Golden Legacy, Boundless Future

Essays on the United States Air Force and the Rise of Aerospace Power

Proceedings of a symposium held on
May 28–29, 1997 at
The DoubleTree Hotel, Crystal City, Virginia

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Editors

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In 1997, a gathering of notable civilian and military personnel met in a symposium to celebrate the United States Air Force's fiftieth anniversary. Among the papers presented were those covering individual reminiscences and the results of historical research encompassing not only the germinal Army Air Service but also futuristic aerospace concepts.

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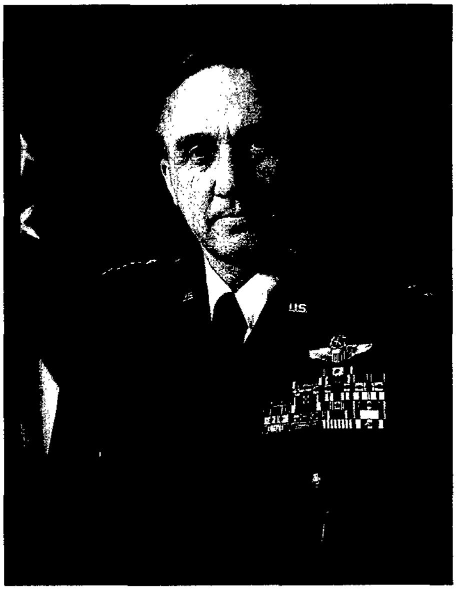

GENERAL BRYCE POE II
1924–2000

Foreword

The last century of the second millennium has been called the "American Century." That same century witnessed the transformation of the world from a two- to three-dimensional movement, triggering, among other effects, a revolution in military affairs. The achievements of the United States Air Force in developing and exploiting aerospace technology bridge all of these. As the century opened, Wilbur and Orville Wright's dreams were realized in a few moments of flight at Kitty Hawk. By its close, military aircraft routinely flew faster than sound and satellites operated in earth orbit. Using these capabilities, the Air Force had taken the lead in military operations, humanitarian missions, and nation-building efforts, and had revolutionized electronic and information warfare. In less than a half-century we had gone from little fabric and wood biplanes flying aerial reconnaissance over the trenches of World War I to unmanned satellites able to pinpoint and photograph any position on the earth's surface.

In 1997, the Air Force History and Museums Program held a symposium marking the fiftieth anniversary of the United States Air Force. It celebrated the technical and operational achievements and the leaders of those years and their predecessors. The papers delivered during the symposium offer glimpses into the history of the United States' air arm during the twentieth century. The reminiscences of the great airmen and civilian leaders who participated give human coloration to that story.

The Air Force History and Museums Program hopes that the proceedings collected in this volume will prove of value as an introduction to the service and its history.

RICHARD P. HALLION
The Air Force Historian

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Gen. Bryce Poe II, moderator of the Roundtable, stands flanked by two of his presenters, Lt. Gens. Devol Brett (*left*) and Thomas G. McInerney (*right*). Seated are his other two panelists, Gens. Bernard A. Schriever (*left*) and Jacob E. Smart (*right*) who, along with The Honorable Eugene M. Zuckert (his address to this symposium appears later in the proceedings), witnessed the creation of the U.S. Air Force in 1947 and experienced careers significantly intertwined with the Air Force's first fifty years.

Roundtable: Turning Points

Gen. Bryce Poe II, USAF (Ret.)

The heritage of our United States Air Force is abundant with examples of action, change, problems, successes, failures, accomplishment, frustration, poverty, and riches. Any one might mark a turning point, for better or worse. On balance, we have been exceptionally fortunate in dealing with the negative, learning from it, and preparing for and taking advantage of the positive.

The Air Force that today celebrates fifty years can measure its history over one hundred thirty-five years, beginning just a short distance away when, in the summer of 1861, the first Army balloon was purchased, just in time for the Battle of Bull Run. It resulted in some good reconnaissance work until it broke loose and, to keep it from the confederates, had to be shot down over what is now Arlington Cemetery.

Go on up that hill to Fort Myer, where you might have seen the acceptance of the first Army airplane in 1909. It was piloted by Orville Wright, with a young Army lieutenant, Thomas E. Selfridge, on board as passenger and observer. Lieutenant Selfridge would be the first military officer to lose his life in an airplane, when the Wright plane crashed during the initial trials.

Another significant turning point took place nearby when on September 28, 1939, President Franklin Roosevelt called a meeting with his senior civilian and military secretaries, including Gens. George Marshall and "Hap" Arnold. Roosevelt had supported some studies of aircraft production and employment, but apparently his heart remained with the Navy until, about a month earlier, Hitler attacked Poland behind a storm of 1,400 first-class planes. The Luftwaffe destroyed the Polish Air Force and went on to attack railroads, bridges, supply facilities, communication centers, and factories.

The President came right to the point: "I want airplanes now, and lots of them." No one was more surprised than Arnold, who later wrote, "The battle that was won in the White House that day . . . took its place with the victories in combat later." The President ordered production of 10,000 first-line combat planes in 1940, another 20,000 in 1941, and then seven months later upped the quota to 50,000 a year.

So, there have been many turning points, beginning even before the official establishment of the independent U.S. Air Force fifty years ago. Just as our history is not limited only by a specific period of time, neither is it solely a recital of large-scale, nationally recognized events and policy-makers. It also consists of the experiences, perceptions, and actions of the individual people who contributed to it.

Today, we are very fortunate to have with us four distinguished senior officers who spent their careers serving, leading, and studying our Air Force. Each will give us his thoughts about aspects of our culture, our institutional development, or our service to the nation as a military force. Personally, I have enormous respect for them professionally, and affection for them as friends. It is an honor to welcome Gen. Bernard Schriever, Gen. Jacob Smart, Lt. Gen. Devol Brett, and Lt. Gen. Thomas McInerney.

Gen. Bernard A. Schriever, USAF (Ret.)

Our topic today is turning points in the history of the Air Force. I have been around long enough to see quite a few of them, but I consider the partnership that Hap Arnold established between the military and the scientific community during and after World War II to be the major influence on the direction the Air Force would take. There was, however, an important earlier historical event that puts the later revolution in military affairs into perspective. That was the airmail experience of the early 1930s.

The brief period when the Air Corps flew the U.S. mail is usually called a debacle, but I think it was useful in waking up those who were asleep to the problems and possibilities of military aviation. At the time, in 1934, we were subject to severe cost-cutting and downsizing. Airmen were restricted to four flying hours a month; we had taken a ten-percent cut in our pay, which left us each $125 a month plus $67.50 additional flight pay. Primarily the Air Corps flew biplanes. The tie I am wearing today has on it a P–12, one of the biplanes flown by an Air Corps pilot with his fifty-pound sack of mail. Even the more advanced aircraft that were used, such as the old Keystone bombers, had no relief tubes, so the typical three- or four-hour flight seemed especially long. Also, many of the airplanes were only equipped with one-way communications, which is like not having GPS in your aircraft today. Planes had open cockpits, and the weather was bitter that winter. Some fifty crashes and severe loss of life occurred during those few months of Air Corps involvement. At the same time in our military mission as support to the Army, we only did a little reconnaissance and artillery spotting. In other words, we were ill-equipped to do much of anything in those days. It took the airmail debacle to change the situation.

I finished flying school in 1933, just before the Air Corps took on the airmail. My first commander at March Field was Hap Arnold, who also became the commander of the airmail activity for the western division in 1934. Coming into the service at that time, my first experience as a military pilot was in an Air Corps that was floundering, despite the best efforts of Arnold and other airmen. However, after the airmail crisis peaked, the Baker Board, which had been appointed to report on the status of military aviation, recommended to the White House that both the Air Corps and naval aviation needed to modernize, that training needed to improve, and that the number of pilots should be increased. The results were dramatic. By 1939, when I had been stationed at Wright Field for about a year and a half as a test pilot, we were flying all of the aircraft that would be in the inventory during World War II, with the exception of the B–29. It was the reaction to the airmail debacle that permitted us to go to war as well prepared as we were.

Regrettably, that kind of preparation had not predated World War I. Then, not a single U.S. airplane was used in combat in Europe. In World War II, however, we beat the earlier record by a very large margin, and showed how quickly the United States could respond to crisis. I found that lesson to be proven over and again, through all of my years in the Air Force. We are a crisis-oriented society and government. Yet, we have failed to keep in mind the historical lessons of those earlier times. Today the United States Air Force lacks sufficient breadth and keeps declining in resources. I do not know how long we can test our national resilience through crisis management.

As I said, to my mind the greatest turnaround in the Air Force during my career came from the establishment of a process for dealing with technological advances, brought about by General Arnold and his scientific adviser, Dr. Theodore von Kármán. Immediately after the war, Arnold pointed to critical breakthroughs that had taken place, including the jet engine, rocket propulsion, nuclear weapons, and electronics, primarily radar. He believed these technologies would change the nature of war, that wars in the future would be different from those in the past. He maintained that World War I had been won by brawn, in the trenches. World War II was a victory of logistics—as an example, the United States established the production capability of some 100,000 airplanes per year. (I, personally, saw the importance of logistics in winning the war in the Pacific theater, where I spent nearly the entire war.)

When I returned from the Pacific in late 1945, I was assigned to the Pentagon in the newly established Scientific Liaison Office. That job gave me a ringside seat from which to observe what went on. I watched Arnold brilliantly assume command of a peacetime air force that would be welded into a powerful tool of the Cold War. Arnold believed that fighting future wars would require the Air Force to "establish the highest cooperative relationship with the scientific community." Scientists and engineers had made tremendous contributions during World War II, but they began returning to the civilian world. Wartime laboratories were being closed down, and the scientists were moving back into the universities. Arnold clearly saw the need for the Air Force to establish a postwar relationship with the scientific community.

