H. Arnold. Westover's son, Charles, reached the rank of lieutenant general in the Air Force after World War II.

Figure 11. The Curtiss P-6E of the early 1930s, one of the last biplane pursuits in Army service. (USAF photo)

Figure 12. Lt Gen Frank Andrews. (USAF photo)

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Chapter 6

Naval Aviation between the Wars

Aviation was well integrated into the Navy after 1919. There was debate over whether it was an auxiliary to enhance the effectiveness of the main armament, the battleships, or a striking arm in its own right. Doubtless, its potential was great in both functions. The old Sailors were partly motivated by the concern that if they did not take care of aviation, then Mitchell would win out and it all would go into a new, separate air force.

All concerned knew that air superiority over the battle was becoming essential. The dilemma was how to base the aircraft that were to achieve it. Seaplanes would be good at scouting and spotting the fall of shot but could not be counted on to be on the scene of battle when needed. Further, they were sure to be so cumbersome that they could not survive against pursuits (fighters). Cumbersome float planes could be launched from catapults, but the ship would have to stop to recover them, thus becoming fat submarine bait. The British led the way into the development of aircraft carriers that could keep wheeled fighters on the scene of battle and still recover them underway. They could achieve security through speeding away from enemy guns, but they required a whole new line of expensive vessels.

The old salts established the Bureau of Aeronautics before the Mitchell bombing tests of 1921 and put Adm William Moffett at its head, where he remained for 12 years. His sensible founding of a real career track for aviators kept them in the Navy, and ultimately they commanded it.

The Washington Treaty of 1922 limited the United States to 135,000 total tonnage of aircraft carriers (the experimental *Langley* excluded). The treaty did allow the British, Americans, and Japanese to exceed the individual ship tonnage on two of their vessels to utilize hulls already under construction. Fortuitously, the *Lexington* and *Saratoga* came on the line on battle-cruiser hulls in 1929, and, at 33,000 tons, they were larger than all foreign carriers. That made them better at war than the smaller vessels later designed and built from the keel up as carriers. The *Yorktown* was one. The assumption for the new carriers was that sortie rate depended upon the number of decks involved, not their size. That did not prove true in battle. The *Ranger* was about half the size of the *Lexington*, and there is a relationship between the length of a ship and her speed. The difference in the *Ranger's* and *Lexington's* speed was only about six knots, but for the airplanes of the day that made a substantially longer takeoff run from the slower ship—one that had a shorter flight deck to begin with. Thus, in the war that followed the *Ranger* was never sent to the Pacific because it was thought unsuitable for that theater.

Dive-bombing tactics were developed from 1927 to 1941, and combined with the Douglas SBD Dauntless, they became decisive in battle. Earlier level bombers had little chance of hitting a moving ship, and the older dive bombers could not carry a sufficiently heavy bomb to penetrate deck armor. Early in the process, torpedoes had been the weapons of choice, but in many ships the horizontal deck armor was not as heavy as the side armor protecting the vital areas of the ships. Thus, the theory was that perhaps a weapon delivered from above could have a smaller warhead than a torpedo.

While Admiral Moffett was attending to aviation's political, personnel, and technical affairs in Washington, Adm Joseph Reeves was dealing with procedural and tactical issues at sea. He played a vital role in developing the deck procedures and task force formations that gave the Navy another advantage in the coming conflict. When war came, the US Navy sortie rates exceeded those of all other navies. Even before the *Lexington* and *Saratoga* got on the line, Reeves had conceived of and was practicing the use of carrier task forces. He assigned a seaplane tender to one force, with one plane representing a carrier air group, and the *Langley* with its assigned aircraft was on the opposite side. The Navy staged mock air attacks against the Panama Canal and Pearl Harbor from the late 1920s onward. One result was that the Navy moved away from its old organization by ship type and toward task forces that were built around aircraft carriers and contained ships of several different types. Ultimately, one effect was to remove the large guns and even smaller ones from the carriers and put them aboard the supporting cruisers, destroyers, and battleships. That enabled the loading of more aviation gasoline and bombs on the carriers and reduced the burden of frequent replenishment at sea.

Adm Joseph M. Reeves, 1872–1948

Adm Joseph Mason Reeves was born while Ulysses Grant was president and died when Harry Truman was in the White House. He was appointed to the Naval Academy in 1890 and played on the varsity football team. Later Reeves was its head coach while assigned as an instructor in chemistry and physics. He was a dedicated professional—almost to the point of obsession—and he served aviation, the Navy, and America well. Reeves was on the crew of the battleship *Oregon* during the famous chase of Admiral Cervera that resulted in the destruction of the Spanish squadron off Cuba in 1898. He commanded a battleship in the First World War and served on the staff of the secretary of the Navy in the Second World War. One of his many commands was the new collier *Jupiter*—before she was converted to our first aircraft carrier, the *Langley*. He served aboard her again as the commander of aircraft squadrons of the battle fleet. It was there and in commanding the *Saratoga* a few years later that he made his great marks on naval aviation. He ultimately got the deck load of the *Langley* up from 12 to 48 aircraft and those of the *Lexington* and *Saratoga* up from 70 to 90 planes. In 1929 he demonstrated the potential of aircraft as the main striking force in simulated attacks on the Panama Canal and also ran exercises against Pearl Harbor. Reeves first retired in 1936 but was recalled to serve on the secretary's staff after Pearl Harbor and retired again after World War II ended. Two airfields in California and a USN destroyer were named after him.

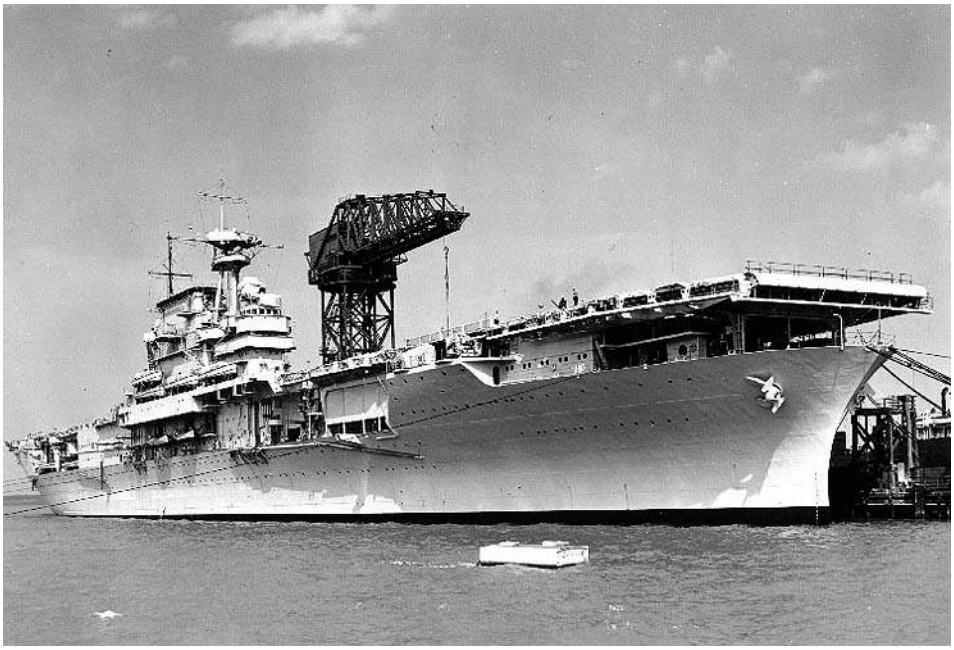

Figure 13. USS Yorktown, August 1937. (USN photo)

Figure 14. Schneider Cup Races, November 1926. (USN photo)

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Figure 15. World War II in Europe map. (Courtesy of History Department, US Military Academy)

Chapter 7

World War II: The Rise of the Luftwaffe

Airpower was not a decisive factor in World War I. Still, the air war was a bloody and close-run thing. In the end, superior numbers and better engines were among the important factors that helped the Allied air forces to win. The Versailles Treaty at the end of the war prohibited military air forces for Germany, and that worked to a certain extent.

Interwar Period

Notwithstanding the Versailles Treaty, Obergeneral Hans von Seeckt reduced the impact of the air defeat by covertly saving the lessons of the conflict. That was a foundation for the initial Luftwaffe doctrines when they emerged in the early 1930s. The Luftwaffe also got some training in glider clubs, in the civilian airline, and in secret operations in the USSR. In 1935 the Luftwaffe officially emerged. Its Condor Legion got some good tactical experience during the Spanish Civil War. It supported the Nationalists against the Loyalists and their Soviet allies and helped Gen Francisco Franco gain air superiority. As World War II dawned, the Luftwaffe had excellent fighters and tactical aircraft but lagged in aircraft engines, high-octane fuels, four-engine bombers, and professional education for its officers.

World War II

Hitler told his generals that war might come in 1942, but instead he attacked Poland in September 1939. The Luftwaffe was but six years old. Yet other air forces were even less prepared than it. The Germans followed a scheme that would become classical tactical air doctrine. It first won complete air superiority and then turned to ground support.

Opening Campaigns

The Polish air force was flushed from its bases, and the surviving aircraft recovered at auxiliary fields could not regenerate the force. It was over in a trice, and the Germans turned west to Norway, the Low Countries, and then France. With the same methods, they rolled through with amazing speed. France fell in May 1940. The Luftwaffe attempted to cripple the evacuation at Dunkirk, but it ran into the Royal Air Force (RAF) for the first time and failed. The collapse of these countries may have surprised even the Germans, and it took them weeks to decide what to do next.

Battle of Britain

The string of Luftwaffe cakewalks ended with the Battle of Britain. Whatever the strategic bombing theories among the German airmen earlier, the Germans simply did not have the equipment and force structure for such an effort. On top of that, it is possible that their tired airmen's motivation was not as strong as that of the RAF. The interwar

notion that "the bomber will always get through" was certainly made open to doubt, though that was not sufficiently appreciated at the time. In the mid-1930s when the strategic bombing idea was developed, hardly anybody could imagine that radar would be a practical possibility within five years. Yet radar made a huge difference. Prior to that, air defense was almost automatically condemned to a "perimeter defense" which would be weak everywhere. That would have condemned the defenders to being tactically surprised and outnumbered at the point of attack in almost all cases. Radar and the rest of the world's first integrated air defense system changed all that. They permitted the concentration of defending forces and gave prior warning as to the imminence, location, and direction of attacks. On top of that, though the crew-reported intelligence on both sides was bad, the British could count the wrecks and interrogate prisoners; the Luftwaffe could not. When the RAF did not fold and the attack on London did not have the effects predicted by Douhet, Hitler called it off and turned eastward.

Barbarossa

Hitler, who had condemned the kaiser for permitting a two-front war, turned against the USSR without defeating Britain. He saw the USSR as a house of cards, but it did not collapse. That condemned him and the Luftwaffe to a long war they could not win. The Germans did catch the Red Air Force on the ground and wiped out hundreds of aircraft but not their pilots. Most of those planes were obsolete, and a whole new generation was about to emerge from the Soviet factories. The new ones were still not as good as the German craft, but the gap was much less than it had been and was gradually closed further as the war went on. The numbers were increasingly on the Soviets' side, and they got some important aid from Great Britain and the United States.

Mediterranean

Just as the Battle of Stalingrad was approaching its climax, the Allied invasion of North Africa put the German Afrika Korps and their Italian allies in such a bad predicament that the Germans were compelled to redeploy substantial air formations to that theater. That was not enough. The RAF and the United States Army Air Forces (USAAF) gained air superiority and, with the aid of ULTRA intelligence, cut off the Axis forces in Africa. This put another substantial defeat on the Germans shortly after their disaster at Stalingrad. But the pressure on the Germans in both Russia and the Mediterranean continued. The Allied invasion of Sicily was next, and then the assault on the Italian mainland soon brought about Italy's surrender. That summer and fall, the air attacks on the German heartland were also mounting. The Ploeisti and first Schweinfurt raids came in August 1943, and the bloody check at Schweinfurt came in October.

Generaloberst Hans von Seeckt, 1866–1936

Hans von Seeckt was not an airman. He was born in northwestern Germany about the time that Prussia took Schleswig-Holstein (his home area) from Denmark. He entered the army in 1885 and ultimately rose to the elite General Staff. He was active in World War I, but his experience in that conflict was not typical. He did not get involved much in the stagnated war on the western front, but he got extensive experience in the mobile war in the East and even in Turkey. As commander of the tiny army that the Versailles Treaty permitted Germany, he laid important foundations by preserving the officer corps and the doctrine and improving both. In Von Seeckt's writing and thinking are some of the roots of the Blitzkrieg, and he was ahead of his peers in thinking about the implications of airpower. Before his tenure was over in 1926, air manuals had been written that still have relevance. Like many airmen, he deemed airpower as inherently offensive and thought gaining command of the air was its first mission. Though interested in more than tactical aviation, he understood that Germany's vulnerable position between great armies in the east and west mandated that ground support would usually have the next priority. Thus the Germans made an important start on Luftwaffe doctrine before that organization ever existed.

Figure 16. Messerschmitt Bf-109G, mainline Luftwaffe fighter in World War II. (USAF photo)

Figure 17. Luftwaffe airmen, National Museum of the US Air Force. (USAF photo)

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Chapter 8

World War II: Europe—The Strategic Bombing Dimension

At first, the only option for the Americans and British to attack Germany in 1941 and 1942 was to continue the strategic air campaign against the enemy homeland. It was imperative because the Germans were rattling the gates of Moscow by the end of 1942, and the Soviets might well have abandoned the fight as the Russians had in 1917. But to invade Europe in those years would have been suicidal for the United Kingdom and the United States.

Strategic bombing got its start in World War I, and in the interwar period the theory was elaborately developed in many places—often in the hope that it would be decisive without the bloody ground fighting that killed off generations of young men in World War I. British and American theories had been similar, but bloody experiences for the RAF in 1940 caused it to adopt night attack for the sake of force survival. It was even tougher in those days to get feedback on the effectiveness of one's attacks than it is today. Thus, it took a couple of years before the British realized that their night bombers were frequently not finding their target areas and seldom hitting the targets they did find. Once they understood that, the RAF developed pathfinder methods that improved their effects, but they generally persisted in area targeting.

Building a theory is one thing; building an aircraft fleet and an organization to implement it is quite another. The United States had probably gone further with the latter effort than had the British. America had four-engine bombers and a sophisticated bombsight in place before she got in the war. But she had enjoyed three more years of peace than had Britain, and she did not need to build a strong air defense system for the homeland. The RAF had only two-engine bombers on the line until 1942, and most of them did not have the range to reach very far into Germany. By the time America got into the war, her largest bombers had bigger guns than the British and more of them on each aircraft. However, that detracted from the size of the bomb load and required a larger number of attacks to achieve the same damage. In the end, the guns could not be decisive. The German interceptors usually had larger calibers and could stand off outside the range of even the .50 caliber Brownings and fire away—not that they always did so.

The US Army Air Forces stuck with their daylight precision-bombing theory after they arrived in England in mid-1942. The attacks that year were small and generally targeted around the German perimeter. There were competing demands for long-range aircraft everywhere. However, by the summer of 1943, the fury of the assault on downtown Germany began to mount. Unhappily, the relatively slow buildup gave the enemy time to strengthen its air defenses. The bomber losses during the two Schweinfurt raids in the summer and then in October were horrific and caused a pause that lasted until the arrival of the P-51 escort fighters early in 1944. Though it was not well understood at the time, the "precision" bombing advertised by the USAAF was not nearly as accurate as it had been in training. Also, targeting was an inexact science, and some efforts were wasted—as in bombing the submarine pens on the French coast.

Three months after Schweinfurt, the USAAF resumed its deep attack campaign in a fury; it reached a peak during "Big Week" in February. The USAAF flew over 3,000 bomber sorties against German targets that week. The immediate purpose was to gain air superiority before the Overlord Landings planned for early June. Notwithstanding the arrival of the long-range escort fighters, the campaign was still not a free ride, and the bomber formations were badly bloodied. But the German people, and especially their Luftwaffe, were suffering heavily as well. By April and May, the heart had been torn out of the defenses, and the bomber losses had declined from 20 percent during the second Schweinfurt raid to about 1 percent during the summer of the invasion. The fuel supplies for the *Wehrmacht* were severely reduced as well.

During the fall of 1944, the strategic bombers were released from their subordination to the commander of the invasion, and they moved to attack the transportation system *inside Germany.* Like the attack on liquid fuel, this was later deemed a decisive attack by the United States Strategic Bombing Survey. Though the Allied ground armies were already inside Germany, it was the bombing that caused a massive collapse of the German economy. However, the survey did not give full comfort to the strategic bombing zealots because it remarked that airpower (not strategic airpower) had been *a* (not *the*) decisive factor. The survey did a rapid and thorough job of examining the effects because the Allies hoped that the knowledge then could be used to make the effort against Japan quicker and more effective than it had been against Germany.

SSgt Archibald Mathies, 1918–1944

During the last year of World War I, Archibald Mathies was born in Scotland. His family immigrated to Pennsylvania when he was three years old. He started work as a coal miner but enlisted in the Air Corps before Pearl Harbor. Mathies went through basic training and then received instruction as an aircraft mechanic and also as an aerial gunner. He shipped out for England in the fall of 1943 and was assigned to a B-17 squadron at Polebrook as a flight engineer. On the 17th of February, he was promoted to staff sergeant, and three days later, at the onset of Big Week, he and the rest of the crew of the Fortress dubbed "Ten Horsepower" were ordered on a bombing mission against Leipzig. Some hours into the outbound leg, they were attacked by Luftwaffe fighters; 20 millimeter rounds killed the copilot outright and severely wounded the aircraft commander, Lt Richard Nelson, rendering him unconscious. Mathies was flying as the ball turret gunner and struggled forward to the bloody cockpit. No one with piloting experience was left. The battle damage admitted frigid, gale-force wind through the cockpit. Mathies and the crew navigator, Edward Truemper, struggled to fly the plane back to Polebrook, and the other surviving members of the crew parachuted out over the home field. Mathies and Truemper were also ordered to bail out, but they refused to do so because they would not abandon Nelson, who was still alive. Mathies undertook to land the aircraft, but on the third pass they crashed and all were killed. Both Mathies and Truemper were awarded the Medal of Honor posthumously. All 10 crew members were in their 20s. It was Mathies's second combat mission.

Figure 18. Boeing B-17F Flying Fortress. (USAF photo)

Figure 19. SSgt Archibald Mathies, Medal of Honor winner, killed in action on a B-17 mission over Germany on 20 February 1944. (USAF photo)

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Chapter 9

World War II: Europe—The Tactical Air Campaigns

For all its emphasis on strategic bombing before World War II, the Air Corps continuously devoted one of its three combat groups, the 3d Attack Group, to tactical airpower. It also developed a string of attack airplanes culminating in the A-20. The Air Corps Tactical School also sustained an attack course in its curriculum throughout the interwar period. However, doctrine for tactical airpower was far from settled when the war began.

The supposition in the 1930s was that, should the United States be involved in another war, it would require a year or more to mobilize and train an army before it deployed. This was not to be, for in the summer of 1942, she decided that she would have to deploy for ground operations against the Axis forces in Africa in November 1942. Thus, many of the ground and air units arriving in North Africa had never trained together or worked out an air-ground doctrine. The Soldiers and the Airmen had divergent theories as to what would work best. The confusions of the early operations stimulated movement on the issues, and by the summer of 1943, the Afrika Korps had been defeated, and the tactical doctrine had been worked out in War Department Field Manual 100-20, *Command and Employment of Air Power*. It was signed by the chief of staff, but not all the Soldiers were happy about it. It provided that: a) neither air nor ground power was subordinate; b) airpower would have to be centrally controlled by an air commander collocated with the ground commander; c) the first mission was to be command of the air; d) next came interdiction (in the usual circumstances); and e) then came close air support, reconnaissance, and tactical airlift. That was the doctrine brought to Sicily, Italy, and finally to France in June 1944. In general, it has been USAF doctrine ever since.

During the spring of 1944, the main goal of Eighth Air Force was to achieve air superiority by the date of the invasion—that was a Go/No Go item. It was assisted in this by Ninth Air Force, which was also based in England. Both were equipped in large part with P-47 Thunderbolts and both were used in escort missions hoping to wear down the German defenders to reduce bomber attrition and to eliminate them as a serious factor opposing the upcoming invasion. Early in 1944, increasing numbers of P-51s with drop tanks were coming on the line, making them better suited for the longest-range escort missions; gradually they were concentrated in Eighth Air Force, while most Ninth Air Force fighters were the Thunderbolts. As was increasingly apparent, the P-47s were better for ground attack in any case because of the absence of a liquid cooling system and thus a lower vulnerability to ground fire. Happily, the Luftwaffe had been ground down in the Russian and Mediterranean campaigns as well. The American Army was made deliberately light on ground divisions precisely because the leaders were counting on airpower to make up the difference.

In April and May, bomber attrition was declining rapidly, and it was clear that the German air forces had been badly bent. When the invasion occurred on 6 June, there was hardly any enemy opposition in the skies, and the invasion was successful, albeit exceedingly painful. It took a while to break out of the beachhead and to get airfields up and running for the P-47s of Ninth Air Force. However, when the St. Lo Breakout occurred in July,

the battle turned into a race for the German border. The Airmen worked mayhem on the fleeing Germans, and hopes were rising that the war would indeed be over before Christmas. In this battle of movement, the Airmen had vital roles in reconnaissance and in protecting fast-moving columns against unexpected flank attacks. The German air defenses, already badly weakened, were further handicapped by rolling up their forward radar installations. A major attempt to turn their flank for an early penetration into Germany failed when the Arnhem airborne operation did not get quite far enough. ULTRA intelligence was diminishing in its value because the enemy was being driven back onto his land lines, and he was therefore less reliant on radio communications that could be intercepted.

That was only one of the reasons for the surprise at the Battle of the Bulge at the end of the year. The Germans demonstrated their wariness about Allied tactical airpower by deliberately planning that battle to commence at the beginning of an extended period of bad weather that would ground all the air forces. They were right in doing so because the armies were in great difficulty until the weather cleared on the sixth day and the Allied airmen could add their full weight to the battle. The Bulge was pinched off, and there was not much hope left for Germany. The strategic air campaign against the German railroad system that fall was a smashing success as well. The tactical airmen were roaming the roads at low level practically at will, and the whole Axis system was coming to a standstill. George Marshall's gamble that he could go light on ground formations and rely on air support paid off, although it was a close-run thing at times. Hitler was still hard to convince, though, and the further wrecking of his country resulted in enormous suffering for the people of Germany in the next couple of winters. The US Strategic Bombing Survey did not say that strategic bombing had been decisive in itself, but it did assert that no advanced industrial power could long survive if it lost control of the air over its homeland.

Maj Gen Henry B. Kucheman, 1919–1987

Henry Kucheman was born in Baltimore, Maryland, in 1919. He enrolled in Virginia Tech in 1937 and spent two years there in the Corps of Cadets before he left to work with the Virginia Highway Department. He joined the Air Corps in the summer of 1941 and graduated from pilot school in 1942. He was sent to England the following summer to fly P-47 Thunderbolts with the 355th Fighter Group, a part of Eighth Air Force. A part of the 355th Fighter Group's work was escorting bomber raids into Germany, and after the invasion of June 1944, Kucheman also participated in the ground attack against targets in France. During missions over Germany, he was credited with shooting down four enemy aircraft. He also destroyed two more on the ground in France. He was awarded the Distinguished Service Medal, the Silver Star, and two Distinguished Flying Crosses for these feats. He finished the war as the commander of his squadron and came back to the United States in 1947. He was retained in the Army Air Forces after the war and initially was sent back to Virginia Tech to complete his degree. He graduated with a BS in chemical engineering in 1949 and then spent most of the rest of his career in research and development for aeronautical, armament, and space projects. His final assignment was as the commander of the Armament Development and Test Center at Eglin AFB, Florida.

Figure 20. Republic, P-47 Thunderbolt. (USAF photo)

Figure 21. Maj Gen Henry B. Kucheman, USAF. (USAF photo)

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Chapter 10

World War II: Europe—Naval Aviation

Though the Navy's principal focus in World War II was the Pacific, naval aviation played an important part in the war against the European Axis. In the early days of the conflict, the German surface raiders roamed far and wide attacking British trade with considerable effect. British air reconnaissance played an important part in trying to track down these surface raiders, an effort that culminated with finding the *Bismarck* in the spring of 1941. The German ship had sunk the HMS *Hood* and was on the verge of making her escape into the French port of Brest when British torpedo planes caught up with her. One of them put a weapon into the ship's steering gear, jamming it so that it could only steam in circles. This enabled the Royal Navy vessels to catch up with the *Bismarck* and send her to the bottom, portending the end of the German surface threat.

Not very long after the United States got into the war, the Allies mounted an invasion of North Africa to defeat the Axis forces there. The landings were supported by US naval aviation operating from carriers until Army air forces could be established ashore. Some of the latter were brought to the scene aboard aircraft carriers as well. But the main naval role in the war against the European Axis was in antisubmarine operations—and that part of the war had been going on for two years before Pearl Harbor.

Between the collapse of France in May 1940 and Hitler's invasion of Russia in June 1941, Great Britain faced Germany and Italy alone. The Battle of Britain was fought during that period. At the same time, the war against British commerce by the Axis submarines probably came as close to defeating her as did the Luftwaffe over London.

Back in World War I, the aircraft of the day could not inflict significant damage on submarines. But they hampered submarine operations because of their ability to spot the submarines and report their location to friendly surface units that had the capability to kill U-boats. In World War II, neither the Germans nor the British were fully prepared for a submarine war. Still, as the Germans began to build up their underwater fleet and expertise, British aircraft performed the valuable service of keeping the subs underwater during daylight. Doing so during the German deployments had the effect of shortening the subs' stays on combat stations. During battle, forcing the submariners underwater prevented their successful attacks because their speed and endurance there were so limited. The subs' own machinery noise prevented lookouts from spotting the aircraft until too late, so they had to remain underwater whenever aircraft were about. As aircraft ranges increased, the safe area for U-boats became smaller and smaller, and they consumed more and more fuel getting there. Thus, in the first two years of the war, aircraft got precious few kills, but they provided a useful service nonetheless.

Even before Pearl Harbor, the American Navy was operating against submarines in the Atlantic, and not just with nonlethal methods. Back home the shipyards were going full bore, and the new construction of cargo ships was increasing by leaps and bounds. In the end, the critical question for the Americans became whether the Germans could sink vessels faster than they could be replaced. When Pearl Harbor was bombed, Hitler soon sent his long-range U-boats to the American East Coast and into the Caribbean

and Gulf of Mexico. The Navy was not prepared, and for a while the German U-boats worked mayhem. Presently, the Americans learned much from their Canadian and British allies, and they overcame the problem using coastal convoys.

The Germans moved their operation back out into the mid-Atlantic Black Hole, but as more and more long-range aircraft like the B-24 Liberator were added to the force, that area was closed. Now the U-boats were subject to aerial discovery from their home ports to the farthest reaches of the ocean. The replacement rate had already passed the loss rate by the spring of 1943. But many lives and much materiel were still being lost on the North Atlantic run.

Technology became an increasingly decisive factor. One of the main achievements was the breaking of the German codes—especially important because the U-boats were under centralized control by radio. Another was the coming of radar light enough and small enough for use on aircraft. The Germans quickly developed a radar receiver that enabled them to dive in time, but just as quickly the Allies had a new radar that was free from the countermeasures. The inadequate attack munitions were also replaced with better ones. The surface and air crews were gaining in numbers, experience, and training. Support groups, ultimately containing escort carriers, became available to reinforce the convoy escorts when the latter came under attack. With the coming of the new radar, the night became the friend of airmen rather than submariners. New technologies for the surface escorts also helped. Their radars and weapons were improved. Depth charges had so disturbed the water that they hampered further use of sonar, but the new forward-firing Hedgehogs did not detonate except by contact with the submarine, so the sound equipment could continue to be effective. By the late spring of 1943, the German losses became so great and their crew morale so low that they had to call off the battle and withdraw their wolf packs. Some sinkings continued to the end, but the Allies had won the Battle of the Atlantic.

LTJG Albert L. David, 1902–1945

On 4 June 1944, a World War II antisubmarine task group led by the escort carrier *Guadalcanal* cornered the German U-boat *U-505* 150 miles off the African coast. A plan to capture the submarine was in place, and LTJG Albert David led the trained boarding party. He had enlisted in the Navy in 1919 and spent most of the interwar period aboard various ships. After Pearl Harbor, he received an appointment as a warrant officer and soon progressed to the rank of lieutenant, junior grade. *U-505* was damaged by depth charges and then on the surface by machine-gun fire. Its skipper gave the abandon ship order. David's party boarded the submarine then partially awash. He and his men went below decks knowing a scuttling explosive might be about to detonate. They closed scuttling ports and stopped the inrush of water, but the boat was still in danger of sinking. David engineered a jury rig to tow the submarine to Bermuda with its decoupled propellers turning, using the submarine's own pumps to drain the water still aboard. In the process, David's team recovered the decoding machine and other German classified material. Unhappily, he died in 1945, so his Medal of Honor was awarded posthumously. Ultimately, the *U-505* was moved to Chicago where it is still on display.

Figure 22. Consolidated B-24 Liberator. (USAF photo)

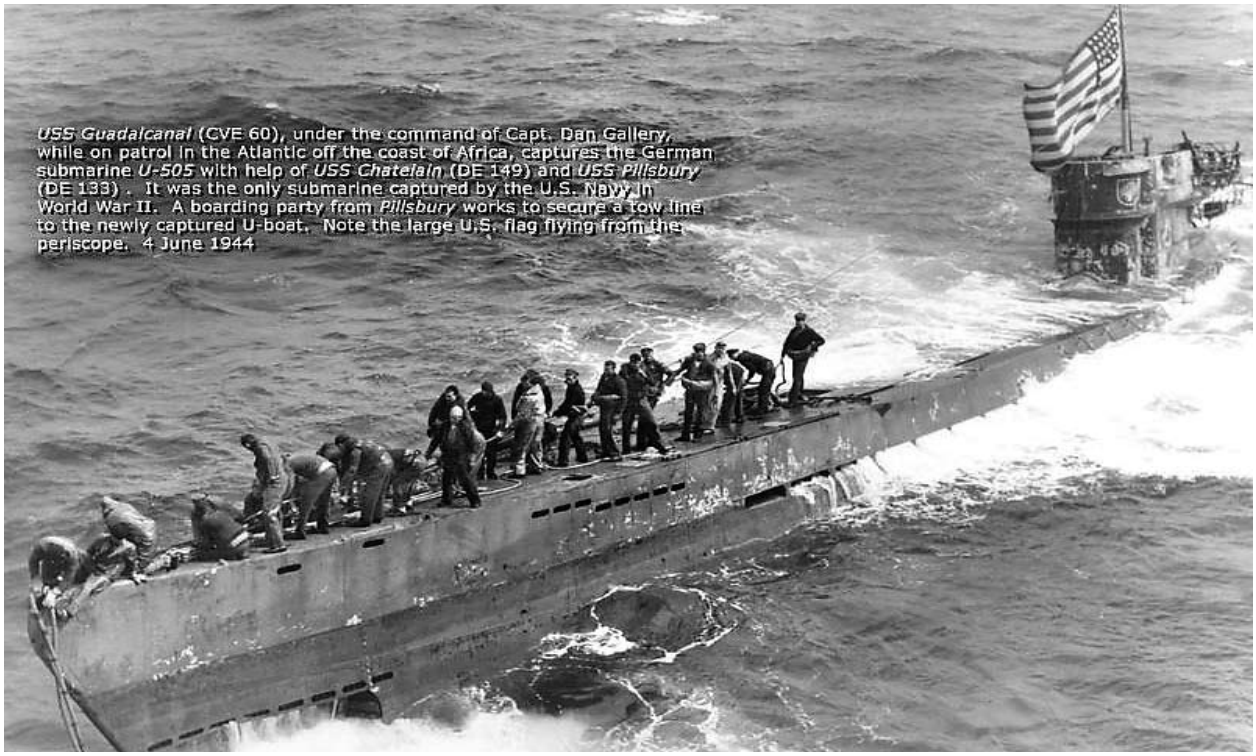

Figure 23. Crew members from carrier USS *Guadalcanal* during capture of German submarine, June 1944. (Naval Historical Center photo)

Figure 24. Capt. D. V. Gallery, Jr., USN, and LTjg A. L. David, USN, June 1944. (Naval Historical Center photos)

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Chapter 11

World War II: Royal Air Force

The Royal Air Force was founded during the spring of 1918, partially in reaction to the German air raids on England. It was formed by merging the air units of the British army and navy. Its leader during most of the 1920s was Air Marshal Hugh Trenchard. The British treasury was in a bad way during those years, but vital progress was made nonetheless in the development of bases, training institutions and procedures, and professional schools.

As with other air forces of the day, there was a preference for the offensive use of airpower, and the RAF developed a bomber doctrine that in many ways resembled the one growing in America. The antiwar movement was strong in England, and both its army and navy did everything they could to recover control of their own airpower. The Royal Navy succeeded in doing so in 1937. Although the status of bombing in the RAF remained at the fore through the 1930s, the rise of Hitler stimulated a new concern among some leaders with defense of the homeland. The force was reorganized into three operational units in 1935: Bomber Command, Fighter Command, and Coastal Command.

Bomber Command

While the RAF theory was not far removed from that of the US Army Air Corps, it had not been accompanied by the technological development that it implied. All of its aircraft were twin-engine machines of limited payload, range, speed, and defensive features. Thus, in the opening months of World War II, it had little effect on the operations in the Low Countries and France, and after Dunkirk made only limited attacks against the Germans. This was done in daylight, and the results were disastrous. Thus, Bomber Command went over to night attack—and the results were also poor because of navigation and bombing accuracy problems, though that was not known at the time.

Fighter Command

From 1935 forward, the air defense of England made great progress, and it came just in time. Air Marshal Hugh Dowding had been in charge of research and development, and he took huge professional risks in committing funding to radar development at a time when that technology was in its infancy. He was appointed to be the head of the Fighter Command, where he created the world's first Integrated Air Defense System (IADS), and he got it in place just in time. It included the radar sensors, ground observers, underground communications lines, barrage balloons, antiaircraft units, command posts, and two splendid new fighters—the Hurricane and Spitfire.

The crisis came in the summer of 1940. The Germans seemed to be in a bit of disarray after the fall of France, and there was a short intermission before they decided to attack Britain by air. Many historians have thought this was for the purpose of achieving air

superiority to make possible an invasion; a few have speculated the delay was another of Hitler's bluffs. In any case, air superiority had to be achieved, whatever the ultimate goal. The attacks began against channel shipping and ports in the hope of drawing the RAF into battle away from its home fields. The British did not take the bait, so the Luftwaffe moved on to attacking the air infrastructure in southeastern England. This went on for three weeks or so from mid-August, and possibly it was hurting the RAF more than the German leaders knew. The Luftwaffe made a promising start against the radar system, but then gave it up prematurely. Their impatience led to an early switch in target systems, and they began an attack on London on 7 September. That relieved the pressure on the RAF at a crucial moment. In the end, the Luftwaffe could not stand up to its losses and gave up the daylight assault on 15 September—and terminated the planning for an invasion. For the next nine months, the British continued to stand alone against the European Axis.

The Return of the Bombers

One of the alleged reasons for the Luftwaffe's switch to London was a small bomber raid on Berlin at a crucial moment. Hitler was said to have gone into such a rage that he ordered the switch with dire results. Whatever the reason for the bombing of London, the only practical option for the British was the bombing of Germany, and they had to do it at night. As time went on and they acquired four engine bombers and experience, the effort grew to a crescendo, but precision targets could not be found and hit at night. The bombers switched to the area bombing of cities. That resulted in much destruction and death, not to mention great suffering and losses among the air crews. Postwar analyses have held that the night area attacks were not effective enough to justify the cost. But until 1944, they were the only option for striking the Germans directly.

Tactical Airpower

The RAF was a significant influence on the development of US tactical air doctrine, dating all the way back to World War I. In Africa in World War II, its Desert Air Force helped the American Airmen greatly in persuading the US ground generals of the validity of tactical air doctrine. The success of the Mediterranean campaigns was the foundation of the subsequent drive across France. In the 1944–45 campaign, the British tactical air force under Arthur Coningham supported the ground forces on the northern flank, and the US Ninth and Twelfth Air Forces fought on the southern fronts. Air superiority was largely achieved before the landings, and the greater part of the work thereafter was in air-to-ground operations.

Marshal of the RAF Hugh Trenchard, 1873–1956

Although Hugh Trenchard was uneasy with the title of "Father of the RAF," he was certainly that and perhaps an uncle of the USAF as well. Writing, public speaking, and academics were not his strong suits. Still, he graduated from Sandhurst and had long service as a Soldier in India, South Africa, and Nigeria before winning his wings. He did so on the eve of World War I, and then he was a major actor and a stout advocate of ground support as the main role of airpower. He took command of the independent bombing force in 1918 and became much more of a strategic bombing advocate after the war. The RAF had been founded just before the war's end, and Trenchard was made its chief in 1919. Thus, he was in command during its infancy and was instrumental in founding its initial institutions, which long survived—its infrastructure, manning systems, professional schools, and doctrines. All this was done under continual fire from the army and navy. He remained in office until the end of 1929 and continued as an airpower advocate and a supporter of bombing as a member of the House of Lords even beyond World War II. He was a stout believer in the offensive use of airpower. His contacts and influence with American Airmen began with Billy Mitchell in World War I and continued with Henry Arnold and Carl Spaatz even after World War II.

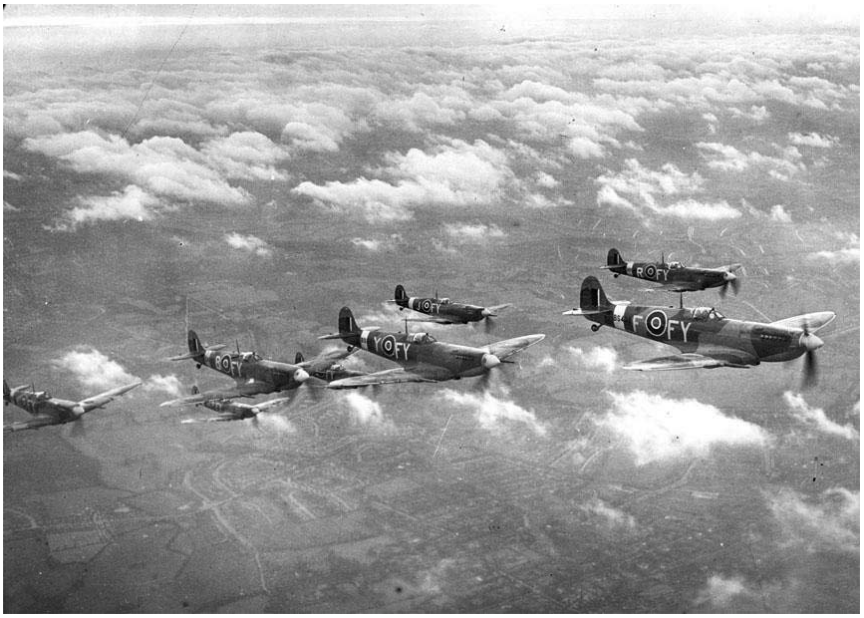

Figure 25. RAF Supermarine Spitfires. (USAF Historical Research Agency photo)

Figure 26. Marshal of the RAF, Hugh Trenchard. (USAF photo)

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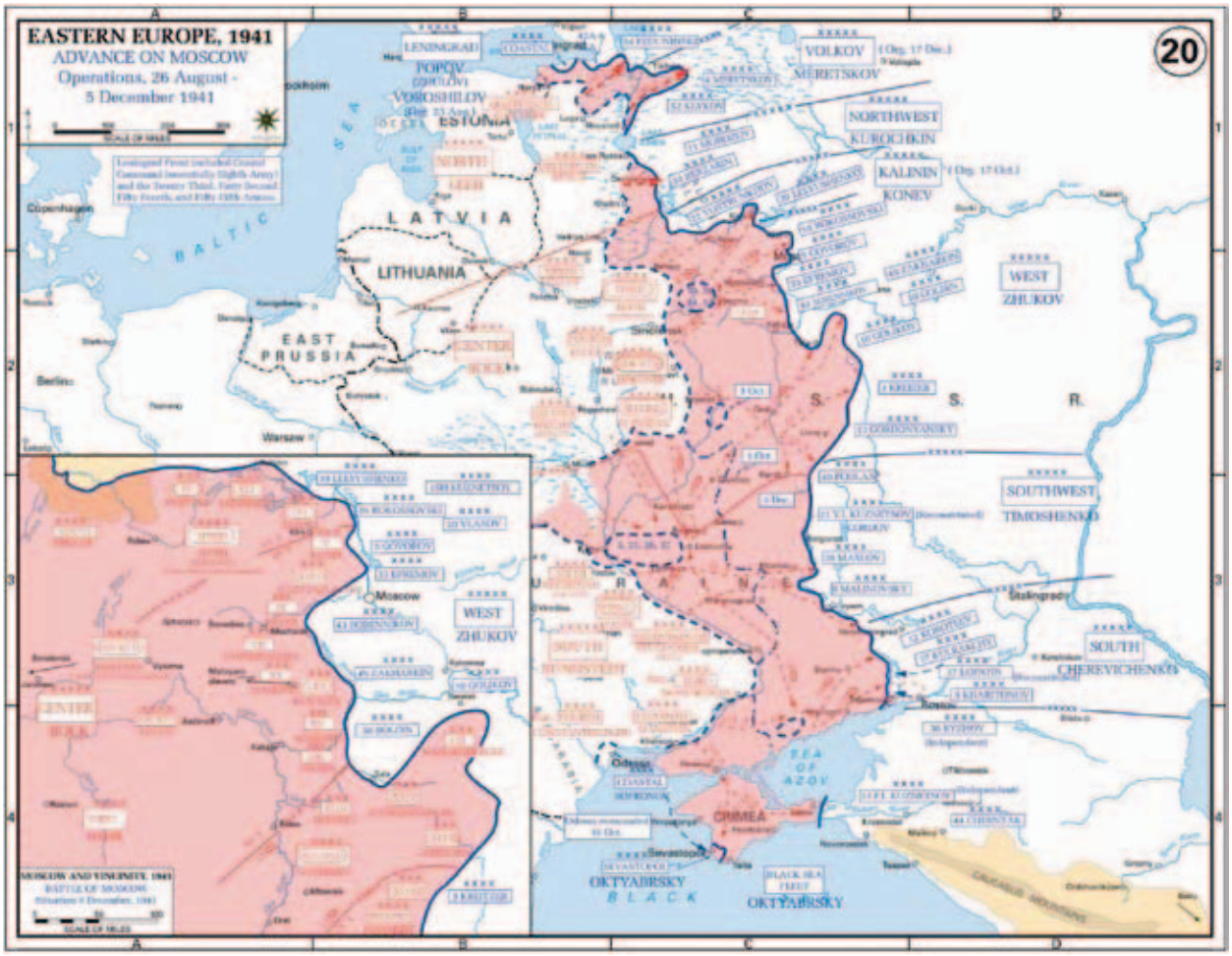

Figure 27. World War II: the Soviet front map. (Courtesy of History Department, US Military Academy)

Chapter 12

World War II: Soviet Air Force

The Tsarist Roots

As is often the case with revolutions, some reforms had already been made in Russia before the outbreak of violence. This was true of industrialization and aviation as well. At the outbreak of World War I, the Russian air force was substantially larger and better developed than was the American. Igor Sikorsky, later to bring his talents to America, designed and built a four-engine aircraft before the outbreak of the war—it made one flight with as many as 16 people on board. As isolated as Russia seemed in the West, it had not been bashful about adopting foreign technologies for centuries—as far back as Peter the Great (1672–1725) at least. In 1914 and for some time afterwards, she remained dependent upon others for engine technology but was able to develop many of her own airframes. The Soviet histories have exaggerated Russian achievement, it is true, but still the performance of Russian aviators in World War I was in many ways worthy. From the beginning, it was clear that the first call on the Russian air force was the support of the ground forces, notwithstanding the work on large airplanes.

Airpower and the Revolution

Airpower certainly did not decide the 1917 revolution or the ensuing civil war. There was not much left to Bolshevik airpower, and the White counterrevolutionaries did get some aviation help from the Western powers. The upset and destruction wiped out much of the progress, and Russia lost a good deal of her aviation talent through death and escape, especially to the rest of Europe and America.

The Five-Year Plans and Aviation

Lenin died in 1924. It seemed uncertain for a time whether the radicals led by Leon Trotsky and others would persist in trying to promote an immediate world revolution or the more cautious under Josef Stalin would succeed with their motto of "Socialism in one country first." Stalin prevailed, but he knew that there were powerful potential predators to the west and that he would have to restore Russian military power as soon as he could. Aviation was to be a major concern of the rebuilding program, and the peasants and workers would have to pay a high price to accelerate its progress. Stalin was not one to allow ideology to stand in the way of technology transfer. In the mid-1920s, he got together with Europe's other outcast, Germany, to facilitate the rebuilding program of both. The Germans could not do much experimentation and rebuilding at home because of the Versailles Treaty and the watchful eyes of the West. The Soviets provided the Germans with some privacy far from those eyes, and in return the Germans helped their hosts with training and some technologies. That exchange did not

last beyond the rise of Adolph Hitler. Stalin then went over to a "Popular Front" policy that envisioned cooperation with the West to contain the rising Nazi menace. One result was that the United States recognized the USSR in 1933, and some US aviation technology, especially engine development, began to flow to the Russians. But there is more to airpower than technology. Though the Soviets were making real progress, their airpower was fragile nonetheless. From 1937 onward, Stalin launched a series of purges that decimated the top ranks of all the services at a time when war was just over the horizon. A host of top airmen were executed, and young and inexperienced people took their places. The Soviets had done a credible job in combat in Spain in 1936 but had to withdraw in 1937. When they fought the Finns in 1940, they suffered a severe humiliation—but that did clarify their thinking.

Barbarossa

The experiences in Spain and Finland did not clarify Hitler's thinking. He made a dangerous short-war assumption when he attacked Russia in June 1941, before he could defeat England in the west. He asserted that the Soviet house of cards would collapse with the first kick on the front door. But when that did not happen, he found himself hopelessly outnumbered. The qualitative edge his Luftwaffe had shown in Spain and the surprise he achieved allowed him to run wild for a time, but the assault bogged down at the gates of Moscow. Meanwhile, the surprise attack caught many Soviet aircraft on the ground. The planes were destroyed but not the aircrews. They would soon be reequipped with new generations of aircraft (and many of them) that would gradually close the qualitative gap.

World War II

The Western Allies invaded Africa just as the Battle of Stalingrad was reaching its climax. The crisis thus created forced the Luftwaffe to transfer important air units from the Eastern Front to the Mediterranean. They could not turn the tide there, but their absence made a difference in Russia. The Russians and Germans had learned something about their opponents' air doctrines in the 1920s, and the two had much in common. Air superiority was the first priority, and then came cooperation with the ground forces. As the Soviet experience level and numbers grew, those of the Germans declined—and the qualitative gap was gradually closing as well. The assassination attempt on Hitler on 20 July 1944 failed, and he maintained his grip and carried his nation almost to the grave. The US Strategic Bombing Survey rightly concluded that no advanced industrial nation could long survive the loss of the command of the air over its homeland.

Alexander de Seversky, 1894–1974

Alexander P. de Seversky was born nine years before the Wright brothers flew and died five years after Americans landed on the moon. His father bought the first privately owned aircraft in Russia and taught his son how to fly. The younger Seversky attended the Russian naval academy and flew for its navy in World War I, achieving ace status but losing his right leg in the process. He was a Russian assistant naval attaché in Washington at the time of the Bolshevik Revolution in his homeland, and he chose never to go back home. In the years that followed, he was an associate of many of the Air Service, Air Corps, and USAF high rollers, including Billy Mitchell himself. Seversky was a considerable engineer in his own right and founded his own manufacturing company that produced the P-35 and, after it had become Republic Aviation, developed the P-47 Thunderbolt of World War II fame. An uninhibited advocate of strategic bombing, he authored *Air Power: The Key to Survival*, which was later the core of a wartime Disney moving picture that was influential at the time and that has been frequently shown at the Air University schools ever since. He lectured to audiences at those institutions well into the 1950s. Many Russians fled to the West as a result of their revolution and made an important contribution to aviation development here. Alexander P. de Seversky was probably the most significant of them.

Figure 28. Soviet and American airmen in Alaska during World War II lend-lease operations. (USAF photo)

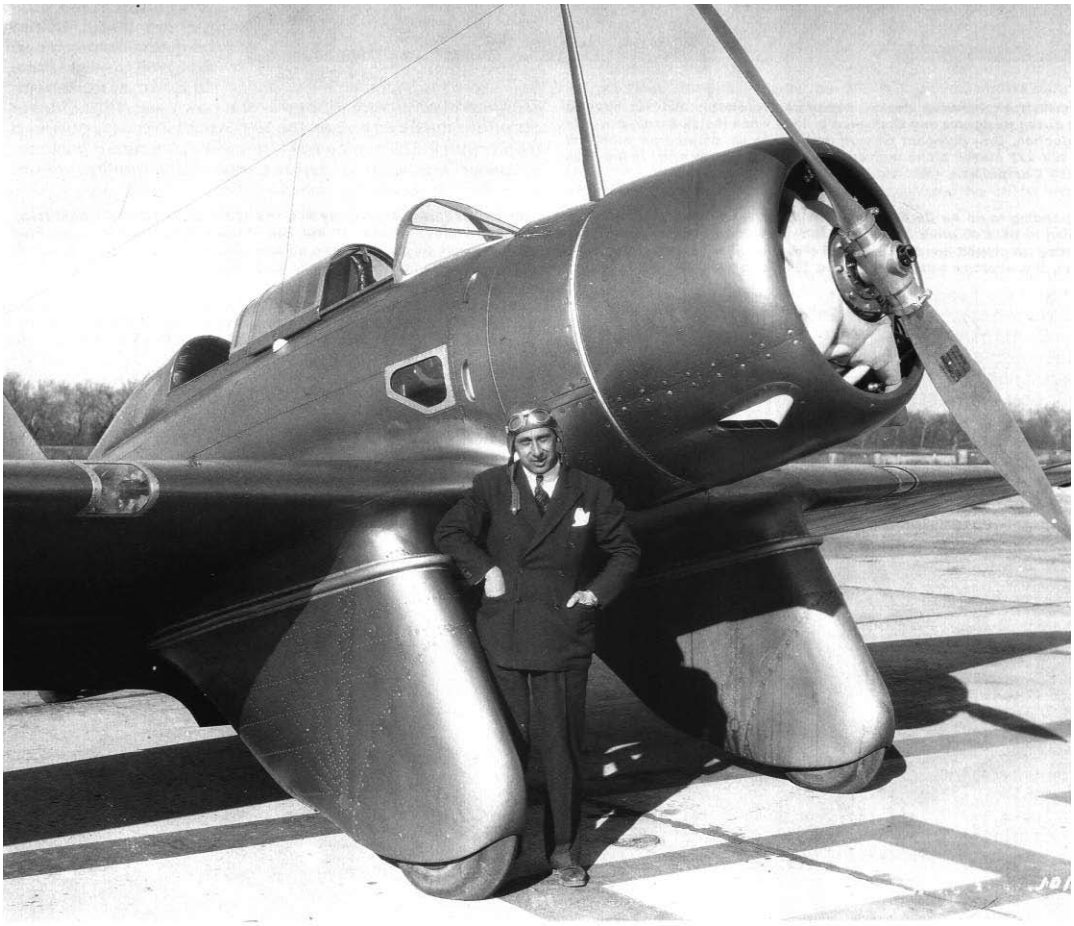

Figure 29. Alexander de Seversky and the SEV-3, 1934. (USAAC photo)

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Chapter 13

World War II: The Fall of the Luftwaffe

Wartime Technology and Production

Usually at the outset of a war, numbers are important. Thus, modifications of existing designs or work on new designs and fundamental research are counterproductive to numbers—changes slow down volume production. If the war is predicted to be a short one, the tendency is even greater. Usually, the aggressor will not start a war unless he thinks it will be a short one, and that was Hitler's opening assumption. One of his reactions was to prohibit undertaking new projects that could not be completed in two years. Another was that he did not move to bring Germany into full, all-out production until 1943. Since he was hopelessly outnumbered, by then the Allies had far too great a lead. In the last stages of the war, Minister Albert Speer did achieve some miracles of production. Aircraft output reached its peak in September 1944. But by then, the human resources had been so wasted that no amount of materiel could make up the difference—and the German fuel had been so restricted by bombing and conquest that new pilots could not be trained even if there had been suitable candidates remaining. Germany's opponents made similar decisions on research and development at first, but they had the resources that soon provided enough excess to allow for more sophisticated research and massive production, as with the development of nuclear weapons, the B-29 program, and the greatest navies in history.

Air War over Germany

The pressure on the Luftwaffe over its homeland started early, but it was slow in building up. The RAF bombing campaign started in 1940, but it did not get its first four-engine bomber until 1942. The USAAF started the war with good four-engine bombers, but the numbers were limited—and the demands for the Pacific war and the submarine campaign also had to be met. It was not until the summer of 1943 that the USAAF began to put heavy pressure on the air defenses of the German homeland. At the beginning of 1944 the long-range escort fighters enabled truly disastrous damage to Germany in daylight. The advance of RAF tactics and technology made it a round-the-clock trauma. The gradualism of the campaign had given the Germans the time to improve their technologies and technique, which increased the pain on the Allied bomber forces. For a time, the assault of the strategic bombers was also weakened by the necessity of supporting the invasion, but they returned to the assault on Germany by the end of the summer of 1944.

The Coming of the Jets

By World War II, the reciprocating engines were nearing the "knee" of their development curve. In fact, the largest operational piston engine ever developed came at the end

of World War II, the complex Pratt & Whitney 4360 in the B-36 and KC-97. Larger and larger investments had to be made for smaller and smaller increments of performance. But in Germany and England in the 1930s, Hans von Ohain and Frank Whittle conceived ideas for much simpler engines. The jet principle had been known since ancient times, but they realized that it might be applied to aircraft engines that not only would be simpler than the standard, but also would gain in efficiency as they flew at higher altitudes. Von Ohain's engine was the first to fly in a developmental jet, and Whittle's came several months later. The first jet in serial production and squadron operations was the German Me 262. It was a twin-engine interceptor that not only outclassed the standard Allied fighters of 1944 and 1945, but also was superior to the first British and American jets that came along a little later. The problem was more imperative for the Germans, though, because theirs was a defensive mission over their own ground. The high fuel consumption of the early jets would have prohibited their use in the long-range offensive operations that characterized the British and American air forces at that point. The Me 262 caused real concern for the Allied airmen, for it had the potential of undermining the offensive against the German homeland. But the jet came along too late. Though it achieved impressive kill ratios, there were too few planes, few well-trained pilots, and the fuel supplies for training more of the latter had been destroyed by the bomber offensive. By then, the 262s faced a target-rich environment, but kill as they did, they could still bring down only a tiny fraction of the Allied force.

The Finale

By the winter of 1944–45, the Luftwaffe was a defeated force. It was reduced to sending its new fighter pilots into battle with a total flying time of less than 100 hours, facing Allied crewmen with far, far more experience. The petroleum supplies had dried up. The rail transportation system in the homeland was paralyzed, and it was impossible to move the coal to where it was needed. The Allied airmen roamed over the countryside practically at will. The assassination attempt against Hitler on 20 July 1944 had shown that many senior German officers knew the struggle was hopeless. But Hitler's survival made the agony drag on for many more months—and condemned his people to further enormous suffering after the war finally ended. The Luftwaffe put up a great fight, but the odds were too heavily against it.

The Aftermath

After Germany collapsed, the British and Americans got into a race to harvest enemy science and technology to fortify their own aeronautical, submarine, and nuclear programs. Another purpose of this effort, called Operation Paperclip in the United States, was to deny the USSR the same assets. Thus, many people like von Ohain and Wernher von Braun wound up in America helping sustain deterrence in the ensuing Cold War.

Hans von Ohain, 1911–1998

During the transition to the jet age, for a time the jets received their air-to-air refueling from reciprocating-engine tankers. That created a huge problem, for the latter's engines and propellers rapidly lost efficiency above about 20,000 feet. However, if the bombers came down to get their fuel, their jets' efficiency declined at lower altitudes, and they had to use up a large part of their new fuel to get back up to their cruising levels. Hans von Ohain was born in Dassau, Germany, and earned his PhD at the University of Göttingen at an early age. In the early 1930s, he knew that the usual aircraft engines were nearing their optimum development. But he conceived of an engine that would be much simpler and not even have a propeller—a jet. He was hired by Ernst Heinkel, and in the mid-1930s he developed a jet engine that powered the first all-jet-powered flight in August 1939 just before the outbreak of war. His engines did not power the first operational jets; his large contribution was the science involved. After the war, he was one of the German scientists gathered by Operation Paperclip to come to the United States, where he went to work for the USAF at Wright-Patterson AFB. During those years he became friends with Frank Whittle, who had independently developed the jet principle in Britain during the 1930s and 1940s. Ultimately von Ohain rose to the position of chief scientist at Wright-Patterson's Aero Propulsion Laboratory.