Arnold put von Kármán in charge of the effort, asking him to assemble the best scientists he could find to produce a study assessing the utility of the technological breakthroughs of World War II. They were to look not only ten or twenty years into the future, but even fifty years ahead. A year or so later, Arnold asked von Kármán to chair the newly created Scientific Advisory Group. Von Kármán remained as its chairman for more than twenty years, even after it evolved into the Scientific Advisory Board (SAB), an organization that continues to this day. Arnold also felt that the Air Force needed an outside, technically oriented analytical group. This resulted in the establishment of the RAND Corporation. In Arnold's view, the Air Force's future lay in its technological superiority, so he took steps to ensure that the new technologies would enhance our operational capabilities.

Not only did Arnold create the structure and process for research and development, his vision was way ahead of his time. He recognized that the rocket engine would propel us into space. He, therefore, asked von Kármán and the RAND Corporation to look into the feasibility of reconnaissance satellites. Both RAND and the SAB responded that a satellite was feasible and, in 1954, recommended that the Air Force proceed with its development. Some of the preliminary work had already been done. For example, Dr. Louis Ridenour, who worked on radar technology at MIT during the war and afterward became a member of the SAB, had identified the capabilities that space would provide for air, sea, and ground support.

Although the Air Force did not get a development operational requirement for satellites until 1956—the process was slow in moving forward with hardware—it was Arnold's vision that got us thinking about space. Not only did Arnold's leadership permit the Air Force to pioneer the planning for the utilization of space for support operations, which would play a crucial role many years later in the Persian Gulf War, but also, in the late 1940s, Arnold considered how the applications of new technology might prevent a surprise attack—a nuclear Pearl Harbor. Because of his far-sighted thinking in these areas, Hap Arnold has always been a hero to me. He truly is the "father of the modern U.S. Air Force."

Let me mention a couple of other anecdotes that indicate the kind of person Arnold was. In World War I he had an unmanned aerial vehicle. It did not fly worth a damn, but it shows that early on he was thinking about unmanned vehicles. In the 1930s, when the Air Corps was unable to commission many regular officers, I left military service to take a job with the airlines. I worked for Northwest Airlines, flying out of Seattle, Washington, to Billings, Montana. I managed to pick all of the easy airmail routes, such as from Salt Lake City, Utah, to Cheyenne, Wyoming, flying in open cockpits. In early 1938, General Arnold visited Boeing in Seattle, and since I knew Hap quite well, he asked Bill Allen to arrange a golf game which also included me. We played, and after the game, while I was changing shoes in the locker room, the general said, "I want to get as many reserve officers as possible, who are now pilots with the airlines, back into the Air Corps. What I want is an all-weather air force, and the airlines are pioneers today. Bennie, I hope you take the exam for the regular commission." I told him that I had not known there was an exam coming up, but I took it and passed, and was sworn in for the third time as a second lieutenant, this time as a regular officer, at the very bottom of the promotion list at the Presidio in San Francisco. And, as Arnold had hoped, we did develop an all-weather air force, as we would demonstrate later in response to the Berlin Airlift crisis—where we never missed a single flight due to weather.

To sum up, I see Arnold's most important contributions to be instituting both the SAB and RAND. Hap Arnold forged an invaluable partnership between the scientific community and the air force. There is no question that now we are the finest technology-oriented service in the world, and the strongest air force in the world. Arnold's vision and leadership offer a historical lesson regarding the required infrastructure for science and technology as it relates to military air operations. Arnold knew that he had to greatly expand what we had, going into World War II. What kind of a research, development, and test evaluation organization did we need to take on the challenges of the technology, coming out of the war? Although he stayed on duty only a little over a year after the war ended, Arnold created that infrastructure, which today includes electronics and geophysics in the Boston area, propulsion and aerodynamics at the Arnold Engineering Development Center in Tennessee, the missile flight test center at Patrick AFB and Cape Canaveral, armament at Eglin, flight testing at Edwards AFB and large-rocket testing at Muroc Lake in California, and nuclear activity at Kirtland AFB, New Mexico.

Unfortunately, we have not continued the approach from the early days of having a discrete organization within the air force for research and development. That was the way Arnold, a visionary, thought it should be, and I believe he was absolutely right. Although I have not had time to mention industry in my comments, industrial production always has been and always will be a very important third leg in the stool of military capability. How it is integrated into air force programs is, like the relationship with the scientific community, crucial to the way the United States Air Force carries out its mission.

I hope I have made a good case that, starting with the airmail and its challenge to introduce new and better equipment, the Army Air Forces carried the technological momentum through World War II, and that, after the war, Hap Arnold created the apparatus to apply technological breakthroughs to the air force mission. All in all, as Hap Arnold's leadership illustrates, our greatest strength has been our people. Air Force people have always been number one.

Gen. Jacob E. Smart, USAF (Ret.)

The Casablanca Conference was held in January 1943. Its purpose was to decide how best to continue the war against the Axis powers. The Allied forces had landed in North Africa two months earlier. The French forces there had joined the Allies after initial resistance. The Germans had heavily augmented their forces in Tunisia immediately following the Allied landings. The Allies in Northwest Africa were growing slowly in strength and effectiveness, despite some setbacks when Allied forces encountered seasoned German forces in Tunisia. In contrast, losses of Allied shipping to Nazi U-boats in the Atlantic Ocean areas continued to increase. The British had won at El Alamein and were preparing to renew their attacks on the Nazi forces in Libya. In the Pacific, the Americans had dealt heavy blows to the Japanese forces in air-sea battles off Midway and the Coral Sea. Allied land and air forces were winning costly, but important, land battles against the Japanese in Papua New Guinea and in the Solomon Islands. The Soviets had defeated the Nazi forces at Stalingrad and were preparing to move westward. The outlook for the Allies appeared less grim in the winter of 1942–1943 than in the earlier years, when the Allies could do little more than respond to enemy offensive drives. At long last the Allies had the opportunity to initiate operations of their own design.

President Franklin Roosevelt proposed a meeting with his Allied counterparts, Joseph Stalin and Winston Churchill, and their military leaders to plan for the continuation of the war. However, Stalin demurred, with the result that the meeting was held without Soviet participation at the Anfa Hotel complex near Casablanca, Morocco. The region was occupied by Gen. George Patton's forces. The hotel and numerous villas on the grounds provided ample accommodations for pleasant living and for intensive work. The meeting site and its environs were secured.

At that time I was serving as a member of the Army Air Forces Advisory Council.* About January 9, 1943, I was told that I would accompany Gen.

* The Advisory Council was comprised of two Regular Air Forces officers (Col. C. P. Cabell and myself) and two legally trained officers brought in from civil life (Capt. James Ames and Capt. Harper Woodward), plus administrative staff. Our role was to develop an understanding of matters that required assessment and a (*continued, next page*)

Henry H. Arnold, Commanding General, U.S. Army Air Forces (AAF) on visits to North Africa, the Middle East, India, and China for meetings with the U.S. and Allied commanders. Information about the itinerary and meetings was extremely sensitive and closely held. We were to fly over or near enemy-held territory, so would travel by a bomber aircraft armed to defend itself. Therefore, I was to take no classified material with me. I departed on the night of January 11/12 as an additional pilot on a new B–17F aircraft, and arrived at Casablanca, Morocco, late in the afternoon of January 14. I reported immediately to General Arnold. He announced that the American and British Chiefs of Staff were meeting with the President and Prime Minister to map out strategies for conduct of the war, and informed me that I would serve as AAF planner. He directed me to "Find Al Wedemeyer [brigadier general in the U.S. Army War Plans Division] now and learn what has and is happening. Keep me informed."

Upon reaching Africa, we had heard rumors that important Allied officials were gathering for a meeting in North Africa. However, I first learned of my role when I reported to General Arnold. I was somewhat awed by the scope of my responsibilities. Fortunately, I was not completely unprepared to serve as a planner for the Joint Chiefs of Staff (JCS) and the Combined Chiefs of Staff (CCS) meetings. My functions as a member of the AAF Advisory Council required knowledge of ongoing joint and combined activities. That entailed review of position papers before they were placed on the Chief's (Arnold's) agenda, and papers that reflected the Chief's decisions with respect to them. In most instances, papers pending consideration by the Chiefs were evaluated and synthesized by the Advisory Council. This endeavor gave us an understanding of content and purpose and, in many instances, the pros and cons of the proposal and which body or individual member supported or opposed the action or elements thereof. Incoming papers were prepared by planning staffs. Outgoing papers were prepared by Maj. Gen. John R. Deane, the Secretary of the JCS. At Casablanca, I was charged with the planning role as well as my former role of assessing appropriateness of content—all without the assistance of Advisory Council peers or staff.

Al Wedemeyer welcomed me as a needed additional hand. He explained that the White House had led the American Chiefs of Staff to believe that Roosevelt and Churchill and their principal military advisers would meet in small, informal, highly secret meetings. The American Chiefs had therefore brought only Rear Adm. C.M. "Savvy" Cook (the chief Navy planner), Generals Wedemeyer and Deane, and almost no administrative support. However, Gen. George Patton, whose forces held that region, provided a clerical and

decision by the Commanding General, USAAF and to provide him independent judgments on the relevances and adequacy of proposals to solve recognized problems and to cope with perceived conditions. Perhaps one-third to one-half of our time was devoted to matters of concern to the Joint and Combined Chiefs of Staff.

administrative staff under the direction of Col. Paul Harkins.