Figure 30. Me 262. (National Museum of the USAF photo)

Figure 31. Adolf Galland and fellow Luftwaffe pilots. (USAF photo)

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Figure 32. World War II in the Pacific map. (Courtesy of History Department, US Military Academy)

Chapter 14

World War II: Pacific—Japanese Airpower

The Birth of Japanese Airpower

At the onset of World War II, little was known about Japanese airpower. Japan was a newly industrialized power; few Americans had ever been there, and incorrect stereotypes aplenty were floating around the United States. Japan fought on the Allies' side in World War I and was using the older industrial powers of the West as models in several ways. The Japanese navy looked upon Great Britain with great respect and took the British navy as a guide to improving itself in many ways. For some time, it had been a formidable force in its own waters, having whipped the Russian navy early in the century. One of the reasons it was able to do so was the conclusion of the Anglo-Japanese Treaty of 1902. The Japanese army, on the other hand, took the German army's way of doing things as its model—despite its defeat in World War I. One result was that Japanese army airpower was more clearly dedicated to ground support than the navy's, and the latter had the responsibility for strategic bombing. The Japanese purchased some airplanes and commissioned a seaplane tender even before World War I. Aircraft manufacturing began in Japan in 1916, usually building European designs under license. Likewise, engine manufacturing began there in the 1920s. The Japanese built the world's first aircraft carrier that had been designed as such from the keel up—though later, larger carriers were constructed on hulls started for battle cruisers.

The Era of Naval Arms Limitation

Some interpretations of World War I hold that the battleship-building race between Germany and Great Britain was a cause. There is no doubt that in 1921 treasuries were staggering under the bills for that war, and the unit costs of ships were formidable. Too, there were those in navies who thought that the days of the battleship might be nearing the end. Atop that, peace movements were many and strong and argued that armaments caused war. One result was the Washington Naval Limitation Treaty of 1922, which halted capital ship construction for 10 years and may have been an unintended stimulant for the development of naval aviation everywhere. It did stipulate limits on the total amount of aircraft carrier tonnage for the great naval powers. For Great Britain and the United States, that was 135,000 tons plus one experimental carrier for each. For Japan the limit was 81,000 tons. As ships like the *Lexington* and *Saratoga* ran to about 33,000 tons each, not many carriers could be commissioned, but all three powers undertook building to reach their limits. (France and Italy were also signatories and had lesser limits.)

The Organization of Japanese Airpower

Many Americans would find it hard to believe, but interservice rivalry was even more bitter in Japan than in Great Britain and the United States. The communication between

the army and navy was very sparse; among the results were a lack of standardization of aircraft and armament parts and even a lack of interoperability between the air forces of the two services. At one point, things got so bad that the Japanese army commissioned aircraft carriers because it could not get the navy to provide escorts for its troop convoys. But the Samurai tradition was strong in Japanese culture, and in the end the army was doubtless more influential.

The Rise of Military Domination

In the 1920s, there were hopes that Japan would join the Western democracies in becoming a democratic, liberal, and peace-loving power. The civilians seemed to have control of the government (with the emperor), and the Diet—the Japanese legislature—did seem to count for something. There *was* resentment, to be sure, over American immigration policies and Japan's inferior allowances in the naval treaties. The natural resources in the Japanese islands were limited, especially in petroleum supplies.

The Decision for War

The army had enjoyed a long string of successes in Asia for 10 years and was eager for the further expansion of the empire. Many senior naval officers had spent a good deal of time in the United States and were well acquainted with its culture (and its navy). They were generally reluctant to go to war against the United States. There was the question as to whether to fight Russia or the Western democracies, and Japan's dependence on overseas oil and rubber was a major factor in the choice to go south against the European colonies.

The Strategy

Adm Isoroku Yamamoto was one of those who had spent time in the United States. He did not want to go to war, but that decision was above his pay grade. He knew that Japan was certain to lose a long war, but he thought she might be very successful in the first few months. Then perhaps American war weariness would set in, and a beneficial peace might be made. Thus, he started with an assault on the main US battle strength at Pearl Harbor, with simultaneous invasions to the south. By the time the Americans recovered, he hoped that Japan would have set up a huge defensive perimeter that could wear down US resolve. Much depended upon getting the US carriers at Pearl Harbor along with her battleships.

Maj Gen Frederick L. Martin, 1882–1954

Much has been written about the unfortunate naval and ground commanders at Pearl Harbor on the "Day of Infamy." Less is heard about the air commander on that unhappy day. Frederick L. Martin was born in Indiana, graduated from Purdue University, and entered the Army before World War I. Like many of the early-day aviators, Martin started out in the artillery. He served as a ground officer during the conflict and emerged as a major—but soon lost the rank as did most others in 1920. As a major again in 1924, Martin commanded the famous around-the-world flight. Flying the Douglas World Cruiser dubbed the "Seattle," he had the misfortune to crash among the Aleutian Islands. In a 10-day saga, he and his engineer survived in the wilderness until rescued. The flight then proceeded and did make it around the world, but Martin went back to Washington to await its return. That fall, Martin attended the Air Service Tactical School—with Maj Carl Spaatz among others. Later, he graduated from the Command and General Staff College and the Army War College as well. As the war neared, he was rapidly promoted to major general and took command of the Army air units in the Hawaiian Department. He repeatedly requested additional aircraft to enable a comprehensive sea search, without avail. After the attack Martin was relieved, along with Adm Husband Kimmel and Lt Gen Walter Short. However, he was not demoted, and when he came home he was appointed to command Second Air Force. He died in California in 1954.

Figure 33. Adm Isoroku Yamamoto, 1940. (USN photo)

Figure 34. Mitsubishi Zero. (National Museum of the USAF photo)

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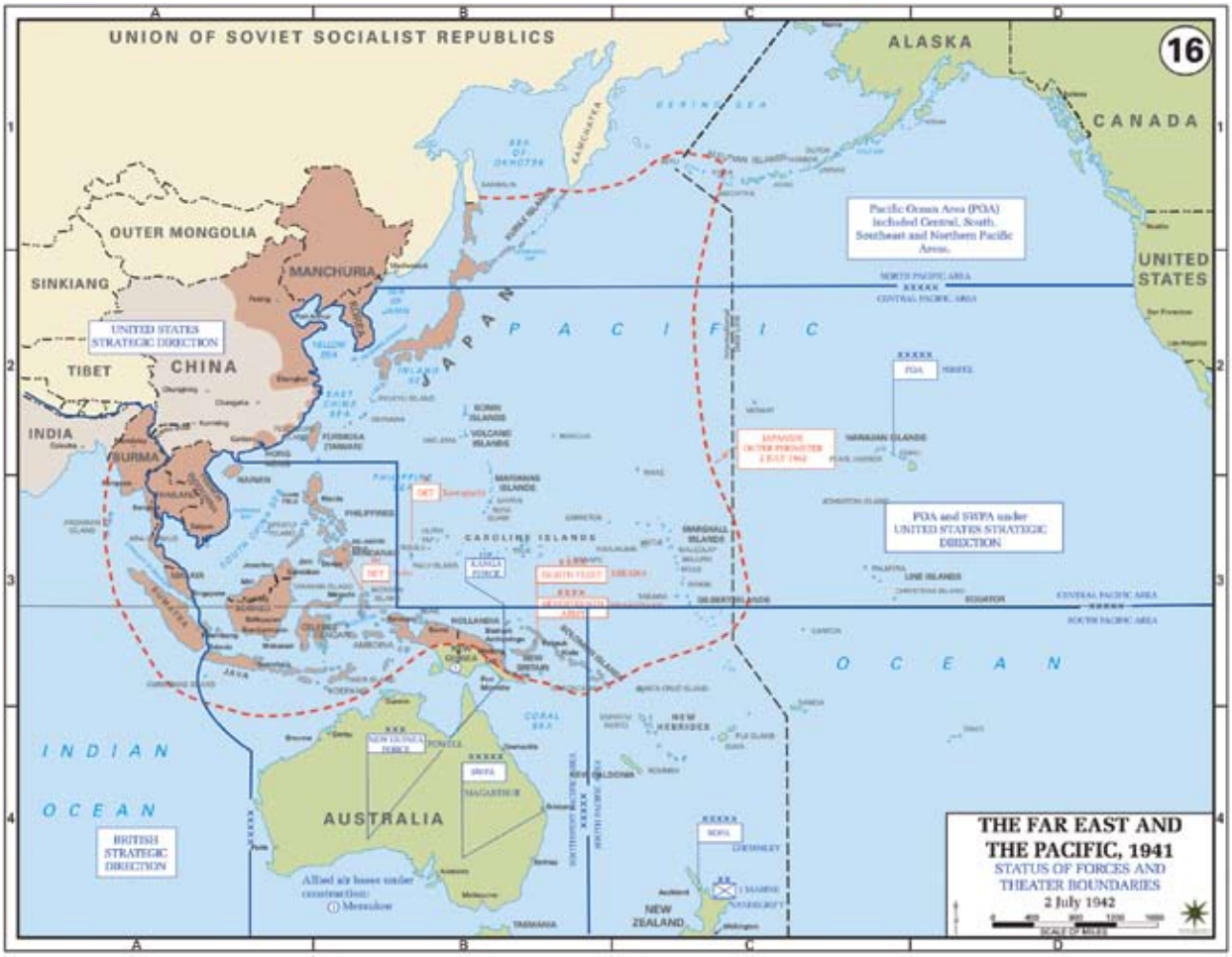

Figure 35. The Far East and the Pacific map. (Courtesy of History Department, US Military Academy)

Chapter 15

World War II: Pacific—The USAAF in the Southwest

The Road to Pearl Harbor

The Japanese and the Americans were on the same side in World War I. For the former, the human costs were minimal, and they made great gains. Relations with the Western democracies were stable in the 1920s, and the Japanese agreed to the Washington Naval Limitation Treaty of 1922. However, after 1929 they suffered from the Great Depression like the rest of the world. The crisis enabled the dominant military influence on politics to cause a resumption of the march toward empire. This started in 1931, and the United States opposed it only with words long afterwards—even suffering the loss of a US Navy ship, the USS *Panay.* Only after the war in Europe began and the Japanese started to move south, threatening the holdings of America's European friends, did the United States put teeth into its trade and financial measures. One of them was the restriction on oil exports to Japan, who was dependent upon them for both domestic and military uses.

Pearl Harbor

American authorities knew that aggressive Japanese moves were afoot in December 1941 and were fully expecting that they would be in the Southwest Pacific toward the remaining British, French, and Dutch holdings. Billy Mitchell had predicted in 1922 that one day Pearl Harbor would be attacked and even suggested that it would happen on a Sunday morning. The Navy had repeatedly practiced mock attacks like that from the early 1930s onward. However, these notions crowded in with many others suggesting attacks everywhere. Even Admiral Yamamoto himself thought it would be suicidal for Japan to take on Britain and the United States. He predicted Japan would run wild for about six months, but if the Americans did not fold then, it would mean the end of the Japanese dream. The attack succeeded in sinking several (old) battleships, but the US aircraft carriers were not there, and the fuel supplies and many port facilities were untouched. The attack also succeeded in uniting American public opinion in favor of war.

The Philippines, 1942

Douglas MacArthur had been in the Philippines for some time before Pearl Harbor; when the attack happened, it was still dark in his location. He thus had eight hours' warning. His Army Air Forces units had been reinforced by some B-17s in the hopes of deterring the Japanese, and they were launched to keep them out of harm's way soon after the notice about Pearl Harbor came. But weather delayed the Japanese attack from Formosa, and in the meantime the B-17s had returned to Clark AB for refueling. They were thus caught on the ground, and many of them were destroyed. The best of the USAAF fighters there, the Curtiss P-40s, were not up to the Japanese Zeroes, and the

radar warning net was primitive. The enemy landings were successful; by springtime, President Roosevelt ordered MacArthur to Australia, and the Philippines fell.

Building the Australian Base

The United States had long maintained contingency plans for war that called for a thrust across the Central Pacific, building up island bases on the way, for the ultimate confrontation with the Japanese fleet near the Philippines. Once that fleet was at the bottom of the sea, then the home islands would be at the mercy of a blockade and bombing. There was nothing in the plan about the South Pacific and Australia. But the enemy had a voice. Having driven the Americans out of the Philippines, the Japanese now sought to thrust southwards to cut the line of communications with North America and thus prevent the building of a base in Australia. In May 1942 they were threatening New Guinea, and a task force that was headed around its eastern tip toward Port Moresby precipitated the Battle of the Coral Sea. A small Japanese carrier was sunk, and their two large ones suffered severe damage. That was enough to cause them to turn around short of their goal. The USS *Lexington* went to the bottom, and the Japanese thought they had sunk the USS *Yorktown* as well. But the drive to the south by sea had been halted, at least temporarily.

One Japanese reaction was to revert to a land strategy for New Guinea—they planned to go for Port Moresby over the spine of the island via the Kokoda Trail. Little Allied land power opposed them, but we had important assets in the terrain and weather. The land opposition came from mostly Australian units, and they were supported with fire and resupply by American air units. The Japanese suffered greatly. They made it almost in sight of Port Moresby, but in the end had to turn back. Notwithstanding the Germany First strategy, some reinforcements were gradually coming to MacArthur and Kenney. In late 1942, the Allies started their offensive aiming to get to the north shore of New Guinea soon enough to halt the Japanese buildup. Early in 1943, signals intelligence revealed that the Japanese were planning to reinforce Lae in a big way with a convoy out of Rabaul. The forward Allied air forces had been preparing to overcome the difficulties in hitting ships from altitude by low-level attacks using forward firing guns to hold down antiaircraft artillery fire long enough to skip bomb the targets. The Japanese convoy was spotted as soon as it left Rabaul and harassed on its way to the Bismarck Sea. Finally, when it got into the range of the medium bombers, the Allies had a field day with their combined attack. They sank the entire convoy and half its escorts. The Japanese never again attempted reinforcement with major surface convoys. Rabaul was doomed by the twin-pronged offensive—the Navy-led force coming from the east up the Solomons chain from Guadalcanal and MacArthur's thrust up the New Guinea coast threatening Rabaul from the west—and the Japanese base was left to die on the vine.

Ennis C. Whitehead, 1895–1964

Ennis C. Whitehead was born on a farm in Kansas in 1895. His college education there was interrupted by World War I, when he served with the Army Air Service, ultimately as a test pilot at Issoudon, France. After the war, he completed his education and returned to the Air Service. He continued working with people who would become aviation greats, flying with Billy Mitchell in the battleship bombing tests of 1921 and with Ira Eaker on the Latin American Goodwill Flight of 1927. Rapidly promoted after 1938, he was deployed to the Southwest Pacific to serve under Douglas MacArthur and George Kenney. While Kenney remained near MacArthur's headquarters, his forward air commander was Whithead, who dealt with organizational and combat issues. Whithead's greatest victory came in the Battle of Bismarck Sea, during which all eight of the Japanese troop transports and four of their eight destroyer escorts were sent to the bottom by his Airmen—using innovative low-level tactics and effective combined operations with Australian air units. After Hiroshima, Whithead led major units up to the Air Defense Command. He retired in 1951 as a lieutenant general and was buried at Arlington Cemetery in 1964.

Figure 36. The A-20 Invaders in New Guinea operated under very primitive conditions. Later in the war, experiments were run with tracked landing gear, as shown here, to enable operations from unprepared runways. (USAF photo)

Figure 37. Lt Gen Ennis C. Whitehead. (USAF photo)

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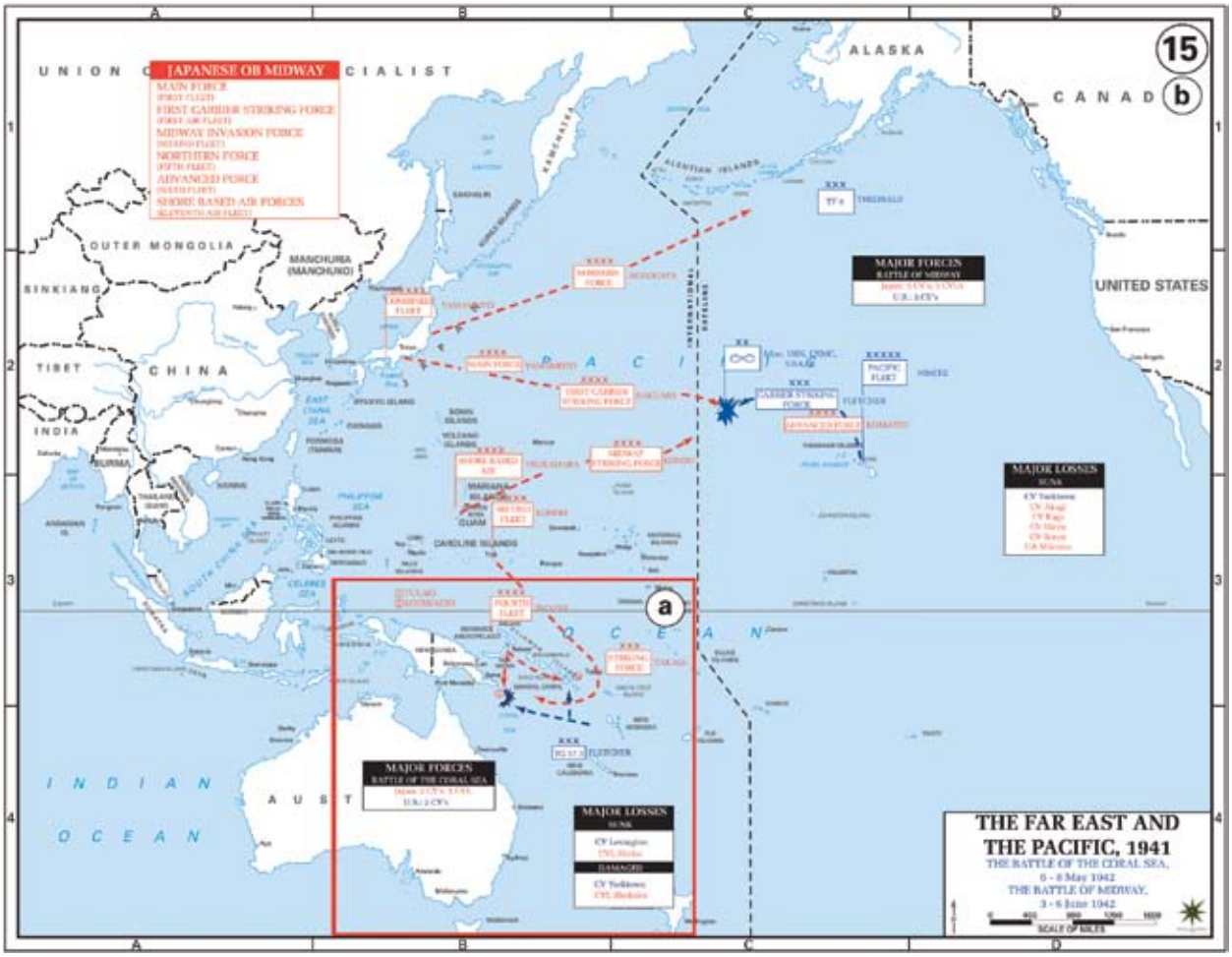

Figure 38. Naval operations in the Central Pacific map. (Courtesy of History Department, US Military Academy)

Chapter 16

World War II: Central Pacific—Naval Airpower

The Initial Recovery

It was fortunate for America that the Japanese decided not to mount a second attack on Pearl Harbor on 7 December. The Japanese attack did great damage to the battleship line, but those ships were all old ones that could not keep up with aircraft carriers. In the end most of them were raised and served well as shore bombardment platforms for later amphibious operations. Happily, the American aircraft carriers were far from the scene. The Japanese commander did not know that though, and he was justified in his nervousness about remaining on the scene long enough for the reattack. The remaining US carriers were precious until the new *Essex* class started arriving more than a year later. The United States started the war with seven (counting the *Langley*), but four were gone by fall. The *Saratoga* was in the yard for torpedo damage repair, and the *Ranger* was too small and slow for the Pacific. So for a time, only the *Enterprise* remained on the line. Thus, the admirals had to be pretty cautious for a long time after the Battle of Midway.

The Battle of the Coral Sea

Three weeks after the Doolittle Raid on Tokyo, the Japanese hoped to threaten the American line of communications with Australia with a seaborne invasion of Port Moresby, New Guinea. The invasion was thwarted by the presence of American carriers in the Coral Sea. A small Japanese carrier was sunk early in the fight, but their two fleet carriers survived, albeit with serious damage to both ships and their embarked carrier air groups. For America, the price was the loss of the *Lexington* and substantial damage to the *Yorktown*, both fleet carriers. The enemy thought that the latter had gone down as well, but she did not and returned to Pearl Harbor with as much speed as she could mount.

The Battle of Midway

The next month, in early June 1942, the most decisive sea battle since Trafalgar (1805) was fought. The Japanese had been stung by the Doolittle Raid, and that was said to end the debate as to whether they should perfect their defensive perimeter in the Central Pacific with the invasion of Midway Island. They also hoped to finish off the US carriers they had missed at Pearl Harbor. But they did *not* know that the Americans still had the *Yorktown* and were also reading the Japanese codes. Adm William Halsey had to be hospitalized at this point, and he was replaced by Adm Raymond Spruance, a non-aviator. Spruance was able to set a trap for the Japanese with the three remaining fleet carriers, and the enemy fell into it. It was a close-run thing nonetheless, but luck was on the American side. Four Japanese fleet carriers were sunk, which put their navy into

a defensive mode that lasted two years. The Americans did lose the *Yorktown* at Midway, and in the early fall both the *Hornet* and the *Wasp* went down.

The Resurrection of War Plan Orange

Since before World War I, US contingency war plans called for a methodical thrust directly across the Central Pacific for a decisive Trafalgar-like battle with the Japanese navy. That victory could then be exploited by a combination of blockade and bombing that would complete the campaign. But there could be no thought of that in 1942. The Germany First strategy caused many resources to go to Europe, and it was not until November 1943 that the new carriers were arriving and the old plan could be revived with the Invasion of Tarawa. That was a bloody experience, and it portended rough seas ahead. But at first the islands were small; the enemy was hard pressed to reinforce its garrisons, and at least the agonies of the subsequent invasions were short—for a while.

The Thrust to the Marianas

The Navy got some early experience in the arts of amphibious warfare in the South Pacific with the march up the Solomons chain beginning with Guadalcanal in August 1942. There the islands were so close that it was possible to provide much of the air support with land-based airpower. In the Central Pacific though, the islands were farther apart, and when the thrust came to the larger islands in the Marianas, the fights got even bloodier and longer. They culminated in July 1944, when Spruance was in command of the attack on the Marianas. His mission was to protect the landing force, and he did this with dedication.

The Battle of the Philippine Sea

When submarine intelligence reported that the Japanese fleet was coming out of its hiding places for the first time in two years, Spruance's aviators urged him to sail off to the west to bring on the great sea battle. But Spruance stuck to his mission, which meant the aviators had to make long flights late in the day to the battle. The result was the "Marianas Turkey Shoot," in which the Japanese airmen took a severe beating. Unhappily, some of the American flyers ran out of gas or daylight on the way back to their ships and were lost at sea or in landing accidents. The Japanese also lost three carriers, two of which were killed by submarines. There was not much left to Japanese naval airpower.

Adm Marc Mitscher, 1887–1947

Marc Mitscher was born in Wisconsin to the family of an Indian agent. His family settled in Oklahoma, where his father became mayor of Oklahoma City, but he attended school in Washington, DC, before being appointed to the Naval Academy. Graduating in 1910, Mitscher was one of the early aviators in the Navy. He was a participant in the Navy's transatlantic flight of 1919. He made the first takeoff and landing on the USS *Saratoga* in 1928. Just before the war, Mitscher served as the assistant chief of the Bureau of Aeronautics and then commissioned and took command of the USS *Hornet*. He commanded the ship when it launched the Doolittle Raid in April 1942 and was still her skipper during the Battle of Midway in June. The *Hornet* was lost in battle a few months after he left her command. In 1943 he was the commander of airpower in the Solomons Campaign. Mitscher commanded carrier forces during the invasion of Saipan, and his Airmen flew in the Marianas Turkey Shoot, administering one of the final blows to Japanese carrier aviation. He won three Navy Crosses. After World War II he commanded the Eighth Fleet, was promoted to four-star admiral, and took command of the Atlantic Fleet. He died of a heart attack while still on active duty. He was buried at Arlington Cemetery.

Figure 39. The Devastator was the main torpedo bomber at Midway. (USN photo)

Figure 40. Ensign George Gay, the only survivor of the *Hornet's* Torpedo Squadron 8. (USN photo)

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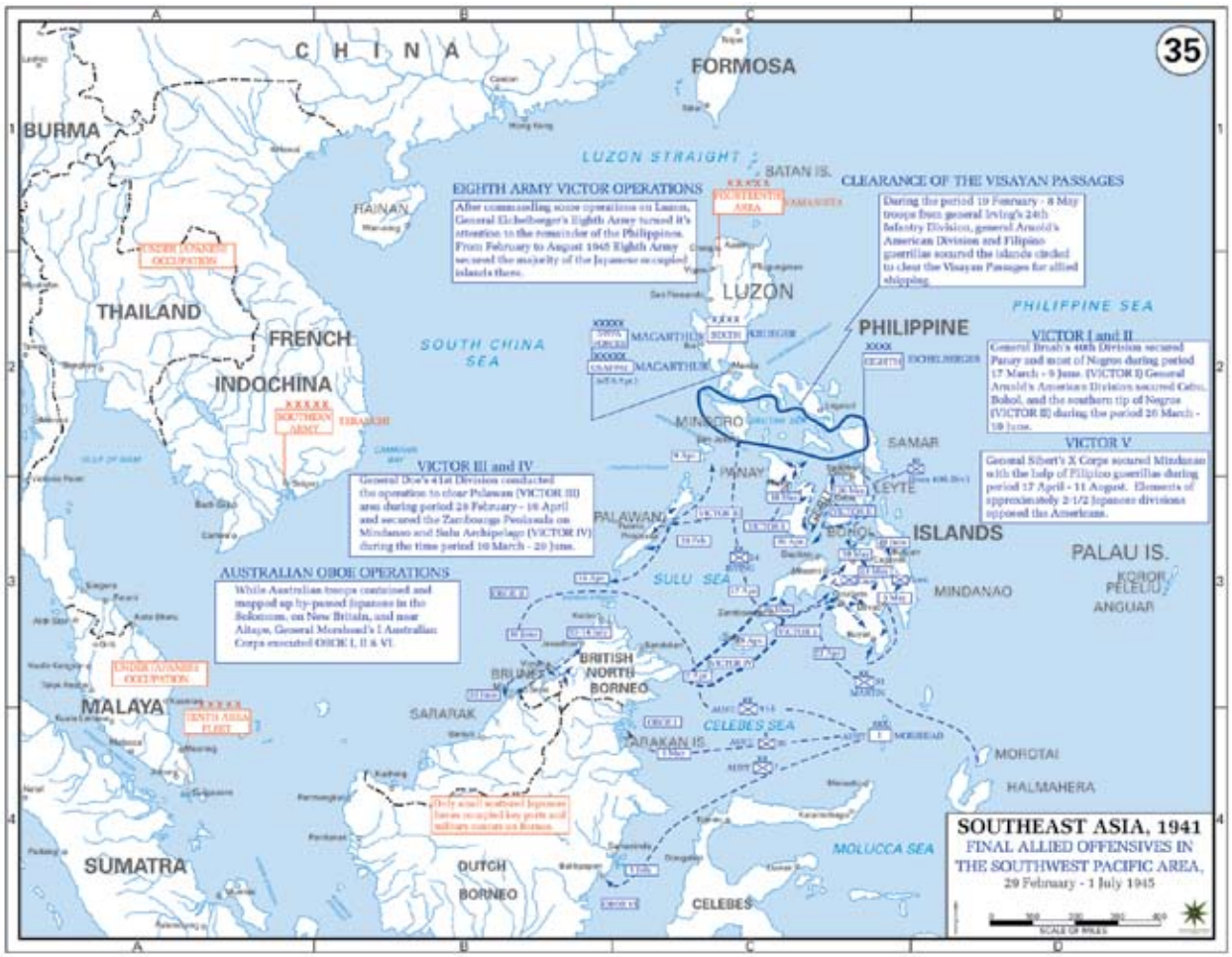

Figure 41. Southwest Pacific map. (Courtesy of History Department, US Military Academy)

Chapter 17

World War II: Pacific—The Merge and Hiroshima

The Battle of Leyte Gulf

Sometimes, the division of one's forces can be very bad strategy. But the United States followed such a strategy in the Pacific for a couple of years without disaster: one force across the Central Pacific led by Admiral Nimitz and the other in the Southwest Pacific headed by General MacArthur. Once the United States took the Marianas in the summer of 1944, the problem of what to do next was urgent. The Joint Chiefs of Staff decided that the two forces would merge for the reconquest of the Philippines, and then the unified force would move northward toward Okinawa and Japan. The invasions were getting ever tougher and longer, and when the force arrived off Leyte, it came near to disaster. Adm William Halsey was in charge of this operation while Admiral Spruance was back in Hawaii planning the next one. The Japanese navy decided to come out in full force for one great sea battle that might decide the outcome. They had a clever plan that successfully decoyed Halsey off to the north chasing carriers almost devoid of air groups. The surface ships were to come through straits both north and south of Leyte to grasp the landing ships in pincers. Halsey did just the opposite from Spruance this time. The Japanese snatched defeat from the jaws of victory because the escorts for the landing forces put up a gallant fight and one of the Japanese admirals apparently lost his nerve at the last moment.

The Return to the Philippines

Landing at Leyte was no picnic either. The rains came and the soil turned to mud. It proved impossible to rapidly develop airfields ashore, and the troops had to depend on naval airpower for an agonizing period before General Kenney could get the airfields running. After Leyte, MacArthur's forces moved on to Luzon, and that battle also dragged on. Manila suffered enormously, and the enemy retreated to the mountains north of Clark AB. It took many months to root them out. The kamikazes first joined the battle off Leyte and were a serious new threat.

Okinawa

Luzon was still too far from the Japanese home islands. The war against Germany was finished in May of 1945, and the USAAF had to redeploy the Eighth Air Force to the Pacific. Its B-17s and B-24s did not have the range to operate out of the Marianas, so the Americans had to find bases closer in. Okinawa sits close enough to the southernmost of the home islands, Kyūshū, and it was to be the first step, with a landing in November 1945. Some naval and USAAF officers argued that the combination of strategic bombing and blockade would be enough—that a bloody landing would not be necessary. MacArthur thought otherwise; the decision went his way, and the invasion of Okinawa

went on as scheduled. The kamikazes ran wild, and about as many Sailors died as Soldiers and Marines. The Japanese did not defend on the shore but rather retreated into the rough terrain and caves in the southern part of the island. Following the bloody invasion of Iwo Jima and occurring simultaneously with the release of photos and information on the German extermination camps, the invasion of Okinawa was a part of the background information for the decision makers grappling with thoughts on whether and how to use the initial nuclear weapons.

The Strategic Attack on the Home Islands

The initial B-29 attacks from the Marianas did not come until the last week of November 1944. They were not very effective at first, but they reached full fury on the night of 9 March 1945. The Tokyo raid that night raised a firestorm and proved to be the single most destructive strategic bombing attack of the war—anywhere. Meanwhile, the US Navy had overcome the initial defects in their torpedoes, and the submarine blockade was decimating the enemy merchant fleet—the caloric intake of the Japanese people was rapidly declining. Some Japanese leaders were beginning to see the futility of it all, but they could not prevail over the hard-core army warriors. After the fall of Germany, President Truman issued an ultimatum during the Potsdam Conference threatening destruction from the sky if the Japanese did not accept unconditional surrender. They did not respond, and the president made the decision to mount an atomic attack. (Many debates over his motivation have been raging lately, but Churchill called it a "miracle of deliverance," and most servicemen of the day agreed.)

The Nukes

In perhaps the greatest research and development effort in US history, the "Manhattan District," led by the Army, developed the first nuclear weapons. It benefited greatly from technology transfer from European scientists and British research. Many of the scientists were refugees from Hitler's persecution. As soon as Gen Carl Spaatz returned from leading the air campaign against Germany, he was dispatched with the information on the nuclear weapons to General MacArthur and Admiral Nimitz, and then he went to the Marianas to take charge of the effort. The first weapon was dropped by a B-29 crew led by Col Paul Tibbets on 6 August. The Japanese did not immediately respond, and the second went ahead against Nagasaki on 9 August. Tens of thousands of people died. Supporters of the decision insist that had the Okinawa model prevailed for the invasions of the home islands, many more people than that would have perished.

The Surrender

Meanwhile, a debate between the Japanese peace and war factions was raging. A decision did not seem to be in the offing when finally the emperor intervened and declared that the war had to stop. Some army officers threatened to disobey the emperor, but cooler heads prevailed, and the peace was signed on the decks of the battleship *Missouri.*

Maj Gen Haywood Hansell, 1903–1988

Haywood Hansell was born in Virginia in 1903. The son of an Army colonel, he spent part of his childhood in China and the Philippines. Hansell was not at first attracted to the Army life and went to Georgia Tech for mechanical engineering. He worked in California for a time but applied for flight training with the Air Corps in 1928. Between then and World War II, he spent a long time at Maxwell AFB as a student and then as an instructor, becoming a part of the "bomber mafia." He was also a pilot on the "Young Men on the Flying Trapeze" aerial demonstration team led by Claire Chennault. In 1941 Hansell worked on the Air Staff on the major war plans for the air war against Germany and Japan. He went to Europe to serve in Eighth Air Force as a commander flying B-17 missions against the Axis. He was selected to command the first B-29 operation out of the Marianas against Japan, but after two months of operations he was relieved because of the apparent lack of results. Some say that his persistence with daylight precision bombing and his moral objections to urban firebombing brought on his relief. Back in the United States, he commanded a training unit at Williams Field in Arizona, and worked again on the Air Staff. He is buried at the Air Force Academy Cemetery.

Figure 42. B-29 being prepared for Hiroshima mission, 1945. (USAF photo)

Figure 43. Gen Carl A. Spaatz presenting the Distinguished Service Cross to Col Paul Tibbets. (USAF photo)

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Chapter 18

The Dawn of the Cold War

Wartime Frictions

Coalition warfare is never easy, and it was no exception for the Allies in World War II. For a time after 1933, relations between the Western democracies and the USSR were passable, but they soured after the Soviets got out of the Spanish Civil War and then signed the Nazi-Soviet Pact of 1939. That opened the door for Hitler. Thus, when he reversed course again with an invasion of the USSR in June 1941, there was a residue of suspicion in the USSR, Great Britain, and the United States. The Soviets were long unhappy with the slowness of the West in mounting the invasion of France, and then the bargaining at Yalta and Potsdam near the end was often seen as a betrayal of Poland and democracy. The USSR immediately jumped into the war against Japan after Hiroshima, reaped great rewards for doing so, and aroused suspicions of opportunism in the West.

Demobilization

Still, the whole world was war weary, and in America the national debt was reaching record heights, and the budget was badly unbalanced. The population wanted to get on with peace and to start acquiring the good things in life so long denied. Thus, the armed forces had to be radically demobilized with little thought for the future. In August 1945 the USAAF had about 2,300,000 people. By the spring of 1947, it was down to a little over 300,000. In October 1945 alone, close to 400,000 Airmen were discharged—gone in one month were more people than are in the Air Force today. The Navy and the Army were likewise slashed.

Initial Air Thinking

Richard Overy later concluded that Allied airpower prevailed over the Axis because the latter was highly specialized, but the West applied it in a generalized way. That idea controlled the thinking of the air leadership as it emerged from the war. The first force structure recommendation of the Aircraft and Weapons Board was for a balanced air force: strategic bombing, tactical support, tactical and strategic airlift, army support, and a firm technological and logistical base. That amounted to a 70-group air force.

Budget Squeeze

The cards were stacked against a large air force. The Americans concerned had suffered through first the Depression and then four long years of war. The deprivations had been enormous, and they needed relief. Nuclear weapons could maintain eternal peace; nuclear power would be so cheap that there would be prosperity forever. Atop that, the

Democratic Party had won the last four national elections—and Harry Truman had not been the one chosen in the most recent one. His prospects for election in his own right in 1948 were dim and in part dependent upon economic and budgetary issues. Thus, he put an absolute cap on the military budget at a little over $14 billion—and was almost totally inflexible on that. That meant a 48-group air force maximum.

The Coming of the Nuclear Air Force

Thus, no matter what the desires of the air force heavyweights, there would be no more than 48 groups, and a balanced air organization could not be fitted into that limit. They had to choose. They knew that tactical air forces had been crucial in the battles in France and the Pacific. America's airlift led the world, and military aviation was on the cusp of several technical revolutions. Despite all that, choices had to be made. The mission that justified a separate air force was strategic bombing. Many in the media and Congress were persuaded that nuclear weapons solved all the defects of strategic bombing and that they could therefore underwrite the peace along with the new United Nations (UN). The air generals had to make their choice. The last to go would be the strategic nuclear bombers. Much as it pained them, then, airlift and tactical airpower would have to be sacrificed (along with big chunks of the Army and Navy). The theories of the day held that the trend toward total world wars was to continue unless they could be deterred somehow.

Berlin Blockade

The Soviets were the first into Berlin in 1945. Eisenhower deliberately decided not to race them for that honor. The USSR was to occupy the eastern part of Germany surrounding Berlin, and the capital itself would be a combined occupation by the Russians, French, British, and Americans. The Western allies could service their forces there through a limited number of land and air corridors. The USSR shut these down in the spring of 1948, apparently to cause the Western allies to give up their roles in Berlin. Some US Army people were advocating a march on Berlin, and some thought we were on the cusp of World War III. Instead, the West decided to supply their zones with airlifts into three airfields there to generate time for diplomacy to work it out. It went on much longer than anticipated, and the Berlin airlift grew to legendary proportions. It supplied a substantial portion of the needs of the city. Two B-29 groups were deployed to Britain, but the Soviets knew that they were not nuclear capable.

Founding NATO

The West did not fold, and the crisis sufficed to motivate the Europeans to form a defensive alliance. Presently, the United States was persuaded to help grow that into what became the NATO alliance, the first peacetime alliance in American history. Apparently, World War III had been averted.

Adm Louis Denfeld, 1891–1972

Louis Denfeld was born in Massachusetts and entered the Naval Academy in 1908. He came on the line of the Navy in 1912 and served in many surface ships and even in a submarine. He started and finished his career at sea on battleships in the Okinawa Campaign, leading the new battlewagons in that invasion. He was a conservative leader and an expert in staff work, winding up after World War II as chief of the Bureau of Personnel. In 1947 at a time of severe military drawdown and intense interservice rivalry, he was chosen as the chief of naval operations. During his regime, the B-36 controversy and the consequent Revolt of the Admirals took place. Denfeld, with unaccustomed outspokenness, led the charge against what many in the Navy thought were unfounded claims for strategic bombing and discrimination against the Navy because of it. It came to a head when Secretary of Defense Louis Johnson cancelled the construction of the supercarrier USS *United States* without the normal preparatory work with the Navy, Congress, and the rest of the administration. It caused such an uproar that President Truman fired Denfeld and appointed a naval aviator to take his place. Denfeld died in 1972 and is buried in Arlington Cemetery.

Figure 44. Fairchild C-82 Packet. Only a few participated in the Berlin airlift, but they were vital because they could be loaded with equipment that could not be handled by other aircraft. (USAF photo)

Figure 45. Lt Gen William Tunner, commander of the Berlin airlift. (USAF photo)

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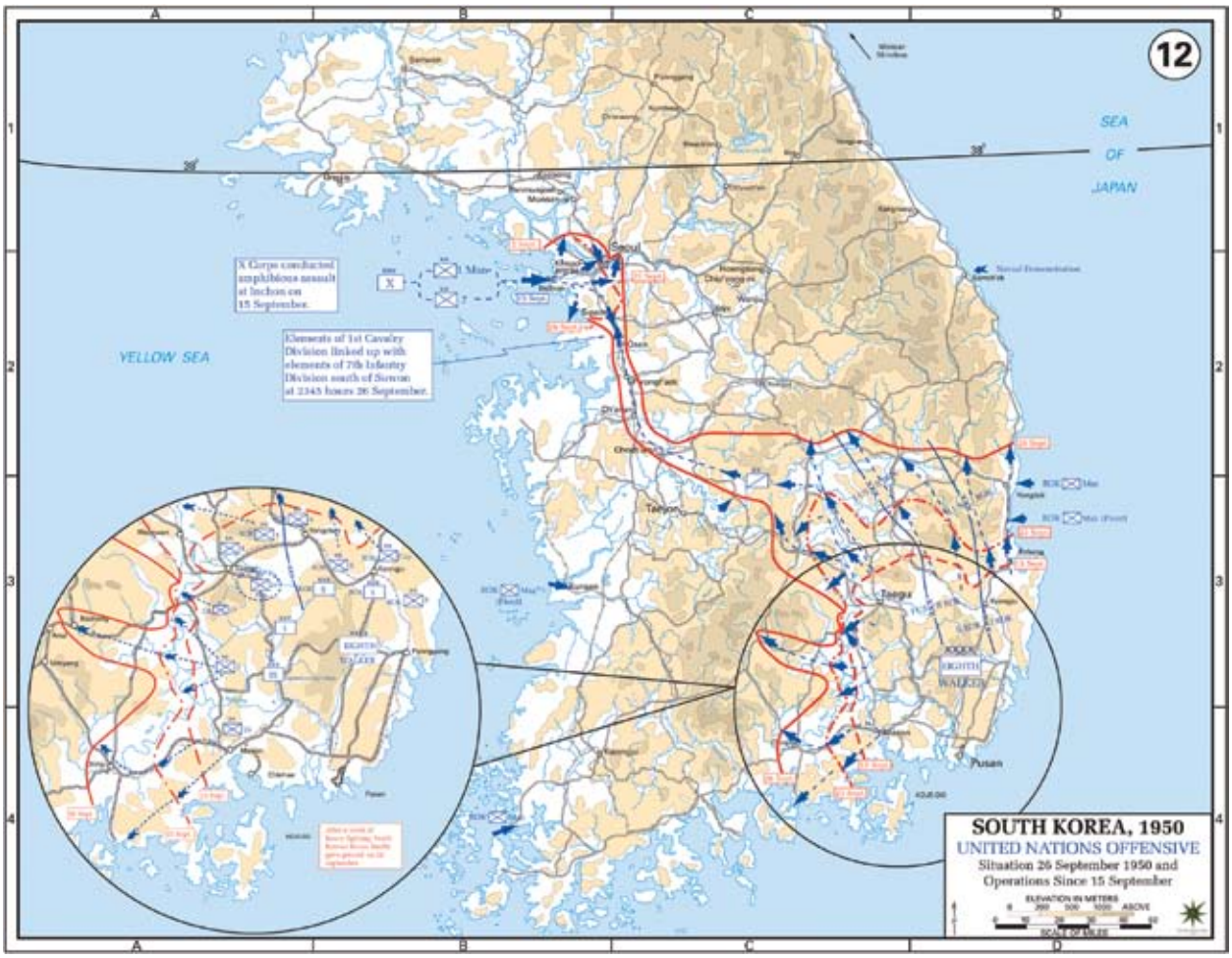

Figure 46. Korean War map. (Courtesy of History Department, US Military Academy)

Chapter 19

The Korean War

Outbreak

Although by 1948 it was clear enough that a Cold War was afoot, the end of the Berlin blockade and the conclusion of the NATO Treaty in 1949 made many hope that there would be no active combat for a long time. Thus, the demobilization of American forces continued. China fell to the communists in 1949, and though it led to many recriminations in the United States, it did not seem to portend war. In fact, Secretary of State Dean Acheson in a famous San Francisco speech seemed to suggest that the American defensive perimeter lay through the islands offshore from Asia. Thus, when the North Koreans invaded the South in June 1950, it came as a severe shock to most people—and President Truman's decision to fight on the Asian mainland was also a shock to many. The US ground forces in Japan were occupation troops, not very well trained and not in good shape. As for the air forces there, they were trained only for air defense of Japan, not tactical support.

Initial Combat

The invading North Korean forces were largely devoid of air cover. Practically no US forces remained in Korea. The communist advance was rapid, and the Americans sent in ground troops as rapidly as they could, but that did not stem the tide. The USAF units on the scene were not trained or armed for the work, and there were no jet-capable fields in Korea. Thus, they had to fly all the way from Japan, and that gave them very little loiter time over the battlefields. Pilots who only recently had trained into jets were frequently reverse-trained into P-51 Mustangs brought out of mothballs. Mustangs were not ideal for close air support, but they did have longer range and greater payloads than the early jets. They could also use more austere runways. But the communist lines of communication were getting longer and longer, and they were not well defended. MacArthur's troops retreated ever farther toward Pusan in the south and built a defense perimeter around the southeastern corner of the peninsula. Some army officers later proclaimed that in that instance, the close air support and interdiction provided by the USAF and Navy were vital in halting the offensive. But the fear of being pushed into the sea was still there.

Inchon

By September 1950, the communists were severely stretched. Douglas MacArthur conceived an end run similar to some of those he had used in the Pacific War. But the conditions on the west coast of Korea, up a dangerous channel to Inchon, were highly hazardous to amphibious forces. He went against the advice of many on his own staff

and the skepticism of the Joint Chiefs of Staff and undertook the surprise strike. The result was perhaps his greatest achievement, for it cut the narrow communist line of communications and led to their rout. The UN forces quickly drove remnants of the North Korean army beyond their capital and up to the region of the Yalu River; MacArthur thought the war would be over in weeks.

Chinese Communist Entry

The United States was largely blind to the danger, but the Chinese were not inclined to suffer a major military presence on their border so soon after the success of their revolution. Thus, as the UN forces approached the Yalu, Mao Tse-tung's armies started across and came close to routing MacArthur's army. The tide was reversed and winter was coming on.

Static War

In early 1951, MacArthur was supporting a variety of aggressive measures to overcome the humiliation, but President Truman was concerned about a possible escalation to World War III. The Russians had already detonated a nuclear device in 1949, and though MacArthur seemed ready to use such weapons, Truman was not about to do so. Nor were many Airmen in favor of that because there still were limited numbers in the inventory. They had to be conserved for the sake of deterring the USSR, and there really were no targets worthy of them in Korea. When the fight got down to the waist of Korea, things stabilized. The communists were unable to bring their airpower south, so they had no air support on the battlefield. The Soviets were providing the Chinese and North Koreans with air resources, but Stalin held his fighters in a defensive role along the Yalu River. The B-29s were quick to destroy any new airfields the North Koreans tried to build closer to the front, and the F-86s were fighting the communist jets over the Yalu. The UN had air superiority over most of the peninsula, and the limited number of communist lines of communication were beat up with interdiction missions, but the flow of goods southward was never completely shut down. The result was a stalemate and truce negotiations that went on for two years before a cease-fire was achieved. Stalin died in the spring of 1953, and there was a new president in the United States, who claimed he made a nuclear threat that had something to do with the coming of the truce. Few were happy with the outcome, but the war *had* remained limited. As for airpower, it was becoming clear that nuclear weapons would not prevent war after all, but maybe they could limit it. A certain amount of complacency may have set in because of the perceived 10:1 kill ratio that the West thought had been achieved over the Red flyers. But the Army and Navy lamented what they perceived as poor air support from the infant USAF because interdiction had not shut down enemy supplies completely, and some Soldiers deemed the USAF's close air support as inferior to that provided by the Marine Corps.

Maj Gen Frederick C. Blesse, b. 1921

"Boots" Blesse, one of the leading USAF jet aces, was born in the Panama Canal Zone and graduated from high school in Manila, the Philippines. His father was a brigadier general in the medical corps of the US Army. Boots graduated from West Point with one of its wartime classes and won his pilot wings at the same time. He got some flying time in the World War II fighters before moving into jets in the late 1940s. He volunteered for two tours in Korea, the first in F-51s and F-80s doing air-to-ground work. He was soon back in Korea in the 4th Fighter-Interceptor Wing. In that tour, he killed nine MiG-15s and one YAK-9. He came back to Nellis AFB after the war to serve as a gunnery instructor. He gained fame on the winning gunnery team in two successive national gunner contests and carried away more individual awards from the second than any other pilot in history. While at Nellis, Blesse also authored *No Guts, No Glory*, a treatise on air-to-air tactics used for many years thereafter. He also did a tour in Vietnam in F-4 Phantoms flying another 154 combat sorties. He retired as deputy inspector general of the Air Force in 1975 and now lives in Florida.

Figure 47. Republic F-84, used effectively for ground attack in Korea. (National Museum of the USAF photo)

Figure 48. Maj Gen Frederick C. Blesse. (USAF photo)

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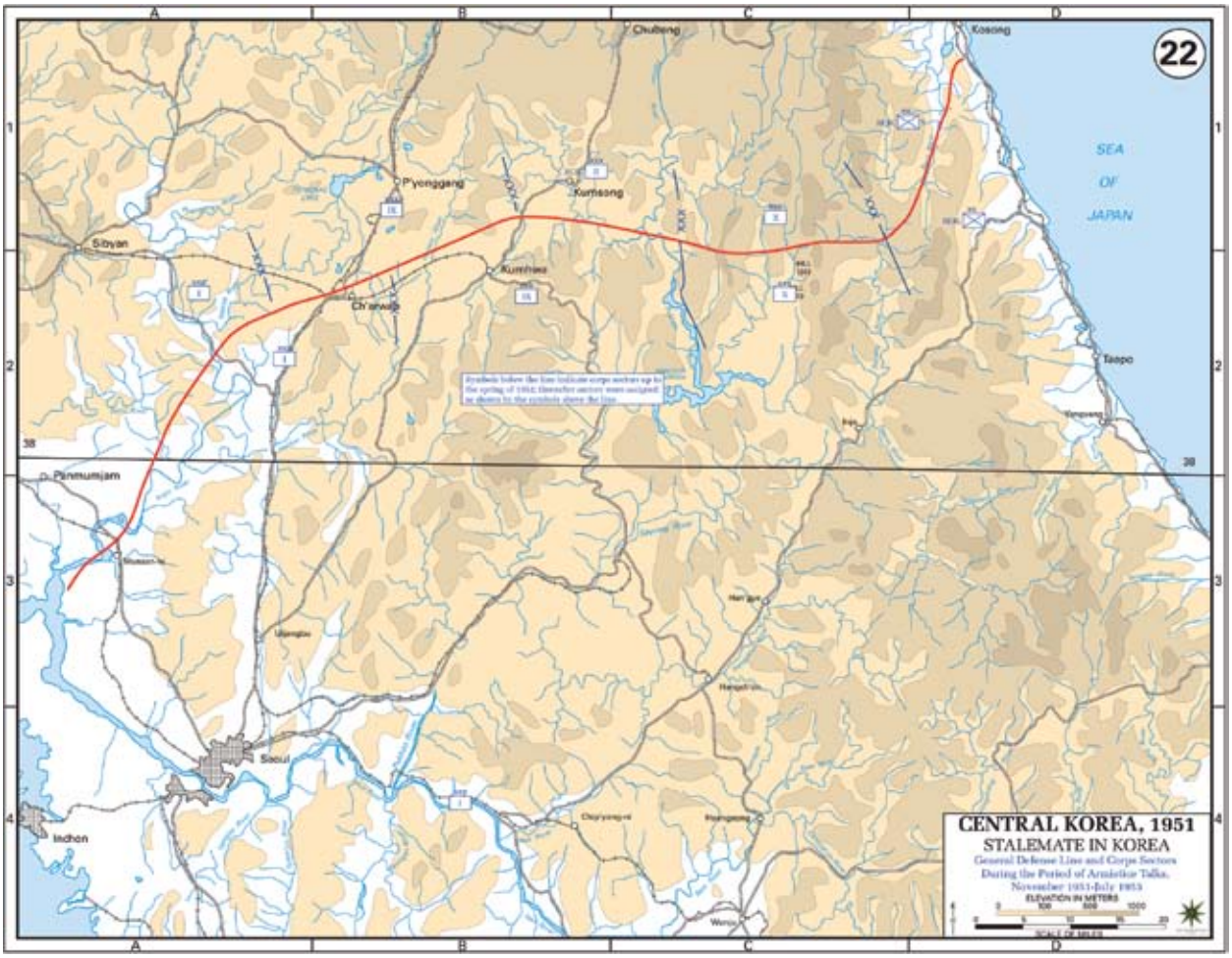

Figure 49. Korean War map. (Courtesy of US Army Center of Military History)

Chapter 20

Naval Aviation in the Korean War

Naval aviation made a crucial contribution to the Korean War, especially in its opening phases. Lacking developed airfields in South Korea, only deployed aircraft carriers could quickly respond to needs for close air support to the beleaguered troops. By the time the Japan-based USAF jets arrived over the battle with small ordnance loads, they had so little fuel left that they could not tarry long enough to be effective. Thus the presence of two Marine squadrons on the escort carriers *Sicily* and *Badoeng Strait* nearby made all the difference. They were still flying F-4U Corsairs with reciprocating engines. Their ordnance loads were much heavier than those of the early jets, and they could loiter over the battlefield much longer because the distance was less and their endurance was greater than the jets. Too, the closeness of the carriers made the emergency response to requests from the troops much quicker. When the fleet carriers arrived, their loads were usually composed of F-4Us, F-9F Panthers, and AD Skyraiders. The Panthers were jets and suffered some of the same limitations as the Air Force F-80s. But the Corsairs and Skyraiders were especially well suited for that situation. Moreover, the US Marine Corps was blessed with reserve formations well trained in close air support. They included ground air-control squadrons commanded by aviators well acquainted with infantry operations, and that added to their effectiveness.

Inchon

The landings changed the check the North Koreans suffered at the Pusan Perimeter into a great rout. They severed the enemy's main line of communications with their supply and reinforcement base. Another objective of the assault was to quickly acquire the Kimpo Airfield and then to develop others. Air support from escort carriers was limited in volume and sustainability, as was that for the fleet carriers. However, they did supply vital air support at Inchon that helped compensate for the main hazards to the surface operations. Kimpo was quickly acquired, and air units were emplaced and resupplied there, which improved the outlook for sustained air support. American and British naval aviation provided close-in air support, while the USAF worked at a greater distance, including the employment of B-29 heavy bombers. As soon as the follow-on forces were established ashore, Marine amphibious troops reembarked for a voyage around to the eastern coast of the peninsula—the lateral communications in Korea were so poor that the trip had to be made by sea. The North Koreans were in such disarray that the South Korean ground forces secured the landing area before the mines had been cleared for the amphibious vessels, so the Marines made an unopposed landing. The troops involved were formed up into the X Corps, which was cleared to cross the 38th parallel, as was the Eighth Army operating along the west coast.

Chinese Communist Intervention

The Chinese intervened with a massive force as the UN forces approached the Yalu. One result was that major elements of the X Corps were nearly trapped at the Chosin Reservoir during late November and early December. The weather added to the agony, and many suffered frostbite. The endangered force was made up of a large component of Marines, some US Army forces, additional British marines, and some South Koreans. In an epic withdrawal commanded by Marine Maj Gen Oliver Smith, UN forces suffered grievous losses—but they administered greater casualties on the enemy. The UN had the advantage of complete air superiority, even to the point of permitting the airlifting out of 4,000 wounded troops and the insertion of 500 replacements as well as resupply. The UN successfully withdrew to the port of Hungnam, where its naval supremacy permitted the rescue of 105,000 troops, nearly that many civilians, 17,500 vehicles, and 350,000 tons of resupplies, all of which were delivered to Pusan. The United States suffered about 3,000 killed, and the estimate for the enemy was about 10 times that.

Aftermath

The communists succeeded in driving down to the waist of Korea, but in so doing, they lengthened their supply lines, making them more vulnerable to interdiction. They could do little there to interfere with UN airpower, and neither side was prepared to undertake further massive offensives. The two sides began negotiations over a truce, MacArthur was relieved, and the stalemate went on for two years before the fighting was stopped. A peace treaty still has not been concluded.

Airpower Implications

Naval airpower retained its utility. It was becoming more clear that nuclear weapons would not solve all national security problems. Nor was it possible to assert that airpower alone could carry the day. Interdiction may have been instrumental in keeping the communists on the defensive for the last two years, but it never could stop the flow of supplies to the enemy completely. Many in the Army came away believing that Marine Corps methods for close air support were superior to those of the Air Force. Airmen did not think so because the problem was entirely different in supporting the much larger Army force. Helicopters were used in substantial numbers and had a dramatic effect on medical evacuation and the survival of wounded personnel. The Americans did not achieve unified control of combat airpower in Korea. The impression that the American air forces far outclassed those of the communists in air-to-air combat was strong. Major tactical units were at the same time being deployed to Europe, and the Strategic Air Command kept its most modern forces at home.

Gen Keith B. McCutcheon, 1915–1971

Keith McCutcheon was born and brought up in Ohio. He graduated from Carnegie Institute of Technology in 1937, and later from MIT, the Armed Forces Staff College, and the National War College. He got his naval aviator wings and served aboard the aircraft carriers *Ranger*, *Hornet*, and *Yorktown* in the early 1940s. He was involved in the development of guided missiles and remotely piloted vehicles at an early day and went to combat in the Solomons and Philippines in 1944 and 1945. Back in the United States, he commanded the first Marine helicopter squadron and had a vital role in its early organization and development. He was back in combat as a helicopter squadron commander in the Korean War. By then, he was developing and writing close air support doctrine with important effects ever since. Before the end of the Vietnam War, he had risen to lieutenant general and the command of the III Marine Amphibious Force there. McCutcheon was awarded the Distinguished Service medal multiple times, along with the Silver Star and Distinguished Flying Cross. He returned to the US Marine Corps Headquarters in 1970 and died of cancer in 1971. He was promoted to four-star general on the retired list. He was buried at Arlington Cemetery.