Other members of the American military delegation, which had arrived two days earlier, were Gen. George C. Marshall, Chief, U.S. Army General Staff; Lt. Gen. Brehon B. Somervell, Chief of Army Logistics; Adm. Ernest J. King, Chief of Naval Operations; Commander Libby, Admiral King's aide; and King's male stenographer. Adm. W.D. Leahy, the President's military chief of staff, became ill and left the delegation at Trinidad. The delegation had brought few records and almost none of the planning and administrative personnel who regularly supported the Joint and Combined Chiefs' activities. President Roosevelt had traveled to Bathurst on the American cruiser *Memphis* and by air transport from there to Casablanca. In contrast, the British Chiefs had brought their full planning staff from London, their principal representatives in Washington, and other senior British officers as advisers.*

With the help of Wedemeyer and Harkins' files, I began to inform myself about the situation. It was essential that I learn what had transpired and what was to occur next, and then—like Alice in Wonderland—to run in order to stay even.

I learned that the British delegation had arrived a few hours after the Americans had landed, that there had been informal get-togethers of the principals, and that as soon as the Americans discovered the scope of the agenda and the disparity in representation, they had sent for reinforcements. Lt. Gen. Ira Eaker arrived from London, and Lt. Gen. Frank Andrews came from Cairo. Later, Gen. Carl Spaatz, Maj. Gen. John E. Hull, and others came to offer judgments and support.

President Roosevelt was established in a large villa. He was supported by his own son Elliot (newly commissioned as a major, AAF), Harry Hopkins, Averell Harriman (the President's representative in London), and others. Prime Minister Churchill used a nearby villa as his official residence and office. He was supported by Gen. Sir Hastings Ismay and others.

The President and Prime Minister and their principal advisers met with the Chiefs of Staff at dinner on the eve of the first formal meeting. They discussed wide-ranging topics, giving the military contingent some understanding of what the heads of state were thinking, their methods of operation, and what their relationships with each other and their Chiefs would likely be.

* The British delegation included the Prime Minister and his chief staff officer Gen. Sir Hastings Ismay, the Chiefs of Staff, Gen. Sir Alan Brooke, Adm. Sir Dudley Pound, Air Chief Marshal (ACM) Sir Charles Portal, and Adm. Lord Louis Mountbatten. Also present were Field Marshal Sir John Dill, the representative of the British Chiefs of Staff in Washington; Maj. Gen. John Kennedy of the British Army; Air Marshal Sir John Slessor, head of Coastal Command; ACM William Elliot, director of plans; Capt. Charles Lambe, Royal Navy planner; Col. Guy Stewart. British Army planner; and Col. Vivian Dykes, British Army representative in Washington. The British had also brought down a naval command and communication vessel carrying records and a large administrative support staff.

General Arnold later quoted Churchill as saying to the Chiefs, "You are the ones who have the facts and who will make plans for the future." Later events made clear that Churchill might well have added, "The President and I will look over your shoulders while you are doing so."

The Combined Chiefs met formally on January 15. The British had prepared an impressive agenda. They tabled papers supporting their perceptions of conditions confronting the Allies worldwide and of appropriate Allied responses to those conditions. Their papers included an outline plan for the invasion of Sicily once the Nazi were driven from North Africa, a proposal the Combined Chiefs had not previously considered. The unprepared Americans could only react to well-prepared positions, all developed from the British point of view.

Each day thereafter there were one and sometimes two meetings of the Joint Chiefs, followed by a meeting of the Combined Chiefs. Commanders in Chief of Allied forces in the region were called to Casablanca to discuss their respective responsibilities and the current situation as well as ongoing and planned operations with the Chiefs of Staff, the President, and the Prime Minister. Gen. Dwight Eisenhower came from Algiers and spent an afternoon with the Combined Chiefs, the President, and the Prime Minister. He and Robert Murphy, the U.S. consul-general in Algiers and member of Eisenhower's staff, discussed conditions and relationships with the Free French in Algiers as well as the military situation. Field Marshal Sir Harold Alexander and ACM Sir Arthur Tedder came from Egypt to discuss conditions in the Levant as well as in Egypt and Libya. Adm. Sir John Cunningham discussed the naval situation in the Mediterranean. Gen. Charles de Gaulle, then in exile in England, and Gen. Henri Giraud, recent escapee from German prisoner of war status and current commander of Free French forces in French Northwest Africa, met separately with the Combined Chiefs. Each spoke with Gallic emotion of the unhappy status of France and the French people, of what the Allies might do to help France, what the Free French forces could do to help defeat Hitler, and the role each would like to play. The two French generals met jointly with the President and Prime Minister.

We planners attended the meetings of the Joint and Combined Chiefs of Staff and, thereby, learned what action was required in preparation for successive meetings, or otherwise. We planners and Harkins' administrative staff were hard pressed to do what was needed in the very short intervals between meetings. It was not uncommon to brief our principal verbally as we walked into the next meeting. On at least one occasion, we were so unprepared that it was necessary to postpone a meeting of the Combined Chiefs. Often, some of the principals would continue discussions of a particular topic with each other, with advisers, or with planners at meals. Such meetings facilitated exchanges between hierarchical levels, nationalities, and services; they helped develop consensus and, of course, made the work of planners somewhat less difficult.

The American Chiefs would usually meet with the President at least once a day. The President and Prime Minister would meet with each other and with the Combined Chiefs as a group or individually from time to time. Meetings with the President and Prime Minister sometimes produced new directions for the planners. On one occasion, we convened at 9 o'clock in the evening for a lengthy session to respond to their instructions. We worked under considerable pressure.

While the American Chiefs had not brought well-prepared plans and had limited planning capability at Casablanca, they were not without strong opinions on how the Allies should proceed with the war or a determination to do so promptly and realistically. The early meetings provided an opportunity for the principals to make known their own views and to hear the views of others, to stress what each regarded as essential, and to assess and express judgments on the relative worth of proposals made by others and on the priorities to be accorded approved actions. Widely differing views and attitudes emerged in these early meetings.

The Americans were impatient. They wanted a cross-channel invasion of France in 1943 to forestall German occupation of Spain (with the resultant closing of the Straits of Gibraltar) and hasten the defeat of Adolf Hitler. They recognized a need to keep China actively engaged against the Japanese and believed that reopening the Burma Road was essential for supplying Chiang Kai-shek's forces. They wanted the British in India to move promptly against the Japanese in Burma and in the Pacific. They were inclined to believe that the British attached too little significance to the Pacific and Southeast Asia theaters, and too much to Norway, the Mediterranean region, and Europe's "soft underbelly."

British thinking stemmed from the determination to preserve the British Empire and to do so with the least cost in human terms, notably British personnel. Churchill spoke eloquently of the loss of large numbers of the best young British men in past battles, and the likely costs of a cross-channel operation before the Nazi strengths were greatly reduced. The British sensed that the Americans were weakening on the commitment to defeat Hitler first, and then the Japanese, and they were determined to counter this tendency. They clearly intended to prosecute the war at a pace commensurate with capabilities. The British Chiefs of Staff came prepared to defend their requirements for American aircraft, armaments, equipment, and supplies, and for support in training.

The Prime Minister was an additional force to be reckoned with—by the British Chiefs as well as by American participants. Churchill—imperialist, globalist, and grand strategist—displayed the broadest perspective of worldwide conditions and of what might be done about them. He aimed at prosecuting the war with the least cost in human and other resources and in a manner that would produce military and political victories that would lead naturally to a postwar world in which the British Empire loomed large. He obviously believed that he understood conditions and knew better than others what should be done about them. He injected his own thoughts into ongoing proceedings. He pressed for operations in Norway, for putting forces into the Balkans, for inducing Turkey to come into the war on the side of the Allies, and for extending Allied influence and presence in the oil-rich Middle East. On occasions, Churchill (wearing a Royal Air Force flying suit and smoking a cigar) would join the planners and others for drinks and in a friendly, tutorial fashion, expounding on topics he regarded as significant and timely.

The military services held differing views, as did the individual Chiefs of Staff. General Marshall pressed for an early cross-channel operation. He regarded ongoing North African operations and the proposed actions against Italy as diversions of the forces needed for the more important defeat of Germany in Europe, followed by strong operations against Japan.

General Arnold, the farsighted, impatient airman, was determined to employ long-range air strike forces against Germany's war-making capacity and to use American long-range bomber forces in daylight, when air crews could see their targets. He advocated unified direction of Allied strategic air strike forces in order that their destructive power be focused on priority targets. He opposed the employment of U.S. strike forces in night operations and the division of air units among subordinate commanders.

Admiral King, the difficult, consummate sailor, was determined that antisubmarine efforts in the Atlantic not be neglected, that naval operations in the Pacific be recognized as the proper and primary effort to defeat Japan, and that the Allies support naval forces accordingly. He regarded British emphasis on "Germany first" as evidence of their lack of interest in defeating Japan.

ACM Sir Charles Portal, the wise British airman, regarded powerful air strikes against Germany's war-making industries and facilities as essential for successful invasion and subsequent land operations in Europe. Like Arnold, he opposed diverting strike forces for use in attacking targets that held little promise of destruction, e.g., the concrete-covered submarine facilities in France's harbors in the Bay of Biscay.

Adm. Sir Dudley Pound, a quiet listener, advocated highest priority for antisubmarine operations in the Atlantic. Adm. Louis Mountbatten, a competent, articulate egoist, offered his judgments on others' proposals (including the accuracy of a translator's interpretation of remarks by General Giraud, who spoke in French).

Gen. Sir Alan Brooke, soldier, battle-tested before Dunkirk, believed the Americans' insistence on an early invasion of France was unwise. He advocated the capture of Sardinia or Sicily and then Italy, after North Africa was cleared of Axis forces. He pressed for air forces dedicated to supporting surface forces during invasion of Europe and in subsequent land battles.