Figure 50. F9F Panthers prepare to land on the USS *Boxer*, off Korea, 1951. (USN photo)

Figure 51. Gen Keith B. McCutcheon, USMC. (USN photo)

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Chapter 21

The Rebirth of US Army Aviation

National Defense Act, 1947

Gens George Marshall and Dwight Eisenhower were all for the independent Air Force in 1947, but there remained many Soldiers who were not. The Army retained some fixed-wing aviation for liaison and artillery spotting work, but the Department of Defense long placed fairly tight restrictions on the size and power of those airplanes. Still, during the debates surrounding the legislation of 1947, the Army and Army Air Forces were generally on the same side against the Navy. The new USAF came away with the responsibility for close air support and airlift for the Army ground forces as well as for air superiority over the battlefield. It also had an important role in acquisition and training for Army aviation. The Marine Corps retained its own air support, doubtless to the envy of most Soldiers. Helicopter technology was still primitive.

Helicopters and Korea

Rather light helicopters with reciprocating engines were becoming practical in the Korean War. Their initial uses there were mainly for search and rescue and medical evacuation. C-119s and C-47s provided airlift for Army troops in the few airborne operations that were attempted—with little real effect.

Close Air Support in Korea

There was a good deal of angst in the Army over what many perceived as the inferior close air support the Soldiers were receiving compared to the excellent support the organic Marine Corps aviation delivered. Some felt that the Air Force was more interested in chasing glory by killing MiGs over the Yalu or wandering around the enemy lines of communication futilely attempting to interdict communist supplies moving to the front. Later the Army consolidated its aviation activities to Fort Rucker, Alabama. Clearly, thoughts were afoot there about ways to rebuild an Army air force based on helicopters so that organic fire support and airlift would be immediately responsive to ground commanders of even fairly small units.

Election of 1960

Dwight Eisenhower retired to his Gettysburg farm in January 1961, and a new administration came to power. The “New Frontier” seemed dedicated to changing many things. Led by a young Jack Kennedy assisted by Secretary of Defense Robert McNamara, that change seemed to come on at a gallop. Both the Army and the Air Force had established special warfare centers with blazing speed, and the Soldiers found a warm

reception when they brought their aviation ideas to the Department of Defense. McNamara encouraged them, and the Army established the Howze Board to consider ways in which aviation could be used to overcome the limitations of the ground forces. Lt Gen Hamilton H. Howze led the effort, and the board recommended major changes.

The Howze Board

The board met through 1961 and reported in mid-1962. It concluded that the Army required a massive move to helicopter aircraft. The idea was that it could make up for its lesser numbers (compared to the Warsaw Pact) through superior battlefield mobility and firepower provided by a massive influx of rotary-winged aircraft to new air mobile divisions. Some Air Force officers perceived this as a turf grab that threatened their service's hold on the close air support and tactical airlift missions. The board's recommendations were for the creation of air assault divisions. They were to be provided with more than 400 aircraft apiece that would replace thousands of ground vehicles. Secretary McNamara approved of the idea, and an experimental 11th Air Assault Division was set up to test the concepts in 1963. The results were deemed favorable, and the 1st Cavalry Division (Air Mobile) deployed to Vietnam in 1965 to apply the ideas in combat.

Evolution of Helicopter Missions

The technology for helicopters advanced fairly rapidly in the 1960s. A major change was the adaptation of turbine engines for helicopters. Simpler, more powerful than reciprocating plants, and more reliable in field conditions, turbine engines enabled a major expansion. The changing missions resembled the early evolution of fixed-wing military aircraft. Their great utility for medical evacuation had already been proven in Korea. Soon, the utility of "choppers" in the old cavalry mission of scouting was exploited. A natural step was the transportation of assault troops to landing zones, and that entailed escorting aircraft for fire support en route and during the landings. Helicopters greatly facilitated the exercise of command and control over the battlefield. Finally, units were built of specially designed helicopter gunships and served as maneuver organizations in their own rights.

Army-Air Force Agreement of 1966

All this stimulated concern in the Air Force for its close air support and tactical airlift missions. Army Chief of Staff Harold K. Johnson and Air Force Chief of Staff John P. McConnell agreed in 1966 to a settlement of some issues. The Army was to have all helicopter missions except Air Force special ops and rescue operations; the Air Force was to have all fixed-wing tactical airlift missions and to receive Army aircraft designed for

Gen Hamilton H. Howze, 1908–1998

Hamilton Howze was born at West Point, and he was buried there 90 years later. His father, Robert Lee Howze, was commandant of cadets and is also buried in the West Point cemetery. The elder Howze won the Medal of Honor in the Indian Wars and served as a division commander in World War I. Hamilton graduated from West Point in 1930, five years after his brother Robert. Hamilton was originally commissioned in the cavalry and served in combat in World War II with armor units in North Africa and Italy. In 1955 he won his Army pilot's wings and was soon destined to become the father of modern Army aviation. In 1961 and 1962, he led the Howze Board, which did instrumental work in building the tactics and plans for Army air mobility units. The first of these, the 11th Air Assault Division, was organized in 1963, and the new helicopter roles included fire support for air assault operations, forward airlift for infantry troops, aerial resupply, reconnaissance, and medical evacuation. General Howze went on to command the XVIII Airborne Corps and finished his career with four stars as the UN commander in Korea until 1965. He spent his retirement years in Texas and died at Fort Worth. The senior Robert Lee Howze and both his sons retired as Army generals.

Figure 52. C-7 Caribou, transferred from Army to Air Force, 1967. (USAF photo)

Figure 53. Army troops delivered by UH-1 Huey landing in Vietnam.
(US Army photo)

the purpose. That seemed to reduce the tension for some time (along with an interservice agreement defining helicopter fire as something other than close air support).

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Chapter 22

Liquid Mobility: Air Refueling

Background

Replenishing aircraft while airborne was an idea antedating World War II. It was first developed using hoses in the 1920s. Various ideas made it seem useful. Potentially, it could facilitate transcontinental air travel by eliminating the need for refueling stops. It might also permit taking off with heavier payloads and topping off the aircraft tanks once airborne. Too, for bombers it could extend their ranges by refilling their tanks once they arrived at altitude. But the military imperative did not seem that crucial in the 1930s, and much of the experimentation in the 1930s was because of the potential for transoceanic travel. Most of that was with hoses and the uses of probes and drogues for fuel transfer—cumbersome and dangerous. In World War II, the ranges for bombers were adequate for the European war, as they were in the Pacific once the B-29s were on the line and it was possible to find islands on which to base them. It turned out that escort fighter development was adequate, albeit just barely, for European fighting. In the Pacific, 6,000 Marines died to take a base for the P-51s at Iwo Jima on the route to Tokyo.

Bomber Range Extension for Jets

After the war, the distances to the potential enemy's targets were much longer, and the anticipated length of a nuclear war was much shorter. The idea of fighter escorts went away. Only the bombers with reciprocating engines had a chance of making the trip, but they were too slow to protect themselves. The great leap in speed with jet bombers seemed to make penetration at a reasonable cost possible, but their ranges were shorter than, say, those of the B-36. The workaround seemed to be the creation of a fleet of tankers based at northern places where they could top off the outbound and inbound jets with enough fuel to make it feasible for a short war. In any case, the mission was deterrence more than attack, and the hope was that the war would never come.

Tanker Evolution

In the 1920s, tankers were merely adaptations of transports. Since receivers were using internal combustion engines also, the altitudes and speeds of tankers and receivers were compatible. After World War II, the initial generations of tankers were also adaptations of other aircraft, all with internal combustion engines. In their case, the efficiency of both engine and propellers decreased with altitude, but it did not make much difference while the bombers were still B-29s and B-50s. But the amount of tankage that could be built into the old bombers (KB-29 and KB-50) was limited. Too, the rate of fuel flow through hoses used at first was so slow that it made for extended hookups.

The initial response was a new tanker with much greater fuselage space as in the KC-97. Some 800 of them were delivered to the Air Force during the 1950s. But the rapid advance of jet bombers created a problem. Not only did they need a high fuel flow for refueling, but also their engines decreased in efficiency when they came down to altitudes where the KC-97 would work, usually below 20,000 feet. Too, it was hard for bombers, especially the B-47, to hang on to the boom that had been developed for its large fuel flow at a speed that a heavy tanker could maintain. The problems with the B-52 were similar. In the case of both bombers, they had to consume a considerable part of the KC-97 offload of about 50,000 pounds to get back up to an efficient cruising altitude. Thus, the need for a jet tanker for bomber altitudes and speeds was obvious. The first such airplane, the KC-135, was similar to the Boeing 707 and was delivered to the Air Force in the mid-1950s. Its later models are still in service and have been joined by the much larger KC-10 (in limited numbers).

Mission Evolution

At one time, the Strategic Air Command (SAC) had nearly 2,000 bombers. Now the bomber force is hardly more than one-tenth of that as the intercontinental ballistic missiles (ICBM) and submarine-launched ballistic missiles (SLBM) have come on the line to replace them. But the tanker mission is not at all diminished. One of the first evolutions was for the deployment of fighters. Aircraft carriers could do that at long ranges, but their number and speed of deployment were limited. So from the early 1950s onward, the US military developed air refueling of fighters so that now the fighters are practically always self-deploying. Even as early as the Korean War, the notion that tankers could facilitate the tactical employment of fighters as well took hold. During Vietnam, that idea was fully developed to replenish the fighters inbound to the target and prolong their loiter time over enemy territory. Tankers also refueled the fighters outbound and sometimes escorted and even towed them back to friendly fields. This also permitted larger weapons loads and reduced the number of penetrations required for a given amount of destruction. The denial of landing rights to transport aircraft hauling materiel to Israel during the Yom Kippur War of 1973 led to applying the idea to airlifters as well. Thus, the C-141 fleet received plumbing enabling air refueling, permitting the bypassing of en-route stations and increased payloads—reducing the numbers of transports required. Both the AC-130 gunships and rescue helicopters ultimately were made air refuelable. The former could get up enough speed to be replenished by the KC-135, but the helicopters could not, so some KC-130s were developed that could refuel at slower speeds than the jets—using the probe and drogue method. Because fighters do not require as rapid a fuel transfer as bombers, the Navy stuck with the probe and drogue throughout. The KC-135 could be adapted for that method, but the adaptation had to be accomplished on the ground and would prevent boom refueling until the changes had also been removed on the ground. The KC-10 can use either system on the same flight without adaptations.

Col Lowell Smith, 1892–1945

When General Pershing and his 1st Aero Squadron went to chase Pancho Villa in 1916, Pancho had an air force of his own. One of its pilots was Lowell Smith, who found it advisable to come back to the United States to join the US Army Air Service. Smith then became one of the pioneers of American military aviation. He flew in the great Transcontinental Air Race of 1919 and finished in an airplane turned over to him by Maj Carl Spatz (as it was then spelled). He was the first to drop a bomb from an airplane. Many think Spatz was the first air refueler in 1929, but Smith had done it on a smaller scale in 1923, remaining airborne for 37 hours. Air Service missions were patrolling the Mexican border and guarding against forest fires. Smith thought the frequent need to land for refueling hampered the mission. He sold Hap Arnold on the air refueling experiment, and it worked. The next year (1924) he flew one of the airplanes in the first circumnavigation of the globe. After Maj Frederick Martin crashed in Alaska, Smith led the rest of the trip. Practically all of Pancho Villa's scouting had been done by horseback. Ironically, Smith died in a fall from a horse in Arizona in 1945. He was stationed there as one of the early commanders of Davis-Monthan Air Force Base.

Figure 54. A KB-29 refueling a B-45. (USAF photo)

Figure 55. A KC-10 refueling an F-16. (USAF photo)

Figure 56. Boom operator MSgt Sam Blackwell prepares to transfer fuel to a KC-10 Extender. (USAF photo)

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Chapter 23

Solid Mobility: Air Transport to Air Mobility

Air Transport and Troop Carrier in World War II

One of the great advantages of airborne reconnaissance over horseborne scouting was rapid mobility and range. It was but a small step to imagine that rapid and distant transmission of information could be equally useful when people or cargo was to be moved. The British actually tried aerial resupply in the First World War, attempting in 1915 to relieve the Siege of Kut. In 1918 Billy Mitchell was toying with the idea of dropping troops by parachute behind German lines.

There were huge improvements in the reliability and capabilities of aircraft between the wars, and air transport came into its own by 1939. The Germans had moved rebel troops across the Straits of Gibraltar at the beginning of the Spanish Civil War with dramatic results. They did it again in the opening campaigns in the west in 1940, again with remarkable outcomes. That inspired both the United States and Great Britain to go to great lengths to create their own airborne capabilities. But the world was getting used to the possibility, and the surprise element was waning. When the Germans tried an airdrop yet again in their invasion of Crete, they overcame a British naval advantage, but the price was heavy. They never again tried a large parachute operation. But the Allies did not immediately recognize the costs of that mission.

There were Allied attempts at assault by air landing during the North African campaign, but they were neither large nor decisive. The Allies mounted a major parachute/glider assault on Sicily in 1943 with bloody results—for themselves. Many gliders landed in the water, and lots of troopers drowned. US Navy gunners shot down 26 fully loaded C-47s. The most apparent benefit was that the insertions were so disorganized that the Axis leaders could not figure out what was happening. There was an even more massive parachute/glider assault for Operation Overlord in 1944, and the heroics involved were undeniable—but there was much confusion, and many gliders were destroyed. The "Bridge Too Far" operation that September is too well known to require treatment; the crossing of the Rhine in Operation Varsity (1945) was less bloody, but when the paratroopers got into the drop zone, they found the Allied surface forces already there. Still, America emerged with a high opinion of such things and has maintained the capability since.

Meanwhile, the Air Transport Command made major progress in strategic mobility. The airlines had come a long way in the late 1930s, and their people and equipment were mobilized for the war. As the other major powers were hurting so badly, their airlines could not easily be utilized for long-distant transport. The field was wide open for the American Airmen. Both services organized for the work in the Naval Air Transport Service and the USAAF's Air Transport Command. They were equipped with slightly modified airliners and developed worldwide route systems served by improving terminals, meteorology, and

air traffic control. Both services used military versions of the DC-3 (C-47) and the four-engine DC-4 (C-54). Many were surplus after the war and became a huge subsidy in establishing the initial equipment of the great postwar airlines.

The Berlin Airlift

Air transport further enhanced its reputation in the Berlin airlift and stimulated a further movement toward four-engine aircraft. The effort began under the leadership of Brig Gen Joseph Smith, who utilized the large number of C-47s still stationed in Europe to get it rolling. He and his boss, Gen Curtis LeMay, realized that the Berlin blockade would go on longer than anticipated. They got the flow of the Air Force and Navy C-54s (Navy R5Ds) from all over the world flying in. The airlift suggested some of the handicaps of using modified passenger airliners in efforts to move large amounts of cargo in a short time and started the move to developing specialized aircraft for the latter purpose.

Tactical Airlift in Korea and Vietnam

Tactical airlift is at the retail end. By Korea, some of the lessons of the Berlin airlift had already been implemented. The C-123 was an evolution of a design that started as a glider in the late 1940s, and the C-130 was later designed for the retail business at or near the battlefield. Both were made a part of an airlift system that minimized ground time and maximized the amount of cargo and troops that could be moved. Compatible ground equipment for maintenance and loading was included. Very limited troop drops were made in both Korea and Vietnam, but aerial resupply was frequent at places like Khe Sanh and A Shau Valley. The most frequent missions, though, were for standard logistical movement of troops and materiel in theater. Five wings supplied abundant airlift in Vietnam that reduced the loss of lives in ground transport and enabled rapid movement of forces.

Migration to Airlift

By the mid-1950s, the movement from air transport to an airlift concept was well underway. The Military Air Transport Service (MATS) leaders enlisted the support of the Army, aircraft manufacturers, and even airline corporations for the creation of a new line of aircraft optimized for unit (rather than individual) movement. A part of this was the Civil Reserve Air Fleet created to supplement the airlifters in times of need. Another part was the design of the rear-loading C-141 and the change of the command's name from MATS to the Military Airlift Command (MAC) and later to Air Mobility Command when the tankers were added in the 1990s.

Outcome

Other countries have fighters and missiles competitive with those of the United States, but as Eliot Cohen and Thomas Keaney have pointed out, none will soon be able to match the American global power-projection capability enabled by its tankers and airlifters.

Medal of Honor Winner Lt Col Joe M. Jackson, b. 1923

On Mother's Day 1968, 45-year-old Joe Jackson flew the last flight in and out of Kham Duc Vietnam under heavy fire from thousands of enemies. A three-man combat control team had been inadvertently reinserted to the outpost after the earlier evacuations had been completed, and they had to be rescued. At least two other airplanes had tried and failed. Jackson, then in command of an air commando squadron, flew his C-123 into the runway shortened by battle damage and, despite being unable to use his propeller reversing, stopped just in time very near the culvert in which the team was hiding. The three rushed aboard through the rear door, and Jackson flew out through a hail of enemy fire. He received the Medal of Honor from President Johnson in 1969. That was not his first brush with combat. In World War II, Jackson had flown fighters and bombers and then did over 100 combat missions in F-84s in Korea. Too, he was later one of the first pilots in the U-2 program.

Figure 57. A C-54, similar to the DC-4 airliner. (USAF photo)

Figure 58. A C-17, dissimilar to airliners. (USAF photo)

Figure 59. Gen Duncan McNabb, Air Mobility Command, congratulating Medal of Honor winner Col Joseph M. Jackson, USAF, retired, as a new C-17 is named in his honor at McChord AFB. (USAF photo)

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Chapter 24

The Age of Massive Retaliation

Quest for a 70-Group Air Force

Before World War II was over, the USAAF determined that it would need 70 groups to have the kind of balanced airpower that made a huge contribution to victory. The initial reports of the Aircraft and Weapons Board (USAAF four-star generals) proposed that it have a strategic striking force; tactical forces to support surface armies, including bomber, fighter, and troop carrier units; strategic airlift; rescue forces; weather units; reconnaissance; and the logistical organization to support the whole. But President Truman would not have it. He set the upper limit at 48 groups. As the strategic attack was deemed the bread-and-butter mission of an independent air force, the air leaders made the greater part of the cuts on conventional tactical and air mobility forces. Congress was persuaded on this because, by relying on strategic nuclear forces for security, it could make major cuts to the expensive conventional organizations of the Army and Navy.

Foundations of the Strategic Air Command

The strategic striking organization got its start in 1946, before the implications of nuclear weapons were thoroughly explored. The first commander of the Strategic Air Command was Gen George Kenney, fresh from his triumphs under Douglas MacArthur in the Pacific. He was somewhat distracted by his other duties at the United Nations, and in the midst of the postwar drawdown, SAC's progress was disappointing. So much so, that in the midst of the Berlin blockade, Gen Curtis LeMay was brought back from Europe to take charge of SAC. He remained in the saddle for the better part of a decade, and the strategic air forces reached their heyday under his command. At their height, they had about 2,000 bombers and 1,000 tankers. During the 1950s after Korea, there was probably less combat for American forces than in any decade since, and the federal budget was balanced for one of the rare times since 1929. But the Army, Navy, and other parts of the Air Force often deemed themselves neglected.

The March of Technology

Changes in nuclear weapons were part of the reason why the hegemony of SAC did not last longer. In the late 1940s few dreamed that the weight of nuclear weapons could be reduced much below the 10,000-pound weapons dropped on Japan. At that size, carrier aircraft could not haul them, they were too big for the planes of the Tactical Air Command, and no one envisioned missiles that could lift them. But earlier than anyone expected, they were radically miniaturized. Atop that, the USN adopted British ideas for steam catapults and canted deck carriers that made for safer naval aviation operations with heavier payloads. ICBMs were coming along, but at first most people thought that

only liquid-fueled missiles would have the throw weight large enough to handle nuclear warheads—and thus they started out in the Strategic Air Command. However, the progress of solid propellant missiles and the reduction in warhead weight enabled putting nuclear missiles on submarines. Too, those developments made it possible for the fighters of the Tactical Air Command and the artillery tubes of the Army to join the nuclear club—and they did it as rapidly as they could. Added to all that was the development of solid-state technology and the miniaturization of electronic components that made weapons lighter and much more reliable at the same time. Computer processing was becoming ever more capable, and computer components were becoming smaller. Much of this portended a reduction in the numbers of Strategic Air Command flying officers reaching the higher ranks and heavier reliance on tactical forces, the other services, ICBMs, and automation.

Sputnik

The Soviets exploded a nuclear device in 1949 long before most people in the West expected it. That stirred up a good bit of angst, but apparently the thing had not been weaponized, and besides the USSR did not have the delivery capability to get it to the United States. The NATO Treaty had been signed only a few months before, and the event did something to solidify its support. Only eight years later, though, Sputnik orbited the earth *before* the United States had achieved such a thing. It really was not that much of a threat, but it did set off a bit of a panic in America. Little noticed at the time was that the USSR, which had turned a cold shoulder on President Eisenhower's "Open Skies" proposal, had *not* requested overflight permission when its satellites repeatedly passed over the United States—thus establishing the "freedom of the space domain."

The U-2 Downing

Fewer than three years later, a missile shot down Gary Powers over the USSR while he was at a very high altitude. That was traumatic for Eisenhower at the time, but happily America was on the cusp of being able to get the information it needed on Soviet defenses from space—and the Soviets themselves could not object to the orbiting of the space reconnaissance satellites over their country. That enhanced the security of our "massive retaliation" forces and worked toward the stabilization of nuclear deterrence.

The "Missile Gap" and the Election of 1960

The U-2 was downed in a US election year. The U-2 and initial satellite reconnaissance revealed that there was no missile gap, but that information was highly classified. Thus, Vice President Nixon was privy to it, but candidate Kennedy was not. The latter was therefore free to exploit public concern about Soviet nuclear power, and though Nixon knew better, he was unable to respond because of the classification. The election was one of the closest in US history, and the outcome portended a change from the "massive retaliation" to the "flexible response" strategy of the ensuing decade.

Capt Francis Gary Powers, 1929–1977

Francis Gary Powers was born in Kentucky but was brought up in Virginia. He graduated from college in Tennessee in 1950 and was commissioned in the USAF as a second lieutenant. After flying school, he did a tour as a SAC F-84 pilot but soon got into a joint CIA-USAF U-2 program. In the mid-fifties, the United States was at a disadvantage because of the closed nature of Soviet society, which inhibited the gathering of human intelligence there. Yet the stability of deterrence depended upon knowing something about their military capabilities. Powers flew numerous extremely high-altitude reconnaissance flights over the USSR before an SA-2 shot him down over Sverdlosk. He bailed out, but the incident led to a downturn in US-Soviet relations and perhaps indirectly to the Cuban missile crisis. Fortunately, the Americans were able to abandon the U-2 flights because their space reconnaissance satellites were beginning to produce the needed information. Powers left the CIA and worked for a time as a Lockheed test pilot before he moved on to flying a helicopter for a California television station. He was killed when he crashed in 1977 and is buried with his wife Sue at Arlington Cemetery.

Figure 60. A Boeing B-47 with a KC-97 refueler in the background on the right. (National Museum of the USAF photo)

Figure 61. Gen Curtis LeMay. (USAF photo)

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Chapter 25

The Dawn of the Space Age

Roots

The origins of space travel and the military use of space antedate Sputnik by several centuries. Rockets were developed in China long before their "red glare" inspired Francis Scott Key at Fort McHenry in 1814. Firearms development largely displaced them from then until the Second World War, but thought about them continued in fiction and among individual inventors and scientists throughout the nineteenth century.

The Years of the Individuals

Much of the early enthusiasm for rocketry and space travel arose in Europe. Among the pioneers were Konstatin Tsiolkovsky and Sergei Korolev in Russia, Hermann Oberth in Germany, and Robert Goddard in the United States. Many of their ideas suggested measures that were to mature after World War II. They included multistage rockets and liquid propellants, both essential to space travel. It was dangerous work, and some people died doing it. Others like Korolev passed time in the gulags for their efforts. From the nineteenth century forward, private rocket and space societies helped individuals and especially promoted the exchange of information and ideas.

The Consolidation of Effort

As rocket science matured, the challenges exceeded the resources of individuals. The age of the lone inventor passed. Only national governments could support the work necessary. The Nazi government got behind the V-2 program and advanced the science in impressive ways. Though the ballistic missile program was not decisive in World War II, the victors made massive efforts to collect the documentation, hardware, and scientists involved. Wernher von Braun was among them. Probably, the British and Americans got the better of that competition. Some wartime work had been done on rockets in the United States during the conflict, but the new input helped greatly. American thinkers were aware of the potential. In the late 1940s, both the RAND Corporation and the Air Force Scientific Advisory Board commented on the future desirability of satellites in orbit and even on ICBMs.

Western Development Division

It is axiomatic that interservice rivalry is usually the most vicious during postwar drawdowns. The late 1940s were no exception. One dimension of this was a fierce

competition for the dominion over missile development. The issues were gradually resolved, but it never was possible to consolidate the function in one service. By the late 1950s, the Air Force controlled the long-range missile business, but that did not last, for the advantages of the underwater-launched Polaris missile were so obvious that the Navy then got a piece of the strategic nuclear attack mission. The Air Force had some advantages in the competition. It had a stronger tradition of contracting out its research and development, whereas the Navy and Army did more of that in the arsenals and navy yards. Too, the Air Force had a very strong relationship with aircraft manufacturers, an industry vital to missile development. One result was the foundation of the Air Force's Western Development Division in 1954. Brig Gen Bernard Schriever led it, and the mission was to develop a nuclear-armed ICBM at the earliest possible moment. This was achieved before the end of the 1950s, and the German scientists and technicians brought in after World War II made a substantial contribution.

Sputnik

The Soviets launched the world's first satellite in 1957, but few people in the United States realized that the scientific and industrial foundation of that achievement was not as formidable as feared. The US space and missile program was more methodically organized and in a much better competitive position than was thought. Still, President Eisenhower had known at the beginning of the massive-retaliation era that the US nuclear hegemony could not last. It yielded a balanced budget for a while, but change was inevitable. One stimulant was that the launching of Sputnik generated political capital for the Democratic opposition, and also the massive retaliation strategy tended toward a nuclear standoff restoring the importance of conventional arms.

The Superpower Competition

Well before Sputnik, rivalry with the USSR was an important driver of the US ICBM program. It was already on a crash development program, and the cost overruns and failed missile tests were spectacular, but tolerated. General Schriever used his wit and influence with both military and civilian heavyweights to simplify and accelerate the missile programs: Atlas, Titan, and finally, Minuteman. After Sputnik, the administration created NASA to run the civilian aspects of space development and put the Advanced Research Projects Agency in charge of what was left of military space programs. Ultimately, though, much of the control of those came back to the Air Force.

The Moon

A trip to the moon had long been a dream of fiction writers and rocket enthusiasts, but it took the superpower competition to bring the necessary resources to bear. Soon after his inauguration, after the national humiliation of Sputnik and then the Bay of Pigs, President Kennedy sought to restore some of the lost prestige by committing to a manned moon landing before the end of the decade. He proclaimed its peaceful intent, and thus the task fell to NASA. It was clear enough that many of the technologies involved would have military implications whatever the intent, and many of the most prominent participants were military people. Kennedy did not get to see American astronauts land on the moon in 1969, but it came at an opportune time because of the diminishing prestige the United States was suffering because of Vietnam.

John von Neumann, 1903–1957

John von Neumann was born in Hungary in 1903. His wealthy family provided him with a secure environment, including private tutors to supplement his formal education. He showed his mathematical genius before he was 10 and advanced so rapidly that he won his PhD when he was 23. He taught for a time in Germany, but his expertise was so early recognized that he was one of the first cadres hired at Princeton's new Institute of Advanced Studies—along with Albert Einstein. From the early 1930s to the end of his life, he maintained his professorship there. Neumann used his genius in ways vital to massive retaliation. One was his work in the Manhattan District program creating the first atom bombs—he witnessed the world's first nuclear explosion in New Mexico in 1945. He was an originator of the implosion technology of the Nagasaki weapon and a major developer of the electronic computer. Both were essential to the development of ballistic missiles and the fusion weapons that armed them. They have helped to underwrite deterrence ever since. A member of the Atomic Energy Commission, he helped develop national nuclear and defense policy.

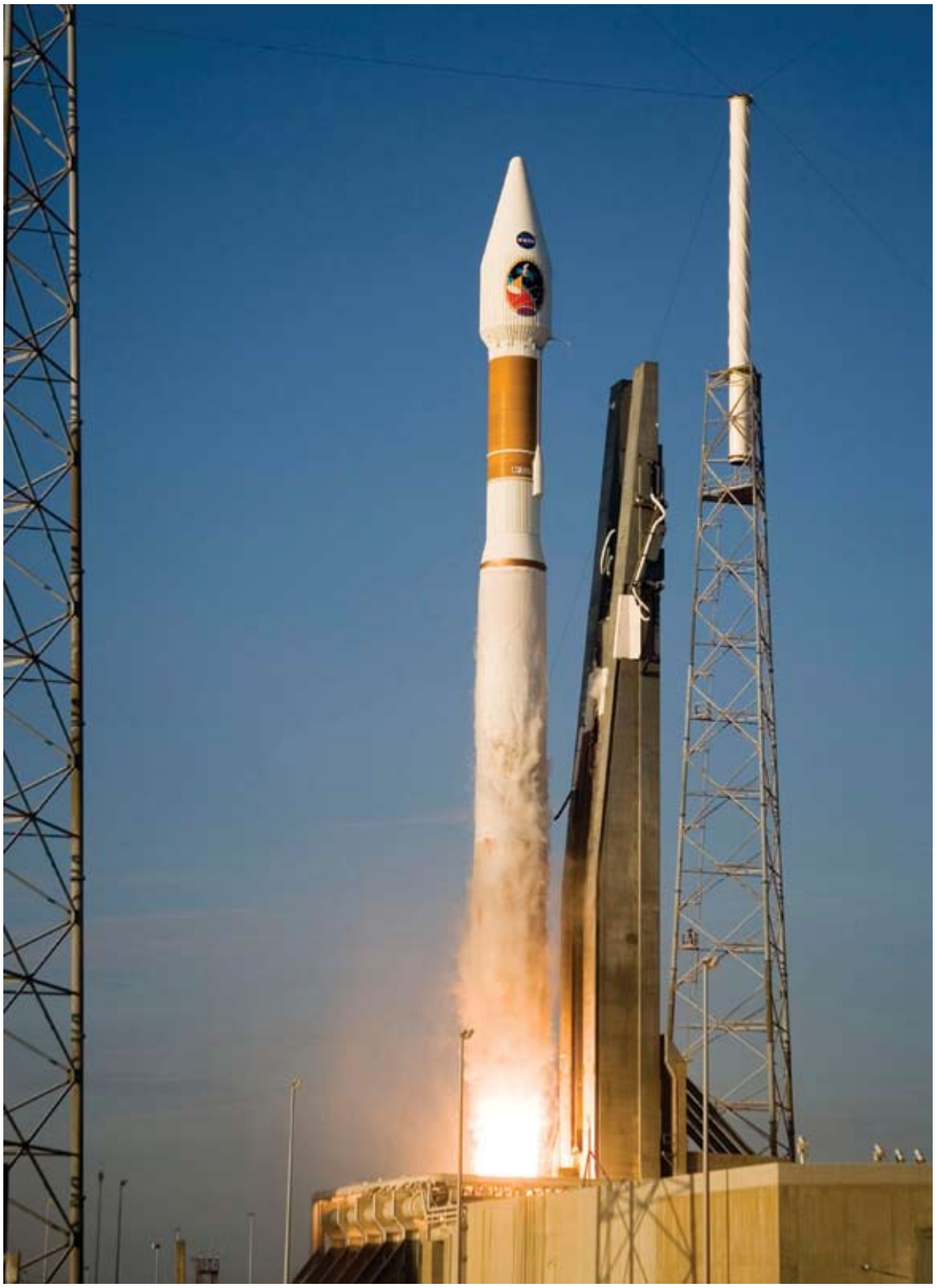

Figure 62. Atlas launch—early versions of the Atlas booster launched the Mercury capsules that pioneered the US manned space program, 1958–1962. (NASA photo)

Figure 63. Gen Bernard Schriever, USAF, 1910–2005. (USAF photo)

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Figure 64. Vietnam map. (Courtesy of History Department, US Military Academy)

Chapter 26

The Vietnam War: Air War over the North

Farmgate

The initial American support for the anticommunist forces in Vietnam came during the first Truman administration, when the Americans supported the French in their desire to restore their colony in Vietnam. From then until 1954, the logistical and diplomatic support was about as far as it went. However, by the early 1960s, the United States was sending military advisers to Vietnam to help against the Viet Cong, and sometimes they engaged in combat. In the summer of 1964, the situation in South Vietnam was rapidly worsening. During August, the United States charged that the North Vietnamese had attacked two US warships cruising in international waters. At the very least, the reports were exaggerated, and they were used to justify escalation through air attacks on naval installations on the Vietnamese shore.

Rolling Thunder

In reaction to an attack on a US barrack in Pleiku, South Vietnam, President Johnson ordered air attacks on North Vietnam under the title of "Rolling Thunder." But the Washington authorities were to control tempo and target choice. Said to be in accord with the theories on coercion by Prof. Thomas Schelling and the experience in the Cuban missile crisis, the target set and pace were expanded only gradually. Apparently, the memory of the Chinese communist intervention in Korea was still fresh. In any event, the results of Rolling Thunder were not that impressive, and the political situation in the south continued to deteriorate. President Johnson therefore decided to escalate by deploying US ground troops to join the fight. Meanwhile, the air campaign continued.

The Air-to-Air Battle

By far the greater part of American aircraft losses over the north was to the ground-based air defenses. But the air-to-air battle was disappointing for it appeared that the kill ratios were not as impressive as they had been in Korea. A part of this was due to the fact that both the Chinese and Soviet airmen had matured in the intervening years. Too, the air defense mission was inherently easier for the enemy than the attackers—the North Vietnamese were not burdened with bomb loads and enough fuel to get back to distant bases or tankers. Their aircraft were more optimized for the turning air fight than were the American, and their training time had not been partially used up preparing for ground strikes. The North Vietnamese got important technical and training help from their Soviet and Chinese allies. Because of the slow buildup of the attack, the Soviets enjoyed plenty of time to help prepare the defenses. On the American side, the F-4 was originally designed for fleet defense against nonmaneuvering targets. It had poor

rearward visibility, and its engines emitted smoke useful to MiG pilots in spotting the F-4 first. Its missiles were unreliable because solid-state electronics were still in their infancy. The radar missile lost a part of its advantage because of the rules of engagement that required visual identification of targets. The infrared missile at that stage could only be fired within a small cone behind the enemy target. Too, American air-to-air training since Korea had been limited by flying safety regulations and by the necessity for low-level, high-speed nuclear attack training. The F-105 suffered many of the same limitations as the F-4, and besides, it was more often burdened with bombs than was the Phantom. The Navy F-8 units had better kill ratios than the USAF, in part because they trained only for the air fighting. In the end, though, the kill ratio was favorable for both services, though better for the Navy than the USAF.

The Air-to-Ground Battle

The enemy developed a competent integrated air-defense system of fighters, artillery, missiles, and a fine command and control system. Some US tactics and electronic countermeasures helped, but in spite of the danger, the strike forces always got through. The target restrictions were also a handicap, and the inclusion of supporting planes in the formations limited weight of attack. There were few, if any, strategic targets in the north because the required supply and manufacturing were almost entirely done in the USSR and China where they could not be attacked. The North Vietnamese did suffer mightily, but their motivation was so strong and their policing so competent that they did not fold.

Linebacker I

By Easter 1972, the United States had withdrawn the bulk of its ground forces from Vietnam. The communists decided to transition to Mao Tse-tung's final phase: the conventional attack. They marched southward in Military Regions I and III, aiming to cause the final collapse of the South Vietnamese. President Nixon decided to redeploy major air forces to halt them, and now aided by the precision of laser-guided bombs, the American air forces were able to help the South Vietnamese enough to defeat the invasion. It seemed that peace might be near, but the South's leadership was not as cooperative as we hoped, and the North Vietnamese seemed to be reversing course. Negotiations in Paris seemed unpromising.

Linebacker II

Congress was in its Christmas recess when President Nixon decided to renew the offensive. For the first time, the United States sent its B-52s to Hanoi and mined Haiphong Harbor. Fifteen B-52s were lost (out of 700-odd sorties), but the North Vietnamese decided to reverse course again. Airmen were quick to claim that airpower had won the war when peace came and the United States recovered her prisoners. Others have argued that the North had achieved most of its objectives, and America could not stand very many victories like that.

Capt Merlyn Dethlefsen, 1934–1987

According to Mike Gilroy, Capt Merlyn Dethlefsen's F-105 backseater, "Merle" was not a "fun" guy. He started life during the Great Depression in Iowa and entered the USAF at a young age. Gilroy described him as taciturn, a born-again Christian, and not at all the typical fighter pilot. Both were experienced warriors when on 10 March 1967, they were a part of a Wild Weasel flight. It was to suppress the antiaircraft defenses surrounding the Thai Nguyen Steel Plant long enough for the second strike force that day to make its bomb run relatively unmolested. The enemy was ready, and when the flight rolled in on them, the North Vietnamese shot down the leader and knocked his wing man out of the fight. Merle therefore assumed leadership of the flight with only one other F-105 remaining with him. On their first pass at the target, they were hit with ground fire and then by a MiG-21, causing additional damage. It is axiomatic that making a second pass on a defended target is hazardous to your health, but Dethlefsen led the two ships through four separate passes, damaging the defenses and thus helping protect the following strike force and also the one scheduled for the next day. His aircraft was so badly damaged that it could not fly the whole 500 miles to Takhli AB, but rather recovered at Udorn Royal Thai Air Force Base. Patched up, he flew it home the next day. Both Dethlefsen and Gilroy survived, and the former received the Medal of Honor from President Johnson in 1968. Merle retired as a colonel but did not live long. He died at the age of 53 and is buried at Arlington.

Figure 65. Vietnamese MiG-21. (National Museum of the USAF photo)

Figure 66. Medal of Honor Winner Lance Sijan. (USAF photo)

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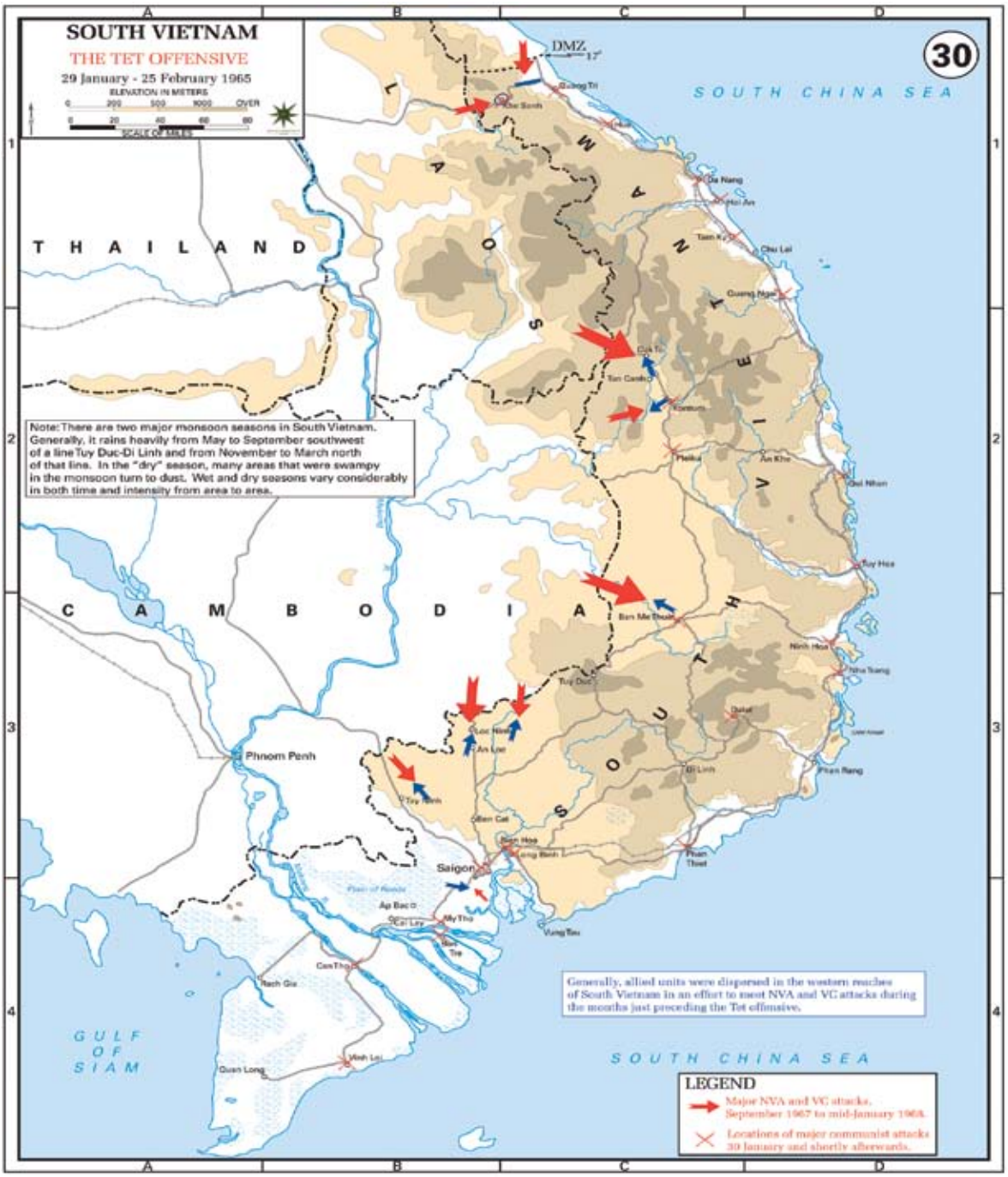

Figure 67. South Vietnam (Tet Offensive) map. (Courtesy of History Department, US Military Academy)

Chapter 27

The Vietnam War: Air War over the South

The Air War in the South

The South Vietnamese air force was gradually built up with leftover World War II equipment inherited from the French and supplied from the United States. In the mid-1960s, the USAF and USN began to deploy air forces to the theater. Carriers served on "Yankee" station up north and occasionally on "Dixie" in the south. The Marines based air units in Military Region I, and the USAF based its flyers at many bases in the south and in Thailand. Also, transport units from offshore islands added airlift. The United States enjoyed complete air superiority above about 3,000 feet, but ground fire and air base attacks took a substantial toll. The allied forces were heavily supplied with both lift and close air support, and there were few complaints about either. But there were many complaints about interdiction because the operations against the Ho Chi Minh trail were never able to shut down the enemy supply line. USAF strategic bombers operated over Vietnam from Guam and U-Tapao, Thailand. Air Force air units in Vietnam were controlled by Seventh Air Force at Saigon. Those involved in the North were directed from Pacific Command in Hawaii. Unity of command over the theater's airpower was never achieved. Still, when the communists gambled on the Tet Offensive of 1968, they were badly bashed by both air and ground forces. The Viet Cong, especially, was decimated for the rest of the war. However, the United States lost its will to continue and proclaimed a bombing halt. President Johnson opted out of the election of 1968.

The Drawdown

The Republicans won in November, but despite the bombing halt and the beginning of force drawdown, the fighting continued in the South and with air units along the Ho Chi Minh Trail to reduce enemy combat potential in the South. The parties began negotiations in Paris, with the United States hoping to preserve a noncommunist regime in the South. By 1972, most of the US ground forces and many of the air units were gone.

Linebacker I

The communists decided that it was time for the final thrust, and this time the brunt would be borne by the North Vietnamese army. It mounted two conventional offensives, even including tanks, one across the demilitarized zone south into Military Region I and the other out of Cambodia driving toward Saigon. The American Soldiers were gone, so the South's defense depended upon its army (ARVN). President Nixon decided to redeploy airpower to assist it. The North Vietnamese had no air cover. Both offensives were close run things. However, some ARVN units stood up well, and gradually airpower began to add important effects. In the north, the invaders had to cross several rivers, and the new

laser-guided bombs were so effective at dropping bridges that the interdiction results were dramatic and the enemy turned back. In the south, the climax came in the Battle of An Loc. The enemy's infrared portable antiaircraft missiles were becoming a major factor against low-flying aircraft, especially the "slow-movers." Three C-130 and two C-123 airlifters were shot down during the battle, and heavy enemy fire caused the loss of much of the dropped cargo. Still, this time the South Vietnamese prevailed. But a presidential election was looming in the United States, and the antiwar movement was alive and well.

Linebacker II

The North Vietnamese spent the summer and fall of 1972 regrouping, perhaps hoping that they would be dealing with a new and more pliable American administration after the election. But the United States and the Soviet Union agreed to the SALT I Treaty that summer, and Secretary of State Henry Kissinger and President Nixon both made trips to communist China. The North Vietnamese position seemed to be weakening. Still the negotiations went on in Paris sporadically with no result. The South Vietnamese were dragging their feet too, fearing their fate in the case of a "peace" settlement. However, Nixon won the election with a surprising majority, and as Christmas approached, he decided on another aerial offensive to get things moving. The battle was a fierce one, and both sides suffered. However, the negotiations resumed, and "peace" was concluded in January 1973. The United States got her prisoners back (except for those like Lance Sijan who died in captivity), and the North Vietnamese seemed to come away stronger than they had been—but they did not immediately go back to another conventional invasion. The United States still had airpower in Thailand and off shore and could reinforce it quickly from the homeland. But presently, the Watergate scandal came to light, and President Nixon resigned in the summer of 1974. A Linebacker III was now an improbable option.

The Fall of Saigon

The North Vietnamese marched south again in the spring of 1975. This time there was to be no An Loc, and they rolled up to Saigon with fearsome speed. Obviously the fight was gone out of both the South Vietnamese army and their air force. US airpower in Thailand and on the carriers was limited to the rescue of the remaining Americans and the South Vietnamese allies most vulnerable to the communists. It was largely a pragmatic response, and the final phases were achieved by helicopters taking survivors out to ships off shore. It was an impressive achievement, but as Churchill pointed out long before, evacuations never win wars.

Medal of Honor Winner
SSgt William H. Pitsenbarger, 1944–1966

On the day after Easter 1966, Ohio's William "Pits" Pitsenbarger died in the jungle east of Saigon. As a pararescueman (PJ), he was there not to kill but to save lives. He was born just before the end of World War II and worked for a time after graduating high school as a stock man. He joined the Air Force and went to Texas for basic training in 1963. Then Pits went through a tough agenda of training: parachuting, emergency medical treatment, jungle survival, firefighting, and water survival. He endured it all and went to Australia in support of the early space programs. In mid-1965, he went on to Bien Hoa, Vietnam, as a PJ in an HH-53 rescue helicopter. An Army force was pursuing a Viet Cong battalion when the enemy surrounded one of its companies, imposing heavy casualties. As Army "Dustoff" helicopters could not hoist the wounded out, the HH-53s were called from Bien Hoa to help evacuate the seriously wounded. Pitsenbarger volunteered, and he went down on the ground to tend to the hurt and get them loaded for hoisting. He remained below while the HH-53s went to a safe unloading site. On the ground the situation worsened. Pits remained tending the wounded, who were waiting for the HH-53s to make repeated trips. Between sorties, he went out to the perimeter to gather ammunition from the dead. He gave his own pistol to a Soldier unable to use a rifle. A battle-damaged HH-53 had to jettison its cable and stretcher. Pits climbed a tree under fire to recover the stretcher to be ready for more sorties. When they found his body the next day, he had been hit four times. He had a rifle in one hand and a medical kit in the other. He was awarded a posthumous Medal of Honor and a promotion to staff sergeant in 2000.

Figure 68. A C-130E making a low-altitude parachute extraction in Vietnam. (USAF photo)

Figure 69. Medal of Honor winner SSgt William Pitsenbarger. (USAF photo)

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Chapter 28

Equality, Effectiveness, and Airpower

Washington, Hamilton, and Jefferson

George Washington and Alexander Hamilton were combat veterans, and both proposed the creation of a military academy for the sake of military effectiveness. They did not get one, but Thomas Jefferson did by pushing through Congress the necessary legislation for West Point. Jefferson believed that the elite of the Federalist Party was gaining too much power in the military and that a military academy would bring more equality into the Army.

African Americans and Women at War before 1903

Women have always been a part of war—in the earliest years as unofficial camp followers. Later they served in various auxiliary roles and in uniform during the world wars. Up until the 1990s, they got into combat only inadvertently. On the other hand, blacks have fought as uniformed Soldiers in all our wars, though generally in segregated units until the 1940s—usually officered by whites. Often used in menial labor, they nonetheless established a creditable combat record from the beginning. That was an important reason why full citizenship could no longer be denied after 1945.

Blacks and American Airpower

On the eve of World War II, the romance of aviation was huge, and most Americans thought of pilots as the military elite. The political power of black Americans was increasing, and with the assistance of Eleanor Roosevelt, a (segregated) pilot training unit was established at Tuskegee, Alabama. Its commander was Col Noel Parrish, a white, and numerous blacks succeeded in getting their wings. The unit initially went into combat led by Benjamin Davis as the 99th Pursuit Squadron flying P-40s. The squadron was assigned to the 33rd Pursuit Group commanded by white Lt Col William Momyer. The squadron was met with skepticism, and the lack of seasoned African American flight commanders limited what could be done. However, the squadron ultimately switched to P-51 Mustangs, fought through the Italian campaign, and came home with an impressive record. Both Momyer and Davis went on to the flag ranks, and both wound up with four stars. In 1948 President Truman ordered the end of segregation of the armed forces, and blacks increasingly appeared in all Air Force aircrew and technical specialties.

Women and American Airpower

As the records of Marjorie Stinson, Amelia Earhart, and Jacqueline Cochran have demonstrated, females have been in on the evolution of aviation from the outset, though it took longer for them to arrive at full combat status than blacks. One may wonder why

because certainly women always had better access to wealth and power than did blacks, and they are not a minority in the population. Perhaps there was less unity among women as to the desire to participate in combat; possibly, the parent culture was not inclined to use them for the nasty work of fighting. In any case, in all our wars women have brought special talents to bear. They did so in the Civil War mostly in the role of caregiver. In World War I, their talents were used in the services for both nursing and clerical work, in and out of uniform. By World War II, many more were in uniform in all the services, though they were in noncombat roles. Some did become prisoners of war when the Japanese conquered the Philippines (their treatment was not as bad as it was for the male POWs). Females got substantial flying experience in the Women's Air Force Service Pilots (WASP), ferrying aircraft around the United States and thus releasing more males for combat. Great numbers of women worked in war industries in the 1940s. In 1948 legislation regularized the role of women in the military, but their number was capped at 2 percent of the whole, their ranks were limited to lieutenant colonel and below, they could not be married, and they were explicitly excluded from a combat role. Though Air Force women worked in many different kinds of units, they were administratively in segregated squadrons officered by females until after Vietnam.

In the 1960s and 1970s, many technological, cultural, and political factors combined to radically change the role of women in the Air Force and the other services. The caps on numbers and ranks were removed, and from the 1970s onward, women began to join the ranks of the generals. The segregated units were ended, and women could thenceforth be commanded by and command men. They were increasingly admitted to the flying schools of all the services in the 1970s but were still legally excluded from combat flying. In 1976 they were admitted to the service academies. The integration of women was not as violent as had been that of blacks, but it was not trouble free. There was a huge sexual assault scandal at the naval aviators' Tailhook Convention in 1991, and in its wake Congress repealed the 1948 laws, thus permitting women to be assigned to combat aircraft and ships. In their initial experiences in combat, they have performed well and even heroically, winning combat decorations and bringing back badly shot up aircraft. In the Air Force, women have reached the rank of lieutenant general, and currently an Army woman is a four-star general.

Diversity and Effectiveness

America has been reaching for the ideal of "all men are created equal" ever since 1776. History has witnessed some armed forces more diverse than their enemies go down to defeat—even disaster. But they were not democracies and certainly were far in the past. In a twenty-first-century democratic society, the talents required in effective armed forces are far more diverse than they were for the Spartans of antiquity. Thus, there are technical imperatives for recruiting a very wide array of Airmen. But it seems much more crucial than that. Without public support in a modern democratic society, no military can ever be effective, and that too makes inclusiveness a requirement.

Gen Benjamin Davis, Jr., 1912–2002

Benjamin Davis was the fourth black graduate from West Point and the only one in the class of 1936. Though he had been silenced all four years and never had a roommate, he graduated high in his class. He qualified as an infantry officer before going to Tuskegee Institute in Alabama to teach. The African American pilot training program was started while he was there, and he was one of the first five to win wings. He shipped out to Africa as the commander of the 99th Pursuit Squadron and fought there, over Sicily and Italy, and into Germany. His unit was credited with shooting down three of the first five German jets destroyed in combat. After the war, Davis commanded at Lockbourne AFB, Ohio, among other assignments. Many whites served there peacefully under African Americans, and valuable precedents were set. He went to war again in Korea to command an F-86 wing. During Vietnam, Davis commanded the Thirteenth Air Force in the Philippines and later was the deputy commander of US Strike Command. He retired a lieutenant general, was promoted to general on the retired list, and like Thomas Jefferson, died on the 4th of July.

Figure 70. Col Benjamin Davis, Jr., in World War II. (USAF photo)

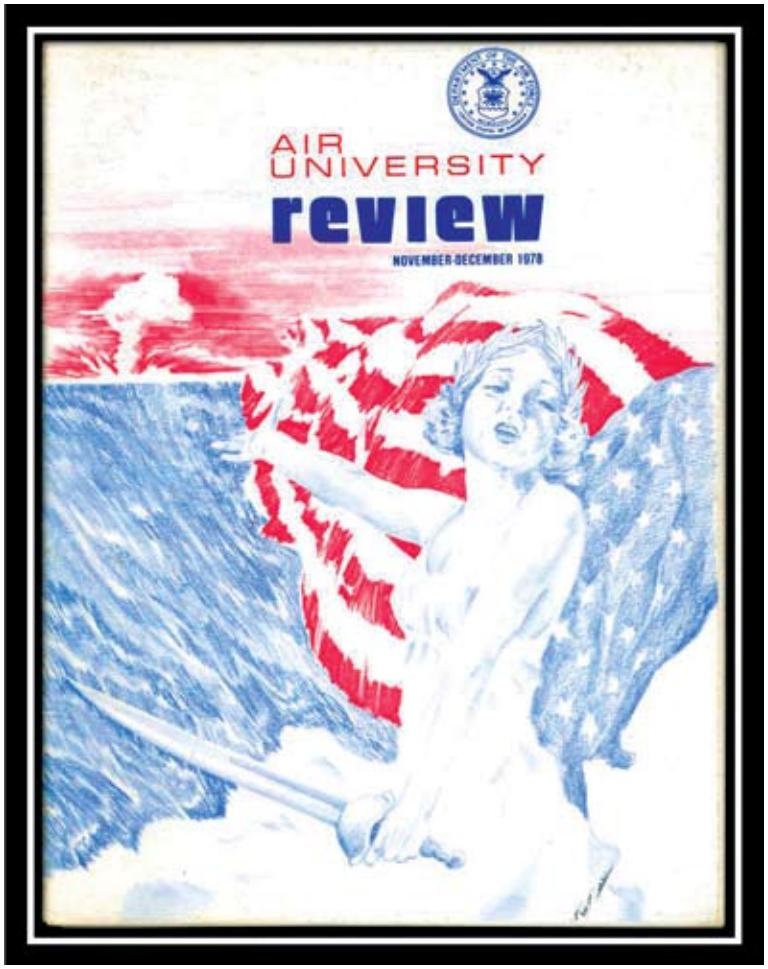

Figure 71. 1978 cover of a USAF professional journal exploring the women-in-combat issue.

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Chapter 29

The Age of Nuclear Parity

Roots of Flexible Response

President Eisenhower recognized early in his first administration that the US nuclear hegemony could not last. During his years in office, both Gens Maxwell Taylor and Lauris Norstad wrote or spoke that nuclear power would not suffice much longer. The president had to have more options than the choice between surrender and nuclear annihilation. Thus, the Kennedy administration moved to rebuild both conventional and special operations forces. Meanwhile, the Soviets were more or less bypassing the nuclear bomber age and focusing on building an ICBM force.

Satellite Reconnaissance

Worldwide satellite reconnaissance became increasingly practical and capable as the 1960s wore on. This contributed to the development of a stable nuclear standoff because it removed some of the uncertainty about adversary capability and intentions. The Nuclear Test Ban and Outer Space Treaties were concluded, which also contributed to some confidence. The fact that nuclear bombs were not used in either Korea or Vietnam added to that confidence. The United States and the USSR agreed to the SALT I Treaty in 1972. As both the USSR and the People's Republic of China cooperated in helping to end the Vietnam War, *détente* seemed to be dawning.