Both the American and British Chiefs of Staff recognized the need to cope more effectively with Nazi U-boats, to provide supplies to the Union of Soviet Socialist Republics (USSR), and to engage Nazi forces in the west as a means of limiting Nazi strengths opposing the USSR. Both recognized the need to employ French strengths against the Nazis and to assist in the reunification of France.

Each of the seven Chiefs of Staff assessed every proposed action in relation to his own responsibilities and objectives, and each measured worth by his own yardstick. Thus, reaching a consensus was difficult. After many days of debate, it became evident that agreement in detail was not feasible. Identification of priorities and objectives and broad policy statements of how to pursue them would have to serve. Planners and advisers, who had listened more or less dispassionately through days and nights of discussion, undertook to draft words that recognized the responsibilities of each Chief, the essentiality of their respective individual roles, and the intention to integrate military and political endeavors in combined programs to defeat first the Axis Powers in Europe and then Japan's military power. Thus, "decisions" were hammered out for approval by the President and the Prime Minister, including:

1. Give first priority to countering Nazi submarine warfare in the Atlantic.
2. Clear North Africa of the Nazis and then invade Sicily.
3. Build up forces in Great Britain as rapidly as practicable and appoint a combined staff to plan the invasion of France in 1944. (At a meeting of planners, the British Army planner discussed the weather, phases of the moon, and tides that favored certain dates for the invasion on the coast of Normandy. The invasion actually began almost as scheduled, on June 6.)
4. Pursue a strategic air offensive day and night with the objective of destroying Nazi military power at its sources, with first priority to German submarine construction yards and supporting industries.
5. Undertake to bring Turkey into the war on the Allied side.
6. Maintain pressure on Japan and retain the initiative in the Pacific with forces allocated in preparation for full-scale offensive operations as soon as Germany was defeated.
7. Continue to supply the USSR and Chiang Kai-shek's Chinese Nationalist armies to enable them to help drive the Japanese forces from Burma.
8. Reconvene later to plan actions after Sicily was taken.

Moments after the Combined Chiefs left their last formal meeting, and while the planners were gathering papers, an officer appeared and said that President Roosevelt had announced to the press that the Allies would accept nothing less than unconditional surrender by the Axis Powers. That was stunning news. I learned later that the President had acted on impulse, and that Mr. Churchill endorsed his statement. I was certain then (as now) that the planners at Casablanca would not have suggested such a move.

The principal conferees left Casablanca on Sunday, January 24 for their respective destinations. General Arnold proceeded to Algiers, and from there continued his journey to Egypt, Iran, Karachi, New Delhi, other regions of India, and then into southwestern China. He conferred with civil and military officials and visited many deployed military units. I accompanied him, preparing and assisting as I could at formal meetings, except those with Chiang Kai-shek. He returned to Washington by way of Central Africa, the South Atlantic, Brazil, and then northward to reach Washington on February 17.

* * * * *

As the end of the conference approached, the President and Prime Minister invited the conferees to assemble for group photographs. The pictures were duly taken and subsequently appeared in the press and in autobiographies and histories. One of the photographs of President Roosevelt and the Prime Minister with their military chiefs and planners affected my life in an unusual way more than a year afterward. In 1944, while serving as a B–17 bomb group commander, I was shot down and made a prisoner of war. During the interrogation, a Nazi officer asserted that German intelligence had full knowledge of my military service with American and British Chiefs of Staffs, that this service had provided me with knowledge important to German decision-making, and that it was his intention to get needed information from me. To impress me with how much they knew about me, he cited many facts about my background, education, and military assignments, the kind of data that was published in the Army Register and other documents, and then displayed the Casablanca photograph that had been published in the *National Geographic*. This photograph likely led at least one, and possibly two, Germans who were among the conspirators who wanted to overthrow the Hitler regime to contact me. Both sought (in great secrecy) my judgment on the possibility that Roosevelt and Churchill would agree to negotiate a cease-fire on terms other than "unconditional surrender" if the Hitler regime were replaced by a government of respected, loyal German citizens. I do not know if either person was among those involved in the July 20 unsuccessful attempt to kill Hitler. Word reached me later from an unknown "friendly" German and also from a representative of the Protecting Power (Switzerland) that the Gestapo were aware that I had been involved. I therefore believe that at least one of the two who spoke to me was a party to the attack on Hitler.

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Casablanca was a valuable learning experience for me. It enabled me to know persons with whom I would work in the years ahead. It provided opportunity to observe and participate in a small way with the responsible American and British leaders who were working to develop strategies for the defeat of the Axis Powers. It was difficult work. We Americans were unprepared, in part because the President failed to inform the Chiefs of the armed services of the nature of the meetings. Neither the Chiefs nor their advisers had given adequate independent, much less concerted, thought to a proper agenda or to the results that should be sought through discussion and negotiation. Therefore, they came without agreed-upon position papers and with limited planning capability to overcome the deficiencies.

In contrast, the British Chiefs were largely united as to their objectives and the programs necessary to attain them. Their superb staff officers had prepared well thought-out position papers that reflected common, deeply rooted convictions about the significance and roles of the British Empire in world affairs, as well as measures appropriate for extant and foreseeable military conditions. As a consequence, we Americans were forced to react to British positions, at least initially.

Subsequent events confirmed that British thinking on the timing and conduct of land warfare in Europe was more realistic than ours. Subsequent events also confirmed that American thinking, notably Arnold's and Marshall's, on the employment of strategic and tactical air forces was correct.

My experiences at Casablanca reinforced my later conviction that we Americans should work harder in preparing our people for citizenship and for government service. There is a continuing need for citizens in and outside government who are capable and motivated to think about national issues, to distinguish between the nation's interest and the interests of lesser groups, and able to muster the courage to place the nation's well-being ahead of partisan considerations.

There is a continuing need for a large body of military and civil government personnel who stay fully informed and are capable of coping with problems and changing conditions that can be resolved only at the national level. There is an urgent need for a national doctrine aimed at assuring the just and effective employment of our great national strengths, notably the destructive power of military forces, in international relations. The military services give considerable attention to service and joint doctrine. However, there seems to be little interest in developing national doctrine. Without doctrine, decision-makers will almost certainly take (to quote Churchill) "short views and indulge their natural impulses" in both foreign and domestic affairs.

Lt. Gen. Devol Brett, USAF (Ret)

Thank you for your introduction, General Poe. I had hoped that we were going to speak in alphabetical order so I would not have to follow these great warriors, Gens. Jake Smart and Bennie Schriever. General Schriever called Hap Arnold one of his heroes. I also knew and admired him, having gone to school with his son. But as I reflect on the most outstanding officers I have known, the men who are heroes to me, I think of General Smart and General Schriever in particular. They have been role models for me and for countless others.

As an aside, when I was fairly young I had occasion to watch General Schriever and my father (Brig. Gen. George H. Brett) fly P–12s. Later, I spent a couple of summers at Wright-Patterson AFB. At the time, Army brats were not restricted from flying in military airplanes, and General Schriever very kindly took me up. That experience, at age 17, started me on the road to learning how to fly. I have always been grateful to him.

We have each been asked to speak about a notable occurrence or activity that influenced, positively or negatively, our air forces. As I look back on my life, the son of an Army Air Corps officer in the 1920s and 1930s, and then on my own career beginning in the mid-1940s in the Army Air Forces, I can think of many people and events that made a strong impression on me. But most of them affected my own life or career, rather than the Service as a whole. One event, however, though it may seem pedestrian, dramatically changed the way airmen saw themselves. It was the unforgettable day we put on the new blue uniform and became—visibly—the United States Air Force.*

Before I describe that day in my own experience, let me remind you that, for centuries, uniforms have held great cultural significance. Most children are familiar with the armor worn by the Knights of the Round Table. The warriors who fought for the great Khans wore such dramatic uniforms that when they

* On April 8, 1949, Air Force Letter 35–46 stated that the new Air Force blue winter uniform (Shade #84) for men was available for purchase and immediate use. Distribution of blue uniforms would be made when stocks were available. General issue to airmen was expected to occur by September 1, 1950.

appeared on the horizon, the fearsome sight terrorized their enemies. In illustrated American history schoolbooks, the opposing forces during the Revolutionary War are immediately recognizable by their uniforms (or lack of uniform)—redcoats marching in close order, much more formal than the coonskin caps and the buckskins of some of the colonial fighters. Many of us still respond, based on our own family histories and regional background, to the symbolism of the blue and gray in the war between the States, in the Civil War, the blue forces of the Union versus the gray of the Confederacy.

More recently, four of us at this table will remember our uniforms at the United States Military Academy, mainly how uncomfortable they were and how they smelled when the wool got wet. A lot of girls who we tried to hold close when we danced did not like the rows of dress buttons, either. I am sure that General Schriever recalls the handsome uniform worn by members of the corps at Texas A&M. Cadets still wear that splendid uniform, with its shiny brown boots and whipcord riding britches. In other words, from ancient times, uniforms have given soldiers a sense of shared identity and pride in themselves, their comrades, and their units.

Before airmen donned the uniform of the United States Air Force, many attempted to remake Army olive drab in their own images, sometimes to the displeasure of their superiors. Photographs of my father show him in riding-type britches with leather leggings, a long leather coat, a leather helmet with rather ugly goggles, and of course a white, rather long silk scarf. And fighter pilots usually left the top button of their Class A blouse undone. Those touches communicated airmen's sense of their uniqueness. Even today, many effect the old, rakish style, although it is a little more tailored, with the white scarf very carefully tucked inside the flying suit. Although he was gently lampooned, the comic-strip Snoopy, imagining himself as the Red Baron, was mighty proud.