March of ICBM Technology

From 1960 onward, ICBMs were steadily improved and made more secure. Nuclear submarines went to sea in the mid-1950s, and the Polaris nuclear missile capability was added to them starting in the 1960s, creating an invulnerable strike capability, although it could not be as accurate as land-based systems seemed to be. Land-based missiles multiplied in number and were put in underground silos that seemed to make them invulnerable to all but a direct hit by a nuclear weapon. Meanwhile, solid rocket propellant was perfected, which made near-instantaneous launch possible. Then both sides developed multiple independently targeted reentry vehicles (MIRV) with as many as 12 deadly weapons in a single missile. In America, a theory was developed called the "second strike" capability. The notion was that so many nearly invulnerable targets and warheads were available that no matter how effective a surprise first nuclear strike, the victim would always have enough second-strike potency to utterly destroy the aggressor. That meant nuclear stability, and anything that threatened the second-strike capability of either side was deemed destabilizing. (Some argued that land-based MIRVs were

conducive to a first strike because one could get 10 warheads with one missile that way. The START Treaty of 1993 outlawed MIRVs on land-based ICBMs, but it was not in force as of June 2009.) The age of nuclear parity had arrived.

Reaction to Vietnam

Nuclear weapons did not win the Korean War. Nor did they win the Vietnam struggle. The rising nuclear standoff seemed to have done no more than keep the limited wars limited. Vietnam was one of America's worst military experiences, and there were bound to be many reactions to it. Many have written that the military services were so revolted by the experience that they refused to learn the potential lessons on irregular warfare. Another reaction was to reconsider conventional war on the northern European plain: NATO against the USSR. In the mid-1970s, the Army developed a notion of "active defense," which did not include much consideration of airpower; the focus was on defense forward at the "inner German" border. The hope was to win the initial battle. However, that did not do much to compensate for much larger Warsaw Pact numbers. It did attempt to compensate somewhat through the reequipping of ground forces with more potent weaponry, especially in reaction to the outcome of the Arab-Israeli War of 1973. There, technologies demonstrated that the defensive power of the infantry was much improved. However, the active defense scheme did not much appreciate the great changes impending in the aerial dimension of conventional war—the coming of precision-guided munitions that promised huge economies in aerial attack because of their accuracy and the capability to hit a point target from much higher altitudes. Both electro-optical and laser-guided weapons had been used but had not received a great deal of public notice.

The Air Force was reacting to its frustrations by developing new aircraft: one optimized for air-to-air fight (F-15), another for air-to-ground battle (A-10), and one that could swing from one kind of fight to the other (F-16). At the same time, the Air Force overcame the limitations that Vietnam had revealed in its air-to-air missiles and made new advances in precision air-to-ground bombs and missiles.

Clarence "Kelly" Johnson, 1910–1990

Kelly Johnson was the founder and long-time leader of the Lockheed "Skunk Works." He was born and brought up in Michigan, where his schoolmates gave him the moniker "Clara" until they tripped him and broke his leg. They changed their nickname for Johnson to "Kelly," which he retained until he died. Johnson worked his way through college at the University of Michigan and received his bachelor's degree in 1932 and a master's the next year. He was hired by Lockheed in 1933 and was instrumental in the design of several pre–World War II aircraft like the Hudson and the P-38, the latter being the first 400-mph fighter. Responding to the 1943 Army Air Forces' need for a jet fighter, he established a dedicated shop at Lockheed that was highly secret and designed and built the P-80 in record time. It came to be known as the Skunk Works. The P-80 flew until the late 1950s and saw much combat in Korea. In 1955 the Air Force wanted an extremely high-altitude airplane that could fly above the Soviet defenses to photograph sites thought critical to US national defense. In a matter of months, Johnson had the U-2 flying, although he knew that the Soviets would bring it down sooner or later. Before they did so, Johnson was working on the designs of the SR-71, which achieved survivability through speed and altitude and flew until the 1990s. After he turned over the Skunk Works to Ben Rich, it proceeded with projects that resulted in the F-117 stealth bomber, the F-22, and the new F-35. Perhaps the most honored aircraft designer in US history, Johnson received awards personally from at least two presidents. He died in 1990 and is buried in Los Angeles.

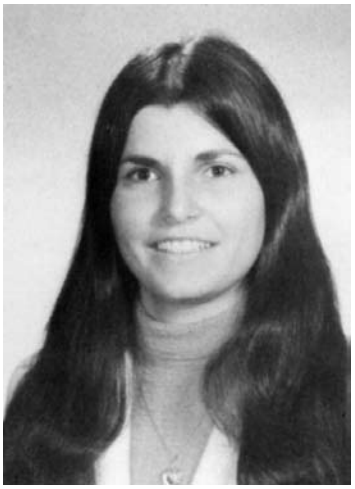

Figure 72. Capt Carmen Lucci, first female flight test engineer killed on a test mission, Edwards AFB, 1981. (USAF photo)

Figure 73. F-15 Eagle. (Air National Guard photo by TSgt Jeff Trumble)

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Chapter 30

The End of the Cold War

Soviet Foreign Policy

In the late 1970s, the USSR was moving toward a more active foreign policy that served as a stimulant to innovative thinking in the US armed services. The Soviets had long been involved in Afghanistan and by 1979 intervened militarily to support the shaky communist regime. Neither Russia nor the British had ever found combat in that country a walk in the park, and this time it was no easier. The Soviets had the advantage of airpower, but the United States, Pakistan, and Saudi Arabia provided the mujahedeen with military equipment and especially with man-portable infrared ground-to-air missiles. The USSR had found its own Vietnam. It suffered for most of the decade before deciding to withdraw.

Air/Land Battle and Follow-on Forces Attack

In America, military leaders returned to thinking about a NATO war and envisioned an "active defense" whereby the first battle might be won, but NATO defenses would be left in a worn condition to meet the oncoming Warsaw Pact second echelon, still fresh. US Army strategists conceived the Air/Land Battle concept that envisioned the use of long-range firepower against follow-on forces to assure that they too would be weakened for any second battle. However, Air/Land Battle focused things at the corps level, and that seemed to be a departure from the Airmen's doctrine of centralized control, which enabled focusing airpower at the most vital target. So the NATO doctrine became Follow-on Forces Attack (FOFA) to be conducted mostly by airpower, and the focus was to be at the theater rather than the corps level. Much of this was done to reduce any tendency to initiate the "first use" of nuclear weapons to halt the charge.

Airpower Changes

NATO forces thought they would be outnumbered in the air as well as on the ground. The USAF therefore concentrated on getting as much combat effect out of each sortie as possible. As always, the air superiority battle had first priority. The answers included the new F-15C fighter equipped with upgraded all-aspect infrared missiles and a new radar weapon called the advanced medium-range air-to-air missile with an autonomous mode of operation. Too, the aircraft was equipped with an advanced radar that could be controlled by a one-man aircrew. Killing the maximum number of targets per sortie was a driver for the air-to-ground battle as well. The excellence of the Warsaw Pact mobile ground defenses made this a daunting task. One thrust was to work toward one kill per unitary weapon, avoiding the waste and dangers of rounds missing their targets. The Maverick missile was one example—with models using infrared, optical, or laser guidance. The Air Force continued developing laser-guided bombs so that more could be carried

on each flight and delivery from increased standoff ranges was possible. It also fielded infrared and television bombs with rocket motors and autopilots for standoff release even from levels below the enemy radar coverage. The hordes of Warsaw Pact tanks made it imperative to achieve multiple kills per pass. The Airmen conceived cluster munitions loaded with mines that were difficult to sweep and had alternative modes of achieving their damage. Perhaps the most formidable against tank formations was the sensor-fused weapon. A NATO aircraft was to launch it over a formation of vehicles. At a given altitude, the container opened to release a host of spinning submunitions with infrared sensors rapidly scanning the surface below. When one of them spotted a hot vehicle engine, it triggered a shaped charge that penetrated the target from above (where the armor plate is usually the thinnest). Added to those developments, President Reagan proposed the Strategic Defense Initiative, and that promised to be expensive indeed. The Soviet forces knew quite a bit about all these ideas and were put to a good deal of trouble and expense trying to build countermeasures. But few in the West understood the stress the USSR was under, and practically no one predicted the early fall of the communist empire.

Reorganization

Meanwhile, many Americans were distressed with the lack of unified control of airpower in Vietnam and with interservice rivalry. Congress decided to do something about it, and the result was the Goldwater-Nichols Act of 1986. It more tightly confined the service chiefs to the “train and equip” function, strengthened the powers of the chairman of the Joint Chiefs of Staff and the combatant commanders, and provided an option under them of a joint forces air component commander. Those changes were substantial enough, and few understood that greater ones were on the near horizon. Then the Soviet empire crumbled.

Dr. Robert F. Futrell, 1917–1999

As the Cold War was ending in 1989, Dr. Robert F. Futrell published the second volume of his encyclopedic *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force*. It is based on a lifetime of study and writing on the history of the air arm, and if that field has a grandfather, Futrell would be a leading candidate. The work serves as a major pillar for air theory and doctrine. It arises from many other authoritative works such as his contributions to the history of the USAAF in World War II, his definitive history of the USAF in the Korean War, and another on the beginnings of the air effort in Vietnam. Futrell earned his bachelor's degree from the University of Mississippi and served as a historical officer in the Army Air Forces through World War II. That included work at the AAF Tactical Center in Orlando and on the staff of Far East Air Forces in the Philippines. Dr. Futrell completed his doctorate at Vanderbilt University after the war, then joined the Air Force History Division in Washington, DC, and later moved with it to Maxwell AFB. He was long a leading authority as a professor of military history at Air University, and he retired to emeritus status in 1974. He continued to reside nearby for the rest of his life and willingly helped those who followed in his footsteps with authoritative advice. Then–Lt Gen Ronald Fogleman described Dr. Futrell as the "dean of airpower historians" at the Air Force Academy Military History Symposium in 1988. Insofar as history is the factual basis of air theory and doctrine, no study can be complete without leaning on Futrell's great work. Dr. Futrell also retired as a lieutenant colonel from the Air Force Reserve.

Figure 74. AF Special Operations Command CV-22. (USAF photo)

Figure 75. TSgt Ben Filek loading the 30mm gun on an AC-130. (USAF photo)

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Figure 76. Desert Storm 1991 map. (CIA map courtesy of University of Texas Libraries, The University of Texas at Austin)

Chapter 31

Desert Storm

Genesis of the War

The world was changing rapidly because of the fall of the Berlin Wall. Perhaps Saddam Hussein did not fully appreciate that the fall of his former patron reduced his safety margin. He sought to repair the economic weakness incurred by his long war against Iran by the annexation of Kuwait in August 1990. He got the idea that the West would not intervene from the US ambassador in Iraq, but the vital interests of America clearly declared from the time of the Carter administration were threatened. The United States could not tolerate the threat to the West's oil sources.

Desert Shield

Saddam did not seem to understand the ancient principle that the sooner you strike, the less force is required. He sat on his hands, allowing the coalition many months to conduct needed diplomacy and to get forces in place in the Middle East. The air forces had a top priority for deployment, and by January 1991 all was ready.

Instant Thunder

The responsibility for operational campaign planning formally belonged to the US Central Command. Because of the sparce Saudi population, the initial deployment had to be defensive. However, the commander, Gen Norman Schwarzkopf, was concerned about the possible execution of some western hostages under Iraqi control. Thus, he called for an offensive option from the Air Staff to meet that contingency. It fell to the Air Staff's Col John Warden to provide an initial draft, which he called Instant Thunder to contrast it with the gradualism of the Rolling Thunder campaign in Vietnam. It called for a massive attack at the center of Iraqi power, especially on its leadership in Baghdad. Lt Gen Charles A. "Chuck" Horner, the CENTCOM air commander, was deployed. Horner decided the strategy was not enough, and his planners added other features for defense, gaining command of the air, and preparing the battlefield.

Desert Storm

There had been additional deployments in November 1990 to strengthen the attack and make possible an end-around assault. By January, a huge air fleet was on hand. Although the initial assault did not bring about Hussein's "instant" collapse, there was so much airpower at hand that parallel (as opposed to sequential) attack was possible, and from the outset coalition air forces assaulted many targets at the center and on the periphery. Precision weapons and the infant network-centric warfare system greatly

facilitated the attack. The air war went on for several weeks, but when the ground assault was launched it lasted only four days.

Outcomes

The objective was to drive the Iraqis out of Kuwait, and that was clearly achieved in remarkably short time with relatively few combat casualties. A significant number of those were caused by Scud missiles, and Airmen launched a futile hunt for those weapons. Otherwise, the air attack was one of the more successful in history. The Iraqi air force was put out of business almost instantly, the ground elements of the air defense were quickly smashed, the battlefield preparation phase greatly weakened the Iraqi ground forces, and the mayhem was so one-sided that the coalition accepted a cease-fire after only four days.

Implications

The combination of the stealth of the F-117 with the precision of its laser-guided bombs targeted with infrared systems suggested that the air warfare pendulum was swinging back in favor of the offensive. The rapid defeat of the Iraqi air force seemed to revalidate the old notion that the loss of air superiority over one's homeland is tantamount to defeat. Military leaders argued about exactly what caused Saddam to throw in the towel. Some Airmen widely proclaimed it was the dawn of a new style of warfare in which at least some efforts could be "air-alone" campaigns. There was much opposition to that argument, for many argued that the battlefield preparation effort and the surprise end-around ground campaign were really the decisive elements. Others argued that diplomacy was decisive in that the durability of the coalition and the lack of Russian support for her former client were the vital elements. Some observed that the opposition was so weak that *any* kind of attack would have caused the collapse. As always, the principle that "victory has a thousand fathers and defeat is an orphan" applied.

Maj Paul J. Weaver, 1956–1991

Paul Weaver graduated from the Air Force Academy in 1979. By the beginning of 1991, he was an aircraft commander in the 16th Special Operations Squadron, based at Hurlburt Field in west Florida. But his AC-130 crew and others flew to the Middle East to help with the battle against Saddam Hussein in Desert Storm. Iraq launched a desperate attack toward the Saudi town of al-Khafji on 29 January 1991, and the joint force commander directed that the local commanders depend on their own ground troops and airpower to halt the multi-division offensive. During daylight, the air commander, Lt Gen Chuck Horner, sent a steady stream of jet fighters to the battle area to stem the tide. The object was to halt the enemy while avoiding the interruption of the Army's "left hook" around the western flank of the Iraqi defenders. During darkness he depended on AC-130 gunships for the same purpose. Three AC-130s were scheduled to help the Marines on the ground during the early morning hours of 31 January. The first two had finished their attacks and returned to base when Major Weaver and his 14-man crew maintained the pressure during the last hours of darkness. He was about to return to base when he got a call from the Marine ground controller asking for the destruction of a troublesome missile battery. The gunships had already administered a tough blow to the invaders, and the crew knew that daylight was coming. Despite the danger, they remained to destroy the enemy missileers. However, the dawn enabled an Iraqi with a man-portable infrared missile to spot them, and he fired. The missile hit, the gunship was crippled, and it crashed in the water off shore. No one survived. Once his body was recovered, Major Weaver was returned to the Academy to be buried in its cemetery. The entire crew was awarded posthumous Silver Stars and Purple Hearts.

Figure 77. Fairchild-Republic A-10 "Hog," stalwart of close air support in Desert Storm and after, armed with 30 mm Gatling gun. (USAF photo)

Figure 78. F-111 in Saudi Arabia during Desert Storm. (USAF photo)

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Chapter 32

Remotely Piloted Vehicles

As long as human conflict has existed, people have longed for ways to observe or punish their enemies while minimizing their own risks. The David and Goliath story well illustrates the point. The ultimate fulfillment of this desire would be remotely piloted aircraft that could strike from afar. Various interpretations have asserted that the first use of unmanned vehicles for military purposes were in ancient China, where kites were used to triangulate distances to enemy walls so that tunnels could be dug undermining them. More recently, in the nineteenth century unmanned balloons were used to carry munitions over enemy locations.

What we know as remotely piloted vehicles (RPV) today have much in common with cruise missiles and precision-guided munitions. However, they are intended for repeated use whereas both of the latter are one-shot propositions. Various people exploited ideas for remotely piloted aerial weapons in World War I. One of them was Charles Kettering, who developed a gyroscope-controlled flying bomb for the US Army, but it could not be perfected before the war was over. In any event, with the guidance systems then available there was little hope of hitting anything but huge area targets.

Radio control systems came on in the 1930s that were much superior to the Kettering gyro devices. They found their first applications in building targets for antiaircraft gunners, and they *were* intended for repeated use. Control systems similar to those were used in World War II for the "Weary Willie" program, in which worn-out bombers were controlled from accompanying mother ships and guided into their targets—without much success. However, the German Fritz guided bomb and the US RAZON weapons used radio control more effectively. All those systems were dependent upon line-of-sight communications, and thus the range was still limited. Autonomous RPV guidance was still beyond reach.

The Ryan Aeronautical Company of San Diego, California, was a major factor in the development of RPVs after World War II. Its Firebee I was produced in thousands of copies for both the Navy and the Air Force. The Firebee I was recoverable and was used extensively as a jet-propelled aerial target. Later versions were equipped with reconnaissance cameras and were used extensively over North Vietnam. Ultimately called the Lightning Bugs, they were launched from pylons on a DC-130 mother aircraft and controlled by operators on its crew. After their missions, they were recovered by a helicopter snatching them while they were descending on a parachute. The Lightning Bugs flew more than 3,000 reconnaissance sorties during the Vietnam War, and on average they lasted for three and one-half missions. Some also dropped propaganda leaflets and chaff corridors to ease the penetrations of manned attack aircraft. Toward the end of the 1960s, Ryan developed and demonstrated RPVs with lethal payloads, and though they were successful, they were rendered outdated by new precision-guided munitions.

The withdrawal from Vietnam temporarily diminished the thrust for lethal RPVs, and development slowed. However, increased sensitivity to human casualties in the limited war era, along with the loss of several manned reconnaissance aircraft and ships, con-

tinued the pressure to some extent. Also, the march of technology in miniaturization, computer processing, and satellite communications made the prospects seem more practical and useful. Israel's successful use of RPVs in the Bekaa Valley fighting of 1982 also added new impetus. In the Gulf War of 1991, the United States used RPVs for several applications—reconnaissance, providing decoys for the Iraqi air defenses, and spotting the fall of shot for battleships offshore. By the middle of that decade, the initial versions of the Predator had come on the line. They were first used in combat in the Balkans but only for nonlethal reconnaissance missions.

It was but a small step to equip Predators with laser designators so that they could designate targets for manned aircraft, allowing the latter to stay out of the range of ground defenses. In any case, RPVs are smaller and quieter than fighter-bombers and thus sometimes harder for the enemy to spot and shoot down. This, along with the availability of the laser-guided Hellfire missile that was light enough for the Predator, made it a prime candidate for attacking ground defenses by surprise. The first lethal attacks took place in early 2002, and the capability has been rapidly developed in the Predator and its larger relative, the Reaper, ever since. The benefits of RPVs in these applications are even greater than reducing casualties. Combined with satellite communications, they have made it possible to greatly reduce the logistical support footprint at overseas locations. That has eliminated not only costs but also some frictions with local populations that complicate counterinsurgency operations. All those developments have been at the tactical and operational levels of war. The other massive program has been the fielding of the much larger Global Hawk, which has intercontinental range and performs strategic reconnaissance and also can help with theater-level requirements.

Charles F. Kettering, 1876–1958

Charles F. Kettering was only one of the many people who have been involved in the development of remotely piloted vehicles over the years. But he was truly a remarkable individual, who claimed to be an amateur interested in new ways of doing things. Born on an Ohio farm, he was remembered as an innovator from the earliest days—trying to develop better ways to dig potatoes, for example. He largely put himself through college and graduated from Ohio State University in 1904. He started with the National Cash Register Company in Dayton, Ohio, inventing the electric cash register among other things. He dabbled on the side, creating a new automobile ignition system that led to an electric starter and the creation of DELCO Corporation to exploit them. DELCO ultimately was assimilated by General Motors, and Kettering became the latter's head of research for 27 years. During World War I, under US Army auspices, Kettering invented a "flying bomb" that came to be known as the Kettering Bug. In principle, its concept was similar to that of the German V-1 of World War II. The Bug was controlled in flight by preset gyros and a counter that measured engine revolutions to determine range. Like the V-1, it was not very accurate, and World War I ended before it could be fully developed. Today, both would more likely be described as cruise missiles rather than remotely piloted vehicles.

Figure 79. Kettering Bug, 1918. (USAF photo)

Figure 80. Charles Kettering. (USAF photo)

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Chapter 33

Expeditionary Airpower

Traditional Basing

By 1991, most Airmen would have agreed that the Air Force was traditionally a forward-based force. It had much experience as an expeditionary force in the Southwest Pacific, the Mediterranean, and France in World War II, but that was beyond modern memory. More recent were the early Cold War days when Strategic Air Command units temporarily stood alert at forward bases in England and Africa, but early in the 1950s the United States decided they were too vulnerable there. Thus, they were brought back home, and the Air Force relied on the tanker force to give them the range they needed. After that, basing took on a semipermanent nature. This was possible because the threat was well defined, and we had a pretty solid idea where the battlefields would be if war did come.

Impact of Ending Cold War on Basing

But the Berlin Wall fell, and suddenly the old uncertainty returned. The superpowers no longer acted as restraints on a host of animosities and ambitions of their clients. The nature and locus of the threat could no longer be predicted. Atop that, the American taxpayer had been laboring under the financial burdens of hot and cold war since 1938 and was longing for a peace dividend. The size of the armed forces had to be brought down, and the remainder could be supported much more economically in the homeland than overseas. At home the forces would be centrally based to respond to whatever threat appeared: north, south, east, or west. They would therefore become expeditionary instead of forward-based forces.

Bases of Long-Range Planning

After the Gulf War, the Air Force did not have to look far for a model of an air expeditionary force. That's what the Navy's carrier air groups had always been: forever in the deployment, rest, reconstitution, training workup, and deployment cycle. In part using that model, the Air Force divided its deployable units into 10 air expeditionary forces of two units each. One of the 10 would always be ready for immediate response to threats that appeared, whatever their nature and locus. Some of the others could be brought up to deployable status soon and could become the follow-on forces to reinforce the first units or to meet other threats. Some high-value, low-density forces like airlift and tankers could not easily be fit into the pattern and remained outside the scheme. But the greater part of the operational air force was included.

Reorganization

Meanwhile, immediately after the Gulf War, a massive drawdown commenced. The Air Force had over a million uniformed people at the height of the Vietnam War and was still very large in 1991. But Congress brought it down to a little over 300,000 in the 1990s. A part of this was achieved through consolidation. The Strategic Air Command was abolished, and its surviving bombers became part of a new Air Combat Command, which also contained most of the Tactical Air Command. That left the tankers out, so they were consolidated with the airlifters of the Military Airlift Command to become the Air Mobility Command. The Air Force also reunited research and development functions with the procurement mission by merging the Air Force Systems and Air Force Logistics Commands. It was a time of great turbulence: the 1990s were marked by several crises involving airpower, and at the same time the Air Force was having difficulty hanging on to many of its pilots, as the airlines were hiring at high salaries.

Testing the Model: Balkans

The Balkans have experienced centuries of clashes among multiple cultures, religions, and states. A communist strong man, Joseph Broz Tito maintained a relative peace there for many years after the Second World War. But he died in 1980, and atop that the end of the Cold War seemed to open the way for renewed conflict. After Desert Storm, the United States had to mount two large air campaigns there to enforce no-fly zones in the north and south to keep Saddam from massacring large numbers of his own people. The Air Force started its large drawdown, and meanwhile brutal conflict broke out in Bosnia-Herzogovina among ethnic Bosniaks, Serbs, and Croatians. Killing and rape ran wild from 1992 to 1995 before NATO stepped in with airpower to put an end to it with Operation Deliberate Force. That was settled in the latter part of 1995, but almost immediately Slobodan Milosevic set Serbia to the “ethnic cleansing” of Kosovo by removing the Muslims living there. Finally, NATO stepped in again to put a halt to the mayhem, this time with air forces much smaller than in Desert Storm. This Operation Allied Force went on for 78 days before Milosevic gave up. It started with the normal sequence of suppressing the Serbian air defense, and then Gen Wesley Clark directed the air forces against the Serbian ground forces in Kosovo. That was not showing impressive results, so after the NATO 50th anniversary meeting in Washington, the targeting shifted to Serbia proper. The ethnic cleansing stopped, the Serbian troops went back home, and the refugees from Kosovo also came home. The shrinking expeditionary air forces were spread thin to cover the combats in the Balkans and the watch over Iraq along with their other responsibilities for the entire decade.

Gen Thomas S. Moorman, Jr., b. 1940

Thomas Moorman was born into a military family in Washington, DC, in 1940. He graduated with distinction from Dartmouth University with a degree in history and political science in 1962. One of his first assignments was to Vietnam, and even then he was involved in the development of weather surveillance using satellites instead of weather scouts. He was commissioned in the Air Force as a lieutenant and climbed through all the officer ranks, retiring as a four-star general and the USAF vice chief of staff in 1997. General Moorman attended Squadron Officer School and Air Command and Staff College at Air University, and later he was a member of its board of visitors. He spent his career specializing in intelligence and space. He was the director of space operations at the Cheyenne Mountain complex in Colorado and held several staff and command assignments at Peterson Air Force Base, Colorado, before assuming the helm of Air Force Space Command. Moorman had the distinction of being the first nonrated officer to head that organization. Moorman was at its helm in 1991 during what was described as the "first space war"—Desert Storm. He served repeatedly in Washington, graduating from the National War College there and working on space issues in the offices of the secretary of the Air Force, the commander of Air Force Systems Command, and finally as vice chief of staff of the Air Force. After retirement, General Moorman became a vice president of a major corporation, and in 2009 he was cited as one of the 10 most important space authorities in America by *Space News*.

Figure 81. The MQ-1 Predator, a remotely piloted vehicle, helps provide for two of the Air Force's primary attributes: global power and global vigilance. (USAF photo)

Figure 82. Capt Corbett Bufton, C-17 aircraft commander (right), and SrA David Methvan, 816th Expeditionary Airlift Squadron, are part of one of the Air Force's primary attributes: global reach. (USAF photo)

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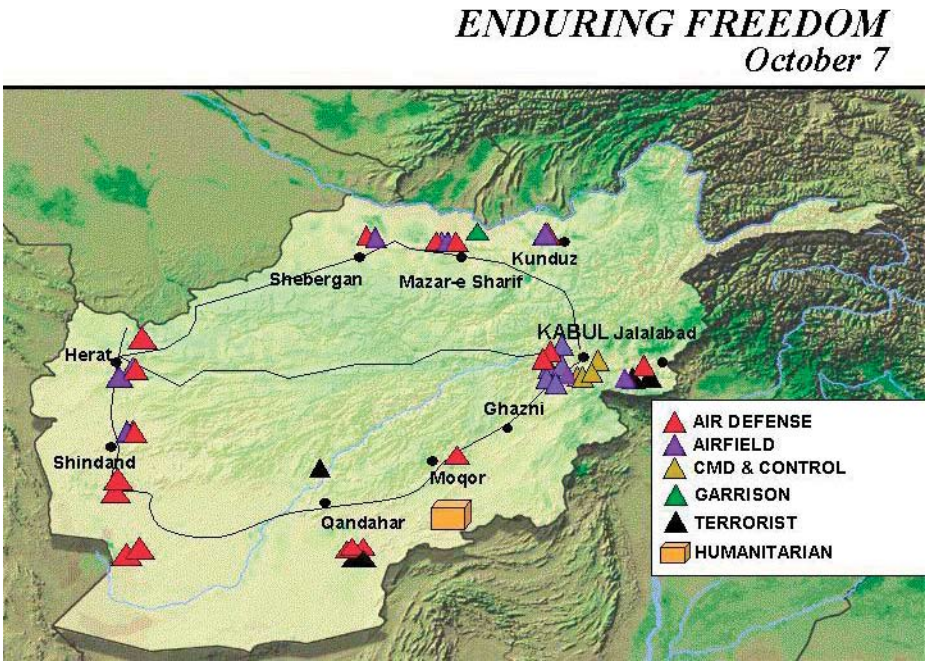

Figure 83. Operation Enduring Freedom 2001 map. (DOD map courtesy of the University of Texas Libraries, The University of Texas at Austin)

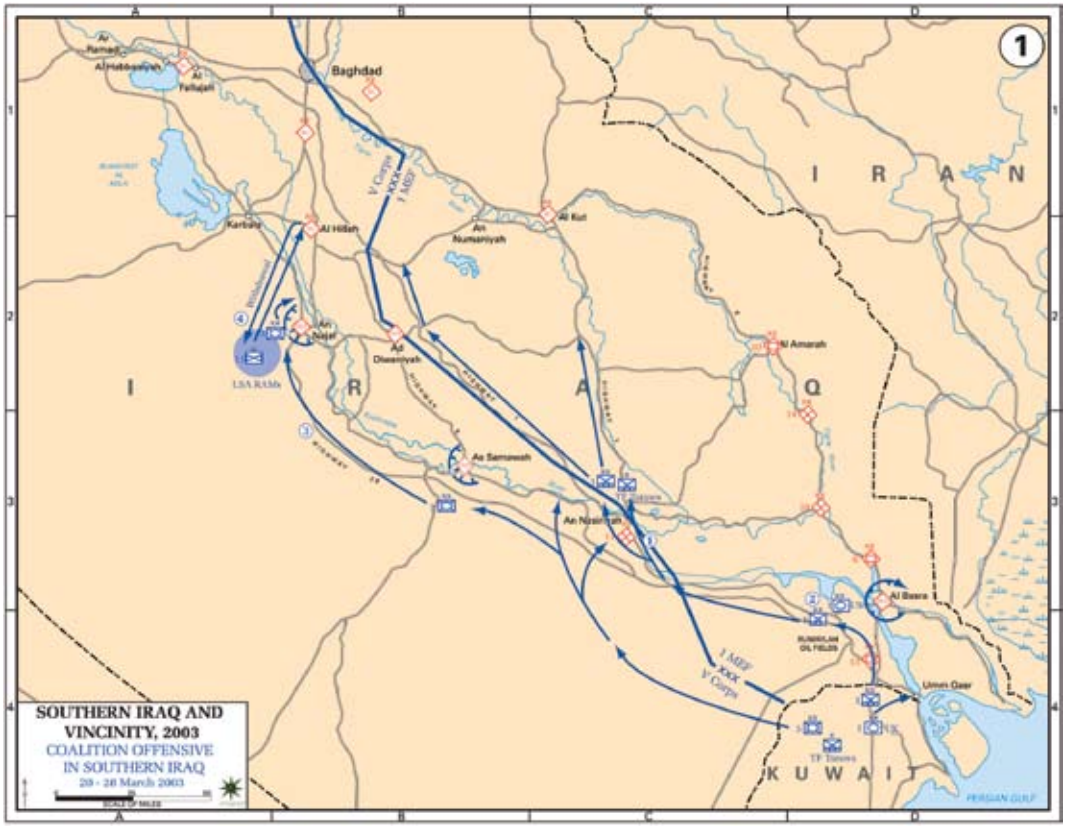

Figure 84. Operation Iraqi Freedom 2003 map. (Courtesy of History Department, US Military Academy)

Chapter 34

A New Age of Innovation: The Twenty-first Century

Desert Storm in 1991 clearly achieved its declared objective: driving Iraq out of Kuwait and thus protecting the flow of oil through the Persian Gulf to the rest of the world. The casualties were far fewer than anticipated, and the campaign shorter than predicted. But many Americans were disappointed that the forces did not march on Baghdad to rid the world of Saddam Hussein; others were persuaded that containment was the way to go.

Northern Watch and Southern Watch

The United States had encouraged the uprising of Iraqi Kurds in the north and Shiites in the south, and when they did so, Saddam unleashed murderous assaults on both, starting with the Kurds. There was little enthusiasm for another invasion, so America chose a containment policy to help protect both groups but avoid the cost of another war. It started with Operation Provide Comfort in the north, using aerial delivery and special operations forces to assist the Kurds to return to their homes. Saddam's ground forces gave way to the troops in the north and the threat of air attack, so the fighting was limited. Provide Comfort evolved into Operation Northern Watch using airpower based in Turkey to maintain a no-fly zone to prevent a return of the oppressors. That went on until after 9/11. Shortly after Provide Comfort began, Saddam attacked the Shiites in the south, and the coalition started a no-fly zone there called Southern Watch. A cat-and-mouse game ensued that went on for a number of years and included one violent air attack called Desert Fox. These operations in conjunction with the sanctions may have been more successful than was apparent, and the containment might have continued but for the attacks on the World Trade Center Towers and the Pentagon in September 2001.

9/11

The Morrow Board of 1925 and the Baker Board of 1934 both asserted that there was not a foreseeable air threat to the continental United States. Aside from some Japanese unmanned and ineffective balloon attacks to the Northwest in World War II, the boards were right until 2001. Even on 11 September, the air attacks originated from airfields in the United States. About the same number of Americans died as did at Pearl Harbor. Al-Qaeda had previously attacked the USS *Cole* and two American embassies in Africa, but those had been far away. A major assault on the homeland, the 9/11 attacks stimulated an immediate and violent response.

Operation Enduring Freedom, 2001

The United States reacted with airpower, both naval and Air Force, and with special forces. Working with the Afghan ground forces of the Northern Alliance, they soon put

al-Qaeda and its supporting Taliban to flight and occupied the capital of Kabul. New global positioning system (GPS) weapons in conjunction with forward air control by special operators with the Northern Alliance forces proved effective. A new government was soon in place, but though the adversaries were in disarray and hiding, the battle was not yet over.

Operation Iraqi Freedom, 2003

Before the campaign in Afghanistan was really complete, the United States decided to attack Iraq to change the regime. Arguments continue as to whether the threat of Saddam Hussein's weapons of mass destruction was real or imagined and whether the supporting evidence was simply mistaken or contrived. The military part of the campaign was effective. US air forces had already achieved command of the air through Operations Northern and Southern Watch, so the coalition armies were free from counterattack from above. They quickly captured a forward airfield en route to Baghdad, but a gigantic sand storm slowed the invasion for a time. The Iraqis attempted to use the cover of the storm to redeploy units and to hide, but airpower surprised them, using GPS and new sensors to penetrate the sand cloud. Bad weather was no longer a sanctuary, and Saddam's ground forces were badly bashed. When the storm subsided, the ground assault resumed, and in three weeks the coalition marched all the way north from Kuwait to topple Saddam's great statue in Baghdad. But that did not end the war. The conventional military campaign was a startling success, but the subsequent tasks of restoring orderly government and its services have been a daunting challenge.

Implications

The experience of the period may generate some tentative lessons. Wars of choice may be less dangerous than in the Cold War, but they can be pretty expensive in treasure and lives nonetheless. Clausewitz was right in asserting that war is the province of uncertainty. Capture of the enemy capital is nice, but it does not necessarily define victory. The feasibility of imposing democracy on an ancient culture has not been proven. Technological hegemony does not guarantee victory. Dominance of the air continues to be a real asset. Long-range strike and mobility remain essential. Air in a supporting role remains vital, and even in counterinsurgencies, some independent air missions remain thinkable. However, it is clear that military force alone is not enough. In fact, it may stimulate asymmetric responses that have to be dealt with by other means.

TSgt John A. Chapman, 1965–2002

John A. Chapman was born and brought up in Windsor Locks, Connecticut, where he graduated from high school in 1983. He was part of the state championship soccer team and established a school swimming record that still stands. He followed his dad into the Air Force. Although he started out in computers, he switched to special operations early. He qualified as a combat controller in the 24th Special Tactics Squadron at Pope Air Force Base, North Carolina, and in 2002 he deployed to Afghanistan. On 4 March 2002, Chapman was part of an interservice team aiming to set up an observation post high up the slopes of Shah-i-Kot Mountain. The post was to provide a site to control air strikes to aid Army troops engaged nearby. Travelling on a CH-47 Chinook helicopter, the team came under heavy fire on approach to the landing zone. A rocket-propelled grenade did serious damage to the aircraft. While the aircraft was pulling away, Navy SEAL Neal Roberts fell off the ramp and was left alone. The pilot made a forced landing several kilometers away. Chapman called in another Chinook, took the aircrew of the downed aircraft to safety, and then led his team back into the teeth of enemy fire hoping to rescue Roberts. Under heavy fire on landing, the new Chinook was disabled. Chapman organized the defense and killed two enemies before he was killed. The Air Force gave him its highest award, the Air Force Cross, and he is buried near his wife Valerie's home in Pennsylvania. She survives him with their two young daughters.

Figure 85. USAF KC-135R taxiing for takeoff to support Northern Watch, Incirlik AB. (USAF photo)

Figure 86. The USAF is partnering to build a new Afghan air force; its commander, Maj Gen Mohammad Dawran, is shown here. (USAF photo)

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Haun, Phil M. "Direct Attack—A Counterland Mission." *Air and Space Power Journal* 17, no. 2 (Summer 2003): 8–17.

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Chapter 35

Conclusion

What Is Professional Knowledge for an Air Warrior?

The outer limits of professional knowledge cannot be defined. Some of the main elements can be described, but by definition professionals must stay current with the developing expertise in their specialties and with the changing nature of the world they are working in as well. The classical version of a profession was laid down by Prof. Samuel Huntington in the 1950s in his *Soldier and the State*—which could well serve as your launching pad. As he saw it, a profession must have the following characteristics as a minimum. First, it is built up around specialized expertise that is developed through a combination of practice and study. He envisioned this as a lifetime enterprise for its practitioners. Second, a profession must be dedicated to a sense of service to its clients—patients in the case of doctors, the citizens of the republic in the case of Soldiers. The motivations go beyond the search for material rewards; a part of the compensation should arise from the psychic rewards of service to others. Third, a profession is characterized by a sense of corporateness—a unity among its members that goes beyond that of other occupations. Implied in that is the duty of the profession to police itself with respect to the maintenance of professional standards. In part, specialized expertise is established through a system of professional schools and journals that facilitate the lifetime study of the discipline. In short, piloting and carpentry are trades; doctoring and military leadership are (or should be) professions.

Why Should I Strive for General Professional Knowledge?

It would be a very nice thing for the US treasury if we could identify those among us destined to be latter-day Napoleons (except wars from 1812 to 1815) while we are still cadets. Then we could concentrate on the enjoyment of our own specialties and the joys of life without diversions into professional schools and endless hours of personal study. The nation could then concentrate its funding on the few who are destined to lead on the highest levels and the staffs that support them. Unhappily, that is not feasible, and we must assume that all officers "carry a marshal's baton in their knapsacks" (in terms that Napoleon used). Too, by now our history demonstrates that the most proficient and dashing pilots have sometimes not been great leaders or strategists. Others who have been run-of-the-mill flyers or in specialties having little to do with combat aviation have emerged with unimagined skills in policy and strategy making—on staffs or in the lead. We can never know, and if officers wait until they have reached the senior ranks, it will be too late to start the professional study they need. Further, junior leaders will be more effective if they understand how their work relates to the larger objectives of the service.

What Are Some of the Elements of General Professional Knowledge?

Even before officers have perfected their specialized expertise, they should consider starting to add to their general knowledge. All of them now are college graduates, and most university curricula strive to develop both kinds of knowledge: how to be a good engineer (or whatever) *and* how to be an effective citizen. The latter usually includes learning self-expression in both writing and speaking as well as in things like political science, sociology, geography, history, and other subjects that give students insights on the world they will be living and working in. The model in figure 87 might be one way to approach your personal study of generalist professional knowledge.

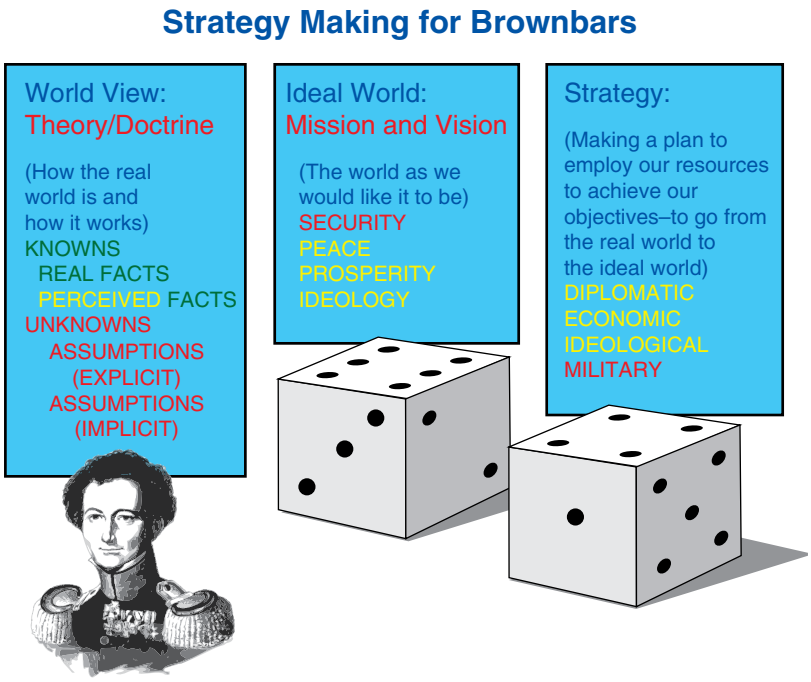

Figure 87. Strategy making for brownbars.

The model was inspired by Kenneth M. Dolbeare and Patricia Dolbeare in *American Ideologies: The Competing Political Beliefs of the 1970s* (Chicago: Markham Publishing Co., 1971), and it originally aimed at being an aid to policy making—which is much like strategy making at a different level. Before one can make a logical plan to do anything, one must first understand the problem—to develop a "worldview." That is a bit of a hopeless proposition because we will never know everything we would like to know. Thus our personal worldview will always be an approximation of reality (at best). In the end, not having all the facts we need means that every decision process ends with a guess. The best one can hope to do is reduce the number of things that are unknown. Officers can do that through personal experience and endless searching for information.

Travel can expand one's views, but life is short, and there is much that is not revealed to alien eyes. Reading military history is another source. It is never a perfect picture of what has happened in the past, and we know that the past has always been some combination of continuity and change. Thus, even if the approximation of past wars is fairly accurate, practically all historians assert that history *does not* repeat itself. Even geography changes, and some things about it are still not known. Political science is often based in part on history but also on deductions that resemble speculations. Political science does instruct an officer on different ways of looking at things. Economics is certainly crucial, but that too is not an exact science. Psychology is worth studying, but it is even less of an exact science. There really are few limits to your exploration, but even if your own view is a wonderful approximation of reality, that is not enough.

The world as it is, is practically never the world we would like it to be. We are on an everlasting search for ways to improve our situation. Safety and security probably come before almost everything else. We know that the grave lies at the end of the road in the personal sense, but we usually hope that our national life will continue indefinitely. Once national security is assured, we seek peace. War hurts. War is expensive. If we can achieve our ends by peaceful means, that is almost always the preferred choice. If our national security is not threatened, and if we are at peace, the usual next priority is prosperity—for ourselves and, on grounds of both humanity and peace, for the rest of the world as well. Finally, most of the western nations seem to believe that spreading democratic ideals is a worthy goal because of the worth of the individual and because of the belief that democracies are peace loving. Unhappily, though, different cultures have different views of what the world is and what it should be.

The last element in our model is devising a plan to move the world as it is closer to the world as we would like it to be. We try to do this in several ways: military action, deterrence, economic rewards or punishment, diplomacy, or persuasion. The images of Carl von Clausewitz and the set of dice indicate that the neat diagram cannot really describe the process. It is inherently messy, the instruments are seldom, if ever, used in isolation from each other, and the goals are not so neatly defined. Accidents and confusion are inherent in both politics and war, and even the brightest professional officer or policy maker can easily be a victim of unanticipated events. The officer's best hope, then, is that through a lifetime of professional study he or she can improve the odds that his or her final guess will be closer to reality than that of the adversary.

Dr. Samuel Huntington, 1927–2008

Samuel Huntington was born in New York City to parents of a literary bent. He graduated from college at 18 and served in the US Army. In 1950 Huntington earned his PhD at Harvard at age 23 and began teaching there. His first book was *The Soldier and the State*, published in 1957 partially in reaction to President Truman's dismissal of General MacArthur in 1951. The book has been an enormous influence on the military and is now in its 15th printing. Dr. Huntington influenced American military and foreign policy in many more ways than that. He served on many commissions, was on the campaign staff of Hubert Humphrey, and served with the Carter White House. The Cold War military that emerged at about the same time Huntington joined the faculty at Harvard owed much to his concepts. As it was the first American mass peacetime standing military, it had to define itself in new ways, and Huntington was instrumental in developing a mature professional model for the United States. Though he was a lifelong Democrat, he was not ideologically rigid and was open to many views, some of which certainly were divergent from political orthodoxy. Perhaps even more influential than his first book was his *Clash of Civilizations* (1996). It argued that the state-on-state conflict that had prevailed since the seventeenth century was being replaced by conflict along civilizational fault lines that would endanger peace in the future. He proposed that culture was more a determinant of conflict than politics, economics, or other factors.

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Appendix

A Timeline of American Airpower Strategic Thought

AMERICAN AIRPOWER STRATEGIC THOUGHT

TIMELINE

AIR FORCE RESEARCH INSTITUTE

1900 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020

U.S. CIVILIAN AIR LEADERS

DAVISON · LOVETT · SYMINGTON · FINLETTER · TALBOTT · QUARLES · DOUGLAS · SHARP · ZUCKERT · SEAMANS · BROWN · McLUCAS · REED · STETSON · MARK · ORR · ROURKE · ALDRIDGE · RICE · WIDNALL · PETERS · DONLEY

U.S. MILITARY AIR LEADERS

CHANDLER · COWAN · CHANDLER · REBER · QUESADA · BENNETT · LENEY · RYAN · MENOHER · PATRICK · FECHET · FOULOIS · WESTOVER · ARNOLD · BRETT · ARNOLD · SPAATZ · VANDENBERG · TWINING · WHITE · LeMAY · McCONNELL · RYAN · BROWN · JONES · ALLEN · GABRIEL · WELCH · DUGAN · McPEAK · FOGLEMAN · RYAN · JUMPER · ROCHE · WYNNE · MOSELEY · SCHWARTZ

HISTORIC AIRPOWER EVENTS

WORLD WAR I · WORLD WAR II · KOREAN WAR · VIETNAM WAR · COLD WAR · GULF WAR · YUGOSLAV WARS · GWOT

- Wright Brothers' first powered flight at Kitty Hawk, NC
- Aeronautical Division of the US Army Signal Corps established
- First US military aircraft flight
- First use of aircraft in combat during Italo-Turkish War
- Aviation Section replaces the Signal Corps' Aeronautical Division
- United States enters World War I
- US Army Air Service replaces the Signal Corps' Aviation Section
- Billy Mitchell sinks the battleship *Ostfriesland*
- US Army Air Corps replaces the US Army Air Service
- First Aerial Refueling
- Creation of GHQ Air Force
- US Army Air Corps begins delivering US airmail for one year
- Doolittle raid on Japan
- US Army Air Forces replaces the US Army Air Corps
- Japanese Navy attacks Pearl Harbor
- United States enters World War II
- Enola Gay drops first atomic bomb on Hiroshima
- USAF becomes independent service
- Chuck Yeager breaks the sound barrier
- United States begins Berlin Airlift
- Standup of Aircraft Gunnery School
- Soviet Union tests its first atomic bomb
- Standup of Fighter Weapons School
- USAF Academy's first class begins
- Congo Airlift
- First US manned space launch
- Soviet Union launches *Sputnik I*
- United States launches its first successful ICBM
- Yuri Gagarin becomes first man in space
- Cuban Missile Crisis
- Linebacker II
- Nickel Grass airlift
- First manned lunar landing
- US air forces strike Libya
- Soviet Union dissolves
- President signs the Goldwater-Nichols DOD Reorganization Act
- US forces intervene in Panama
- US begins enforcing Iraqi southern no-fly zone
- US forces intervene in Somalia
- US forces intervene in Haiti
- NATO begins air operations in Bosnia and Herzegovina
- US begins enforcing Iraqi northern no-fly zone
- NATO begins air operations in Kosovo
- Al Qaeda conducts 9/11 terrorist attacks
- Operation Noble Eagle
- US forces invade Afghanistan
- US forces invade Iraq
- Synthetic Fuel Flights •
- Cyber Command (P) standup •
- Global Strike Command (proposed)
- Cyberspace NAF (proposed)

AVERAGE DEFENSE BUDGET (Total % GDP)

$0.2 Billion	$2.7 Billion	$0.9 Billion	$0.9 Billion	$35.2 Billion	$44.6 Billion	$63.6 Billion	$94.2 Billion	$248.2 Billion	$279.1 Billion	$417.3 Billion
0.8%	3.5%	1.1%	1.1%	17.4%	10.8%	8.6%	5.8%	5.5%	3.8%	3.5%

INFLUENTIAL AIRPOWER WORKS

- Army Service School thesis, Foulois
- Strategical Bombardment, Cornell
- Report of Aeronautical Commission, Bolling
- Memorandum on the 'Air War' for the US Air Service, Caproni & Douhet
- Let Us Kill the War; Let Us Aim at the Heart of the Enemy, Salvenschi
- General Principles Underlying the Use of the Air Service in the Zone of the Advance AEF, Mitchell
- Tactical Application of Military Aeronautics, Mitchell
- Our Air Force: The Keystone of National Defense, Mitchell
- The Command of the Air, Douhet
- Paris: Or the Future of War, Liddell Hart
- Winged Defense, Mitchell
- Employment of Combined Air Force, ACTS
- Air Warfare, Sherman
- Skyways, Mitchell
- The War of 19…, Douhet
- Air Warfare Doctrine of General Douhet, Chandler
- Air Power and Armies, Slessor
- AWPD-1, Munitions Requirements of the Army Air Force
- Fire Power of Bombardment Formations, Air Corps Board
- Employment of Aircraft in Defense of the Continental United States, Air Corps Board
- AWPD-4/Air Estimate of the Situation and Recommendations for the Conduct of the War
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- Unlimited Weapons and Limited War, Brodie
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- Space Policy and Requirements Study, AF Scientific Advisory Board
- Burning Chrome, Gibson
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- Global Reach-Global Power II , Rice
- Toward the Future: Global Reach, Global Power
- Gulf War Air Power Survey
- Spaceward 2020, Air University
- New World Vistas, AF Scientific Advisory Board
- Global Presence, Widnall & Fogleman
- Air Theory for the Twenty-first Century, Warden
- Firing for Effect: Change in the Nature of Warfare, Deputula
- The Emerging System of Systems, Owens
- Joint Vision 2010
- Global Engagement, Widnall & Fogleman
- United States Air Force Long Range Plan
- Network Centric Warfare, Cebrowski & Garstka
- Power to the Edge, Alberts & Hayes
- Lasting Heritage…Limitless Horizons •
- Airmen and the Art of Strategy, Moseley •
- CSAF Strategy White Paper, •
- The Nation's Guardians,
- America's 21st Century Air Force
- SECAF Strategy article, •
- Sovereign Options: Securing Global Stability and Prosperity …

Items included in this timeline were taken from a wide variety of sources, including existing timelines produced by the USAF History and Museums Program. Also inputs were solicited from Air University colleges and schools. Space limitations dictate sampling; although, we have found a pattern of diminished intellectual production between eras of major conflict. We plan to develop an electronic version to permit displaying additional ideas and events, as well as adding hyperlinks that provide context. Please feel free to make suggestions to improve this version. Keep in mind that the vertical fills quicker than the horizontal.

Send inputs to: AFRLAFRResearchers@maxwell.af.mil

INFLUENTIAL AIRPOWER CONCEPTS

- Aerial Observation
- Air Superiority
- Aerial Bombardment
- Air defense
- Centrally Controlled Airpower
- Strategic Bombing
- Independent Air Force
- Close Air Support
- Interdiction
- Targeting morale rather than forces
- "Go straight to the vital centers"
- "A well-organized, well-planned, and well-flown air force attack…cannot be stopped"
- Industrial fabric theory of war
- Global Air Warfare
- Collective Security
- Diplomatic Pressure via Airpower
- New Look Strategy
- Massive Retaliation
- Counterforce Strategy
- Nuclear stalemate breeds limited war
- Freedom of Space
- Flexible Response Strategy
- Space Superiority
- Missiles as a part of airpower
- Finite Deterrence (Mutual Assured Destruction)
- Aerospace concept
- Strategic (Nuclear) Superiority
- Controlled Flexible Response
- Strategic Triad
- Tactical Counterforce
- AirLand Battle
- Assumed Destruction and Essential Equivalence
- Cyberspace concept
- Countervailing Strategy
- OODA Loop
- Five Rings Theory
- Effects Based Operations
- Parallel Warfare
- System of Systems
- Full Spectrum Dominance
- Network Centric Warfare
- Expeditionary Aerospace Force
- Cyberspace as a warfighting domain •
- C2 Enabling concept •
- New Air Force Mission: Sovereign Options Air, Space and Cyberspace
- New Air Force Mission: Fly, Fight and Win in Air, Space and Cyberspace

AMERICAN AIRPOWER'S STRATEGIC DIRECTION

American airpower is used primarily for observing enemy land forces from the air, denying enemy observation of US forces and directing artillery fire. After World War I, Airmen see airpower as the wave of the future, increasingly believing its capabilities and different perspective will eventually require a third branch of the armed forces. Additionally, they suggest airpower is an effective and efficient means for defending the US coastlines.

Officially, the Army Air Corps' mission is to support US ground forces through air superiority and ground attack, but Airmen at the Air Corps Tactical School are laying the foundation for an independent role through high-altitude, precision daylight bombing. The US airpower leadership foresees a future, independent air force that will act as the first line of American defense and be the country's forward-looking, technological military leader.

The Army Air Forces mission is to safeguard the United States and its allies by taking offensive action against the Axis powers and supporting Allied ground offensives. An independent air force is still the dream of most Airmen.

The Air Force's mission is to protect the United States and its allies from the Soviet Union by massively retaliating against enemy attacks, thereby deterring the Soviets or, if deterrence fails, winning the conflict. Although nuclear forces become the strategic centerpiece, tactical airpower is still developed and used heavily in the Korean conflict.

Airmen envision an Air Force empowered by the technology of a nation excited about aviation and capable of delivering devastating blows to its enemies.

The Air Force Chief of Staff sums the Air Force mission up in 1969 in this way: "to fly and fight." Massive retaliation is replaced by flexible response, in which all-out nuclear responses to attack are replaced by scalable options. Deterring nuclear war, rather than winning it, becomes the main goal of strategic nuclear forces.

In Vietnam, the failure of Rolling Thunder's gradually increasing air pressure is replaced by the heavy air strikes of Linebacker II, and American tactical airpower is tested in air superiority and interdiction missions throughout the country. Later in the Gulf War, conventional weaponry provides strategic effects as the Air Force conducts a vigorous air campaign to paralyze Iraqi leadership and forces by attacking the Saddam Hussein regime's sources of power.

The Air Force's mission is to defend the United States through the control and exploitation of air and space. The end of the Cold War leads the Air Force to replace its threat-based strategies with capability-based ones, transitioning to an expeditionary force and reducing its permanent forward presence. Global Reach-Global Power and its successors describe how airpower enhances national security and the service's vision of being the world's most respected air force.

The Air Force's mission is to deliver sovereign options for the defense of the United States and its global interests—to fly and fight in air, space and cyberspace. The service establishes three priorities: win the war on terror; develop and care for Airmen and their families; and recapitalize and modernize its systems. In the Long War, a balanced airpower strategy is emphasized. The Air Force's vision is a modernized, balanced force.

AIRPOWER TECHNOLOGY

- Wright Brothers powered aircraft
- Gnome rotary aircraft engine
- Air-to-ground radio
- Aerial torpedo
- Aerial machine gun
- Bomb release racks
- Autopilot via gyroscope
- Bomb sights
- Air-to-air radio
- Remotely piloted vehicle
- Liberty 12-cylinder aircraft engine
- Radio navigation aids
- Autogyro
- Wright J-5 Whirlwind radial engine
- Liquid-fueled rocket
- 500-lb bomb
- Norden bombsight
- Ground-based radar
- Airborne radar
- Jet aircraft
- Radio proximity fuze
- 22,000-lb bomb
- Radio-controlled glide bomb
- Air-launched rocket
- Axial-flow turbojet
- Pulse-jet rocket
- Mass-produced Helicopter
- Atomic device explosion
- Radar-controlled glide bomb
- Prats & Whitney R-2800 radial engine
- Turboprop engine
- First rocket to escape atmosphere
- Operational aerial refueling aircraft
- Afterburning turbojet
- Guided air-to-air rocket
- Mach 2 powerplant
- Radar-guided air-to-air missile
- Inertial navigation
- Infrared-guided air-to-air missile
- Turbofan engine
- First MIDAS Launch
- Intercontinental Ballistic Missile
- Mach 3 powerplant
- Radar-controlled air-to-ground missile
- First US space launch
- Integrated circuits
- Gasting-type aircraft gun
- Solid rocket booster
- Anti-radiation missile
- TV-guided glide bomb
- Runway-cratering munition
- Laser-guided bomb
- Large-scale integrated circuits
- First DSP Launch
- TV-guided air-to-ground missile
- Air-launched cruise missile
- Depleted uranium gun ammunition
- First GPS Launch
- Very large-scale integrated circuits
- Low-observable stealth technology
- High-maneuverability research with X-29
- Infrared-guided air-to-surface missile
- Infrared-guided glide bomb
- Autonomously guided conventional weapons
- GPS-guided munition
- Supercruise aircraft engine
- Long endurance unmanned aerial vehicle
- ISR Full Motion Video
- Integrated high-performance turbine engine technology
- All-composite airframes
- Advanced thrust vectoring
- Integrated cockpit/avionics
- Directed energy weapon
- First purpose-designed hunter/killer UAV
- Precision airdrop (JPADS) •
- Small diameter bomb

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