No doubt those here who served in the Army Air Forces also remember the crushed hat of World War II. Some airmen probably wrapped their hats up in a wet towel at night to make sure they achieved that distinctively wrinkled, crushed look. Few pilots left in the grommets, a wire ring designed to stiffen the brim. There are countless pictures of Gen. Carl Spaatz, Gen. Jimmy Doolittle, and other great airmen wearing their fifty-mission crushed hat. (By the way, I have never seen a picture of Gen. Curtis LeMay with anything but a regulation, grommet-stiffened hat on his head. I would not care to speculate about the meaning.)

All those affectations were intended to set airmen apart from other branches of the United States Army. There was no question that the message was, "We don't want to look like them." As a graduate of West Point and an Army brat, I have always felt a strong kinship with Army people, particularly my classmates from the military academy. At the same time, I was very aware that I was an airman and not a soldier, that there was a difference that we wanted known. Even when the law passed that created the independent Air Force fifty years ago, the rank and file did not feel independent as long as we were still wearing the Army brown and khaki. Brown shoes and socks, brown belt, and brown tie—even though the pinks and green were good-looking, it was still an Army uniform. We did not feel we had established our own independent mission until we donned Air Force blue.

I clearly remember the day we changed the uniform. I was a first lieutenant, a fighter tactics instructor in the Air Corps Tactical School then at Tyndall AFB in Panama City, Florida. Our commander sent word down that, after midnight two days hence, we were to wear black shoes and socks, black belt, and solid color blue or black tie. The PX and clothing sales instantly ran out of black socks, ties, and belts. Panama City's one or two small clothing stores also quickly sold out. So, with typical ingenuity, some of the men fanned out as far as Tallahassee to get the necessary clothing for all of us. It did not matter what the shoes looked like, as long as they were black. The same for the belts and ties. Thus, on the appointed day, we at Tyndall were decked out in Air Force blue, or almost. Although I cannot remember seeing anyone in Army brown or anything close to it, our garb was the weirdest assortment of clothing you have ever laid eyes on. Loafers, wing tip shoes, or anything you could apply shoeblack to, and cheap, ugly ties of all kinds. But they were either blue or black, and they were worn with great pride. In only a matter of days, the PX and the clothing stores came out with official Air Force blues—shoes, belts, ties, et cetera. But, on that uniform change date, we were not particular. We knew that at last we were an independent Air Force. The old saying, a bit twisted, applied: clothes make the airman.

Lt. Gen. Thomas G. McInerney, USAF (Ret.)

During my tenure on active duty with the Air Force, I witnessed several operational "turning points" that demonstrated the capabilities of air power. I would like to mention a few that I came to know through personal involvement. When the Berlin Wall went up in 1961–1962, I and a number of F–104 pilots began flying "live oak" missions to escort C–130s down the corridor to keep the western sector of the city open. We also flew escort from Key West, Florida, for surveillance and photography missions during the Cuban missile crisis. I was privileged to work with Gen. Jacob Smart when he was CINC-PAC, and I was with a group of the first forward air controllers to be deployed to Vietnam with an ARVN division.

Among its significant administrative "turning points," the Air Force has undergone major reorganizations, which have altered the way we do business. At the time the Berlin Wall came down, we were called the "objective" Air Force. A fundamental change in our organizational structure came with the realignment of the major air commands that disestablished SAC and TAC. Although identified in different terms, reconfiguring our forces continues.

The incident that I have elected to describe in greater detail here is the impact of air power in the implementation phase of Operation El Dorado Canyon in Libya. In that operation in 1986, when I was commander of the Third Air Force in England, we employed air power to retaliate against Qadhafi and his state-directed terrorism. It was triggered in late December 1985, during the Christmas holidays, when terrorists massacred American tourists in Rome and Vienna. I was then on leave at Berchtesgaden. By the time I returned, JCS had directed EUCOM that the Third Air Force was to prepare contingencies to respond to Qadhafi and Libya's state-directed terrorism.

Between January and April we reviewed a list of options, including different types of targets. The planning group was very tightly controlled. Only I and my director of operations, plus ten people from the 48th Wing, were initially entrusted with the information. The 48th would be the primary executor of the mission; it would fly F–111s equipped with Pave Tack laser guidance systems and 2,000-pound bombs.

The planning assumed greater urgency in March and April after a bomb went off inside a TWA airplane, blowing out a pregnant American passenger. When the LaBelle discotheque in Berlin was attacked not long afterward, we recognized that the time had come to act. By then, we had received corroborating evidence from the British that Qadhafi was directing these acts of terrorism. Despite the cowboy attitude that people talk about, President Ronald Reagan had been extremely cautious throughout the whole process until he was presented with concrete evidence. Once Qadhafi's involvement in the LaBelle discotheque blast was verified, the decision to go forward was made on Wednesday, April 10, 1986.

Gen. Bernie Rogers, CINCEUCOM, was called back to Washington on Thursday to see Secretary of Defense Caspar Weinberger. He was given the ops order, the frag order, by hand, signed by Weinberger, in front of him. The Secretary had a technician type it up, and then he changed the execution date by a day to see if there were going to be any leaks. General Rogers hand-carried it back to EUCOM, where it was transmitted to us. It was then Friday. We were to strike Tripoli late Monday night, at a time of our choosing.

Saturday the wing commander, Col. Sam Westbrook, and I met with Gen. Chuck Donnelly at USAFE Headquarters in Ramstein. We were given two options, which illustrates the flexibility of air power. The first was to take eighteen airplanes through France. Ambassador Walters was meeting with President Mitterrand that afternoon to discuss the possibility. If President Mitterrand did not approve, we would employ the second option, to take six airplanes the long way through Gibraltar, over the sea, all the way in. Prime Minister Thatcher had already given us permission to launch from the United Kingdom. Each approach required a different force, with different tankers.

Late Saturday night, as often happens in warfare, I had been given two options, but told to execute a third. It required taking eighteen attack airplanes the long way. This expanded force and distance meant that we had to transfer about 1.5 million pounds of fuel in the air. We did not then have sufficient tankers in the United Kingdom, or in all of Europe. But thanks to the JCS and Gen. Larry Welch, CINCSAC at the time, more tankers than we had ever seen began arriving Sunday night and Monday, and crews assembled from everywhere. Never before had twenty-three KC–10s been airborne simultaneously, let alone in one tanker task force.

By Sunday night events were moving fast. The tanker task force commander told me he was going to file an international air traffic flight plan. When I asked whether he was afraid the information would be relayed to Qadhafi, he said that we were not going to include Libya. Of course, Qadhafi had a lot of friends in the area. Frankly, SAC had never launched in the real world without a flight plan, so the commander did not know how to get out of England without one. However, two SR–71s had been flying down every day. When I asked how they got there, one of the pilots explained that he was on a classified flight plan that required his flying different legs under different authorities. We decided we would work that way too.

I was also worried about refueling so many airplanes with different tankers. The three squadron commanders who were going to lead wanted to stay with one tanker the whole way. We could only work that plan with the KC–10 because it could be refueled. We figured on three F–111s per KC–10. We planned to launch the tankers from one base and the F–111s from another, and we prepositioned the EF–111s from Upper Heyford. Ultimately, we launched from four bases, a complex arrangement with comm out (communications out), in the United Kingdom. Four different wing commanders and four different support structures made for complicated take-off times and coordination with the British. In Europe, only the United Kingdom could execute the plan. They handled air traffic control because only they had the classified flight plan procedures. We were especially concerned that Soviet overhead reconnaissance would see a bunch of airplanes coming in, and we knew there were tattletales in the Sixth Fleet down in the Mediterranean. Clearly, surprise was extremely important.

Worst of all, leaks started coming out of Washington. As you know, Washington is the only ship that leaks from the top. I started seeing reports in England about a potential strike, which was very troublesome because many lives were at stake. It was the last straw when BBC showed up at the end of the runways at Mildenhall and Lakenheath. In modern warfare, with modern communications, military leaders and planners must become accustomed to continual and often intrusive press coverage.

Very cleverly, the wing commander suggested that we stage a mock NATO exercise named Salty Nation. We would pretend we were getting ready for a NATO tactical evaluation exercise, called without previous notice. Therefore, that day we actually flew more noncombat than combat sorties from Lakenheath. We realized the enormousness of the task that lay ahead. If we wanted eighteen airplanes to arrive on target, we had to launch twenty-four aircraft, which meant having about twenty-nine airplanes prepped and ready to go. At the same time, we had to maintain the tactical deception of the exercise.

The night before the launch, the tanker task force commander and I considered the fact that the tanker crews included women. Although regulations precluded women from flying in combat, we decided not to recompose the crews. They had been training as they were, and there was no time to change and retrain. Under the circumstances, common sense prevailed.

To further complicate the picture, Air Force Chief of Staff Gen. Charles Gabriel arrived at 4 o'clock in the afternoon on the day of the launch because his visit had been laid out a year in advance. All activity was to appear normal, and his schedule was not changed. He had visited the NATO air chiefs the week before and spent the weekend at Ambassador Charles Price's residence in London. When the Chief arrived, we talked to the crews at both Mildenhall and Lakenheath just before launch.

As the crews stepped to the airplanes, the Chief and I called Adm. William Crowe, JCS Chairman, to tell him our people were preparing to launch. The admiral asked if we knew that some Il–76s had been moved to a new location from Tripoli International Airport. We had planned to hit three targets. Qadhafi's headquarters and home, the brain trust of the whole terrorist operation, was the first. Number two was the Il–76s at Tripoli International Airport that were ferrying the terrorists. Number three was a commando training base. The Chairman had learned about the new positioning of Il–76s from his daily satellite downlink. Unbelievably, the air crews in the theaters of war did not get the same information simultaneously. (Today we still have not solved that problem, a major lesson we should have learned.) In any case, we realized that changing the targets at the last minute inevitably creates chaos, so we decided to go against our original targets.

The Chief and I went out to the field to watch the flights take off, beginning at 6:30 in the evening. Mildenhall and Lakenheath are twelve miles apart; the runways are basically parallel. One of the tankers would take off from Mildenhall. At the same time, the fighters at Lakenheath would roll and slide right in, make the turn, and come around, all comm out, with Eastern radar and London MIL coordinated. I only gave them thirty minutes' notice, which, understandably, made them a little upset, but we could not afford a leak. In spite of keeping them off balance and the fact that the wind shifted, the crews were marvelous.

Some of the BBC were still watching the F–111s take off at Lakenheath when the Chief and I drove over to Mildenhall. When you see fifteen KC–10s lined up nose to nose, you know something is going to happen. But luck was with us. The BBC people did not think that Mildenhall was the key base. They thought that we were only launching exercise sorties, so the BBC at Mildenhall left for dinner. It was just a flight of four, two flights of four coming in and launching. Simulated bombs were on all of them, so it was difficult for non-experts to tell whether they were live. When the operation was planned, it would be dark at 6:30, but by May 15 there was still daylight. But temporarily at least, the press contingent was not paying close attention.

We ran into another problem with the wind shift because the tankers had to take off the opposite direction from what we planned. The fighters were going one way, the tankers another, and they had to join up, comm out, in Eastern radar and then transfer to London MIL. The London MIL at Heathrow had by then reached a high rate of evening incoming traffic. Fortunately, each one of the KC–10s had a TACAN on board. The F–111's radar does not allow for easy rejoining, but with that TACAN on, they were quickly able to lock on and move in to rejoin.

Those of us at the wing waited for the 9 o'clock news. Would the BBC report that a massive number of airplanes had launched from the United Kingdom, destination unknown? That an unprecedented number of tankers were in the air? General Gabriel and I finished dinner and went to watch the news. Amazingly, nothing unusual was reported.

We had launched sixty-four airplanes, counting the spares, in comm out. They rejoined from four different places in the United Kingdom—again, comm out—so London MIL and Eastern radar could not vector them. As I said, we feared Russian satellite interception, so we did not want any communications to the airplanes. They rendezvoused and topped off before they went through the Straits of Gibraltar. There were four tankers with three in one cell with three F–111s underneath them, one being refueled at the time. Above that were four KC–10s refueling the KC–10s and refueling the fighters. Only the U.S. Air Force could do the refueling, and only our Air Force could do simultaneous refueling, comm out the whole time, no communications throughout.

The attack phase now began. We were supported by A–6s from two carriers. The A–6 lacked speed and survivability, and, although our planes did not have stealth, the F–111s came in low on the deck with four 2,000-pound bombs and made their toss forty-five seconds before their TOT (time on target). We had not been able to get F–4s out of Germany to deliver the high-speed antiradiation missiles (HARMs), so the Navy used its A–7s. They put their HARMs in the air as we came in; if any missiles came up, they had a potential hit. With the preplanned strikes and the known positions of the SAM sites, we had a rain of missiles for about a forty-five-second to a two-minute period.

The 492d Squadron commander led. (Our people's names are never publicized, for obvious reasons.) The initial bomb, after going 2,700 miles, 5,400 miles round trip, tossed from 24,000 feet, exploded on target on the exact second, 0200. We put nine airplanes on the first target, three on the second target and a parallel run-in, and in Tripoli we came in the long way around behind. We flew "one-way streets" because of the other airplanes coming through. Timing to the second was critical. Those crews performed extraordinarily well even though we had equipment problems and one crew picked the wrong target opposite from the aim point and hit a hotel next to the French embassy. As it turned out, a very high-level terrorist was killed in that mistaken hit, but Qadhafi thought we knew he was there and had targeted him on purpose.

One airplane was lost. We do not know why, but there were a lot of missiles in the air, and one could have connected. Or the plane could have hit the water, because after the mission we learned that Libya's missiles interfered with the F–111's terrain-following radar. Coming in at 540 knots on the deck at night, a pilot can lose 400 feet quickly, especially when a great deal of activity is going on. Moreover, the enemy fired over seventy missiles and, in addition, sent up a heavy barrage of flares and AAA for which our air crews were unprepared since only six of them had combat experience. Nonetheless, they all performed brilliantly.

What did we achieve from this operation? We demonstrated that we can respond swiftly and effectively to state-directed terrorism. Today, the best and quickest tool we have is air power, a means for hitting the target quickly, with precision. We put 54,000 pounds of warheads on Qadhafi, although he was never targeted personally. He used to sleep in a different place every night, and it was his good fortune that he escaped on this occasion when a pilot was not able to bomb a target where Qadhafi happened to be sleeping in a tent next to his house.

As I mentioned, our people transferred nearly 1.5 million pounds of fuel in the air. We proved the importance of tankers being able to refuel tankers when great range is involved. We demonstrated the critical importance of speed and communications stealth. We learned how important it is for all sorts of information to be fed to the crews in the airplanes to give them complete battlefield awareness. It is very disturbing that war fighters still do not get immediate or adequate near-real-time intelligence information.

I believe that air power will be the instrument of choice as we go into the twenty-first century. Therefore, this nation must retain the finest air force in the world. We will, and should, change the way we are organized when the world we are protecting changes. Yet it is important that we meet those organizational challenges effectively in order to maximize our resources. The history of the U.S. Air Force is illustrious. I am convinced that, in the future, the well-being and leadership role of this nation will be assured as long as we continue to produce well-trained, well-equipped people.

The Road to Independence

Air Power Engineer: Maj. Gen. Mason M. Patrick and the Air Force Road to Independence

Robert P. White

In the summer of 1923, in a cloudless sky above Bolling Field just outside Washington, D.C., a student pilot of the Army Air Service soloed for the first time. When he lifted off the grass airstrip moments before, he banked to the right and, turning, followed the Potomac River upstream on the first leg of what would be his successful proficiency flight to become the oldest Junior Military Aviator in the history of the Air Service, and the oldest rated officer ever, in what would become the United States Air Force. Maj. Gen. Mason M. Patrick, Chief of the Army Air Service since October 1921, earned his wings that day at the age of fifty-nine. In December 1927, as General Patrick was about to retire, he flew over Bolling Field again, this time as Chief of the vastly improved Army Air Corps. From his first solo flight to his last active duty sortie, Mason Patrick presided over six years of extraordinary change within the Army Air Service and its successor, the Army Air Corps.

Unfortunately, little is known of this individual who, in retrospect, was responsible for saving a fledgling air force from a variety of self-inflicted wounds and many competing and self-serving outside interests. Nor has there been much study of the Air Service and Air Corps during the interwar period, especially the decade following World War I. In a popular and scholarly sleight of hand, it seems that if one knows the story of Billy Mitchell, enough said. Billy Mitchell and his travails have personified and dominated the era. Mitchell, however, was only part of the story.

When Mason Patrick took over the Air Service in 1921, at the request of his West Point classmate Gen. John J. Pershing, it seemed as if the Army Air Service was in its death throes.[1] The Air Service, with a little over 200 officers, was a mere skeleton compared to its size during the American Expeditionary Force (AEF) days of World War I, and it was embroiled in doctrinal disagreements, fiscal deficiencies and personal antagonisms as well.

At the armistice on November 11, 1918, the Air Service had almost 200,000 personnel; 11,000 planes (of the 27,000 ordered) in 45 aero squadrons; and 48 air fields complemented by 19 supply depots around the country.[2] The acquisition, training and supply pipelines of the Air Service were running at peak capacity on Armistice Day, but late that very afternoon the Air Service began to demobilize. Unfortunately, there had been very little forethought concerning the manner in which demobilization would be accomplished, let alone any consideration regarding the composition of the postwar Air Service. Of course, this should have come as no surprise, given the relative disinterest in American military aviation since the Wright brothers first flew.

This is not to say that no attempts to plan for the future were made before World War I. On the contrary, there was much talk, but little action. Between 1908 and 1913 the United States spent approximately $435,000 on military and naval aviation; by comparison, France spent $22 million during the same period.[3] When one puts American air power personalities in historical perspective, much of the early trench work was done by unsung heroes: Foulois, Fechet, Arnold and Lahm, to name a few. By comparison, although Billy Mitchell uttered not a word about airplanes until 1916, when he began to speak, write, dictate and pontificate about American air power, his was the voice that made headlines. Ultimately, Mitchell's court-martial ensured his martyrdom and enshrined his memory in Air Force history to the exclusion of many other notable air power advocates of the time.[4]

Mason Patrick, Mitchell's boss, was one of those. Patrick assumed the stewardship of America's military aviation organization on two critical occasions, and he held together the wildly competing centrifugal forces swirling in and about the Army Air Service. It must be said that Billy Mitchell contributed mightily to those clashing currents. The conflicting forces could either be brought into harmonious (or at least grudging) balance or else, if left untethered, they threatened to sunder the promise of an independent air force. Although overshadowed to a great extent by the Mitchell controversy and its subsequent notoriety, it was Mason Patrick who engineered and laid the groundwork for independence.[5]

The martyrdom of Billy Mitchell crystallized overnight into Air Force mythology. Propagated initially by his acolytes, Mitchell's gospel of the dominance of air power was carried with missionary zeal to the present day. This is not to say that Mitchell's contributions were unimportant. He was a magnificent air combat leader in World War I, synthesizing the best of French, Italian and British air doctrine, and after the war, his sensationalist-oriented mastery of the media contributed greatly to the public's awareness of the role of air power and to Mitchell's own quest for Air Service independence.

But it was Patrick, as Billy Mitchell's superior, who manifested an unerring sensibility in guiding the Air Service to a *realistically achievable* degree of autonomy. Initially, keeping the Air Service breathing, let alone gaining its autonomy, was a massive and problematic undertaking. From October 1921 through 1927; it fell to Patrick to orchestrate the behind-the-scenes policies and politics that eventually resulted in the creation of the U.S. Army Air Corps in July 1926, along with an impressive five-year procurement program.[6] Mason Patrick was chiefly responsible during this period for ensuring the creation of a firm foundation for an independent Air Force of the future.

Patrick's aversion to sensationalist headlines only enhanced his effectiveness as an Army insider and an aviation advocate. Patrick agreed with much of what Billy Mitchell espoused, and he voiced many of those same opinions in his congressional testimony, speeches and doctrinal statements. But Patrick's moderate approach was based on firm grounding in doctrinal justification. Patrick was practical enough to know that the Air Service's survival depended on a doctrine that explicitly supported the need for autonomy. Most important, though, it was the *degree* of autonomy pursued by Patrick (in various ways and at various times) that made him different; in the long run he was much more effective at enhancing the credibility of the Air Service than Mitchell. It was Patrick's political "horse sense," influence and determined agenda that ensured a victory with the ultimate creation of the Air Corps in 1926.[7]

To understand the enormous challenge that Patrick faced, one must appreciate the historical development of American military aviation, starting from the day in 1903 that the War Department "lost" a $50,000 investment when Dr. Samuel Pierpont Langley's ill-fated "aerodrome" monoplane toppled into the Potomac.[8] This embarrassment, coupled with the U.S. Army's innately orthodox approach to new technology (a distinct lack of appreciation for the airplane as a weapon), a conservative congressional fiscal policy, and America's inherent isolationism, severely dampened any enthusiasm for military aviation until the nation's entry into World War I.[9] In Europe, on the contrary, aviation enjoyed immense and enthusiastic support.[10] The appreciation of air power, both military and civilian, was initially almost wholly lost on the American psyche. The advances that did occur in American aviation were due to a handful of dedicated entrepreneurs and scientists whom one historian termed the "invisible establishment."[11] It took an acutely embarrassing performance during the 1916 Punitive Expedition into Mexico and a world war to eliminate this lethargy and kick-start American military aviation, which by this time lagged far behind the Europeans.[12] As a result, during World War I U.S. pilots mostly flew second-hand European aircraft and employed European air doctrine, there being no indigenous American doctrine developed prior to the war.[13]

In revolutionary terms, World War I was to American military aviation what the Spanish American War had been to the U.S. ground army: a call for a dramatic reappraisal and new courses of action. The reassessment occasioned by the Great War led to many contentious confrontations not only between soldiers and airmen but among airmen themselves. These disputes would not have been so disruptive if not for the fact that they were taking place in the midst of a war. General Pershing, as the AEF commander, was not only caught up in doctrinal distractions, but he had to contend with the inflated egos of Billy Mitchell and Benny Foulois, which ultimately led to the appointment of Pershing's good friend, Brig. Gen. Mason Patrick, as Chief of the Air Service, AEF.[14] Pershing fully realized the capabilities and disabilities of his two top Air Service officers: Mitchell was dogmatic, flamboyant and an excellent combat commander; Foulois, while less capable as a combat leader, was the best "homegrown" senior officer the Air Service had produced up to that time. But neither was a good administrator. Pershing put the AEF Air Service leadership problem into perspective when noting that they were "good men running around in circles."[15] To get the Air Service to fly in single formation, Pershing appointed one of the strongest administrators he knew, a trusted friend and West Point classmate.

Mason Mathews Patrick graduated second in his 1886 West Point class. His high class standing allowed him to choose his career field, and Patrick chose to be an engineer.[16] It was a job he performed with drive and administrative skill up to the moment that Pershing asked him to take over the AEF Air Service. Patrick's no-nonsense approach brought order to the personality-induced chaos that had engulfed the Air Service. That Pershing had to go outside the Air Service to find a commander points up a major shortfall that would continue to plague the young air arm: lack of capable senior leadership.[17] As General Patrick later noted in his diary, Pershing might well have dismissed both Mitchell and Foulois had other experienced airmen been waiting in the wings.[18] With Patrick in charge, the AEF Air Service began to provide the much needed support that Pershing desperately required, but there were still problems with the way Mitchell and many of his contemporaries viewed their ultimate utilization as a combat arm. The organizational arguments and the question of the capabilities of air power that took root during the war would pit airman against soldier for the next forty years, but the issue would be most divisive in the years immediately following World War I.

At the close of the war Mason Patrick remained in Paris to assist Pershing and the American peace delegation. Patrick made it clear that he did not wish to continue as head of the Air Service.[19] Maj. Gen. Charles T. Menoher, a straightlaced infantry officer who had commanded the Rainbow Division on the Western Front, was appointed the Air Service Chief, the job Billy Mitchell coveted. The inevitable clash of wills between Menoher and Mitchell ultimately resulted in the removal of Menoher by Secretary of War Weeks.[20]

Pershing again asked Mason Patrick to head the Air Service. Patrick agreed, and on October 5, 1921, he found himself as Air Service chief due to command difficulties which centered primarily on personality problems. Other long-standing factors—the evolution of aircraft technology, new air war fighting concepts and a dearth of funding—heightened tensions within the Air

Service itself and especially in the relationship of the Air Service with the War Department.

Mitchell had returned to the United States in March 1919 with his visionary blueprint for a new military policy based on the omnipotence of air power, but he mistakenly assumed that everyone would fully appreciate and readily implement his vision once he was in charge. Again Patrick attempted with a steady and knowledgeable hand to rein in Mitchell's traits of sensationalism and uncompromising character. In fact, even Sir Hugh Trenchard, Chief of the Royal Flying Corps during World War I, commented about his friend Mitchell: "If he can only break his habit of trying to convert opponents by killing them, he'll go far."[21]

On the road to Air Service independence the Patrick-Mitchell relationship was only part of the story. Patrick also faced challenging relationships with the War Department heads and the General Staff; the Navy (especially Josephus Daniels and Admiral Moffett); Presidents Harding and Coolidge; key congressional air activists of the era; industrialists; inventors; and a group of Young Turks (besides Mitchell) within the Air Service itself.

In other words, Patrick was charged with bringing order to an organization that seemed to be in conflict with every other federal entity in Washington and beyond. But, given his stature and good standing within the War Department and Congress, Patrick was able to push Air Service ideas that would have been greeted with derision if voiced by die-hard air power advocates. In this endeavor, Patrick was not in the least bit obsequious, nor was he averse to a good fight. His confrontations with congressional committees, members of the War Department, the Navy Department and some of his own officers demonstrated his intelligence, wit, determination and charm.

What were Patrick's ideas about air power? Quite simply, he viewed air power in much the same light as Billy Mitchell did. Patrick knew the value of air power, but most important, he grasped the *limitations* as well as the *capabilities* of air power at that time. This is not to say he saw air power as relatively static—quite the contrary. Patrick was a professionally schooled engineer with an agenda. His agenda concerned commercial aviation development, Air Service officer professionalization, the development of air power doctrine, and legislative initiatives that would set the Air Service on the path to independence. With regard to the first of these issues, commercial aviation, when Patrick took over as Chief of the Air Service, he decried the abysmal condition of the aircraft industry. He was a firm believer in the vitality of the commercial and civil aviation infrastructure, and he set to work, in his own way, to turn promise into reality. It was obvious to Patrick that a viable aviation industry had to be in place prior to a conflict; to play "catch-up" after the start of the war would almost guarantee failure. During the war Patrick had learned that the average life of a single-seat fighter was six weeks.[22] Patrick was determined to assist the aviation industry by eliminating a source of direct competition with commercial manufacturing: the Air Service's Engineering Division at McCook Field, which was tasked with the design and prototype production of new aircraft. Patrick ordered the division to halt current and future design work on new Air Service aircraft. Instead, the Air Service Engineering Division became responsible for the testing and acceptance of new aircraft designs submitted by commercial manufacturers. As he attested during the influential Lampert hearings in 1922, Patrick was convinced that the aircraft industry could design and produce first-rate military aircraft.[23]

Patrick also initiated a move to eliminate the requirement for an aircraft company to sell its design rights to the government, thereby losing all patent protection. Patrick successfully lobbied Assistant Secretary of War Dwight Davis, who supervised all War Department procurement, to change the rule concerning proprietary design rights. Davis eventually ruled that the government would "recognize the principle of proprietary design rights" for aircraft manufacturers.[24] Thus, Patrick could invoke a sole-source requirement, due to the patent on a particular aircraft design, and be assured that the company would be relatively well positioned to provide a good product. The competitive bidding process, in which the lowest bid almost invariably won, had led to major quality control problems and numerous bankruptcies.[25]

The need for separate Commerce Department oversight and control of commercial aviation in the United States was another of Patrick's themes. Here, Mitchell and Patrick differed. Mitchell campaigned for an all-inclusive federal Department of Aeronautics that would control all aviation assets—military, commercial and civil.[26]

Patrick was indeed ahead of his time, and stayed ahead of his detractors as well. He initially envisioned an Air Corps and Army relationship that was analogous to what the Marines and the Navy enjoyed: separate services within the same department. He supported full autonomy, a unified and separate air force, but it would be achieved by a gradualist approach. He had a road map to get there, and the route was through legislation. A December 19, 1924, letter to Secretary of War Weeks explained in a nutshell what General Patrick had in mind for the future of the Air Service:

> I recommend that legislation be prepared at once to create an Air Corps; although I believe the ultimate solution of the national defense problem is a Department of National Defense, with the air, land, and sea forces as coordinate parts thereof. In the interim the best solution to the immediate problem with regard to the Air Service is the passage of the proposed legislation to create an Air Corps. Operating under the Second Assistant Secretary of War, it can be advancing toward the position it would logically assume in a Department of National Defense.[27]

Unequivocally, Patrick was for an independent air force, but unlike Mitchell, Patrick had a precise road map to get there. Patrick's pièce de résistance was his 1924 proposal that ultimately led to the creation of the Air Corps in 1926. With such a success, if anyone can claim bragging rights, it was Patrick. Granted, due to political pressures, Patrick did not get all he asked for, but his achievement was a major step toward recognizing the unique status of the air force as a whole, the need for rated officers to fill command positions, and funding for a massive aircraft acquisition program.[28]

Patrick not only engaged on the legislative front but he also entered into a raucous and tenacious struggle involving new technology and new doctrine, both of which bumped up against hard political realities. In his attempt to institutionalize new doctrine, Patrick spoke and lectured regularly at Leavenworth and the Army War College about the capabilities of air power. The emphasis on new doctrine was facilitated by the professional education of a relatively small coterie of Air Service and Air Corps pilots at the Air Corps Tactical School. Patrick did not agree with all of the ideas that were coming out of the school, but he heartily endorsed its educational and professional benefits. An intense camaraderie developed among the school's graduates and especially among its faculty. This group of officers and their beliefs set them squarely at odds with the War Department bureaucracy and the Department of the Navy. They called for resource reallocation and development of a war-fighting doctrine that inherently internalized the rationale for service independence, both causes supported by Patrick. In effect, the professional military education of the time, rationalized via doctrine, justified the need for service independence.

What made this doctrinal and independence debate so interesting is that it was based to a great extent on unproved theories, and what many would say were futuristic fantasies. If the Air Service was largely, if not exclusively, tied by doctrine to the ground force mission, there existed no rationale to support autonomy, and there would be no need for additional monies to support the infrastructure and mission of a separate service. General Patrick keenly appreciated the critical aspect that doctrine played in the resource debate, and he judiciously supported principles that best supported an independent air force. At the same time, he never underestimated the importance of the airman's support of troops on the ground. In his final report at the conclusion of World War I, he urged that ground attack (close air support, and interdiction to a lesser extent) be greatly enhanced, and he was true to this belief throughout his tenure as Chief of the Air Service and Air Corps.[29]

By implementing a detailed plan to obtain independence that contained the critical aspects of legislation, education, doctrine, commercial and civil aviation initiatives, and a good mix of public and private politics, Patrick proved to be an exceptionally far-sighted Air Service Chief. He was practical in his outlook as well as a progressive visionary in his quest to obtain as much autonomy for the Air Service as possible. His was a balanced and successful approach to air power advocacy. Unlike Billy Mitchell, Patrick represented an era of planned evolutionary change, accomplished through competitive revolutionary theories within a conservative regulatory tradition. Against immense odds, the Air Service, under Patrick's guidance, was put on a precise heading: a flight path to independence.

Notes

1. Mason M. Patrick, *The United States in the Air* (Doubleday, Doran & Co., Garden City, N.Y., 1928), pp. 82–85, 89–91.

2. Mauer Mauer, *Aviation in the U. S. Army, 1919–1939* (Center for Air Force History, Washington, D.C., 1987), pp. xxi–xxii.

3. Charles J. Gross, "George Owen Squier and the Origins of American Military Aviation," *The Journal of Military History*, Jul 1990, p. 287.

4. Alfred F. Hurley, *Billy Mitchell, Crusader for Air Power* (Indiana University, Bloomington, 1975), p. 12.

5. In addition to Hurley, see Isaac Don Levine, *Mitchell, Pioneer of Air Power* (Duell, Sloan & Pearce, New York, rev 1958); Burke Davis, *The Billy Mitchell Affair* (Random House, New York, 1967); and Roger Burlingame, *General Billy Mitchell* (McGraw Hill, New York, 1952). Each of these books, written in the popular genre, have flaws and biases that tend to glorify Mitchell's actions and denigrate, downplay, or simply dismiss those individuals who were not in agreement with Mitchell. In the case of Mason Patrick, all three authors tend to dismiss Patrick as a hidebound obstructionist concerning Air Service independence, and too much of a traditionalist in the General Staff mold. However, Patrick's congressional testimony and personal correspondence indicate that he was ideologically compatible with Mitchell. See Record Group (RG) 18, Series 321.9 and Entry 228, Boxes 1–8, National Archives (NA).

6. See RG 18, Series 321.9, "Air Corps Act," Box 484, NA. Mason Patrick and his staff (including Maj. Herbert "Bert" Dargue, Maj. W.G. Kilner, and Capt. Ira Eaker) drafted the legislation for what ultimately became the 1926 Air Corps Act. See file A–1, Jan 29, 1926, for Ltr (w/attachments), from Brig. Gen. J.E. Fechet, Acting Chief of Air Service, to the Secretary of War.

7. For an excellent dissection of Billy Mitchell's court-martial, see Michael L. Grumelli, *Trial of Faith: The Dissent and Court-Martial of Billy Mitchell* (unpublished Ph.D. dissertation, Rutgers University, New Brunswick, N.J., 1991).

8. Juliette A. Hennessy, *The United States Air Arm, April 1861 to April 1917* (Office of Air Force History, Washington, D.C., 1985), pp. 20–21.

9. I.B. Holley, *Ideas and Weapons* (Office of Air Force History, Washington, D.C., 1989), pp. 25–38; Robert Frank Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force, 1907–1960* (Air University Press, Maxwell AFB, Ala., 1989), Vol. I, pp. 15–19; R. Earl McClendon, *Autonomy of the Air Arm* (Air University, Maxwell AFB, Ala., 1954; Air Force History & Museums Program, Washington, D.C., 1996), pp. 1–6.

10. Richard P. Hallion, *Rise of the Fighter Aircraft, 1914–1918* (Nautical & Aviation Publishing Co. of America, Baltimore, Md., 1984), pp. 2–4; C.V. Smith, *Aviation: An Historical Survey from its Origins to the End of World War II* (HMSO, London, 1970), chap. 1.

11. Gross, "George Owen Squier," p. 288.

12. Alfred Goldberg, *A History of the United States Air Force, 1907–1957*, (D. van Nostrand Co. Inc., Princeton, N.J., 1957), pp. 9–10. For a detailed and complimentary account of American military aviation development and logistical support (or lack there-

of) during this period, see Roger G. Miller, *Keep 'Em Flying: A History of Air Force Logistics from the Mexican Border to the Persian Gulf* (Air Force History & Museums Program, Washington, D.C., 1997), unpublished manuscript, pp. 45–58.

13. See Lee Kennett, *The First Air War, 1914–1918* (Free Press, New York, 1991), pp. 93–113; R.R. Flugel, *United States Air Power Doctrine: A Study of the Influence of William Mitchell and Giulio Douhet at the Air Corps Tactical School, 1921–1935* (unpublished Ph.D. dissertation, University of Oklahoma, 1965), p. 30; also see Holly, pp. 50–63.

14. John J. Pershing, *My Experiences in the World War* (Frederick A. Stokes Co., New York, 1931), Vol. II, p. 50; see also Patrick, *United States in the Air*, pp. 3–8.

15. Patrick, *The United States in the Air*, p. 6.

16. United States Military Academy, *Official Register of the Officers and Cadets of the U.S. Military Academy, 1885–1892*, Class of 1886, USMA Archives, p. 10.

17. If it were not for the actions of Congress, the Air Service would have had even fewer experienced officers when World War I began. Before the war, neither the War Department nor the Signal Corps supported the Aeronautical Division to any great extent. In fact, the Signal Corps had to be prompted by Congress in 1913 and again in 1914 to submit legislation concerning flight pay and for the expansion of the military aviation program. Even then the 60 officers and 240 enlisted men that were approved for the Aeronautical Division constituted less than 0.4 percent of an Army that totaled 98,544. What exacerbated the situation was that most of the officers were volunteers from other branches, serving four years and then returning to their original career field. See Alfred F. Hurley and William C. Heimdahl, "The Roots of U.S. Military Aviation," in *A History of the United States Air Force*, Bernard C. Nalty, ed. (Air Force History & Museums Program, Washington, D.C., 1997), Vol. I, pp. 26–28.

18. Daniel R. Mortensen, "The Air Service in the Great War," in *History of the United States Air Force*, Nalty, ed., Vol. I, pp. 54–60.

19. Patrick was indeed adamant about not continuing as Air Service chief, stating in his diary while still in Europe: "I do not want to have anything more to do with the Air Service after I get back. I shall be glad to lay down the burden I have been carrying and then at home to fall at once from my high estate. It will be quite a fall, but I am not going to mind it much, provided I get off in a[n engineering] district somewhere and can just have *enough* to do, not too much." Unpublished diaries, Maj. Gen. Mason Patrick, Jan 8–July 14, 1919, entry for May 6, 1919, Mason M. Patrick Diary, United States Air Force Academy Library.

20. Futrell, *Ideas, Concepts, Doctrine*, Vol. I, p. 37.

21. H.R. Allen, *The Legacy of Lord Trenchard* (London, Cassell & Co., 1972), p. 82.

22. Patrick, "Report of the Chief of the Air Service," in *United States Army in the World War, 1917–1919* (GPO, Washington, D.C., 1948), p. 278; Kennett, *The First Air War*, p. 94.

23. U.S. Congress, House, *Report of the Select Committee of Inquiry into Operations of the United States Air Services, House Report No. 1653* (GPO, Washington, D.C., 1925). [Otherwise known as the Lampert Hearings].

24. John B. Rae, "Financial Problems of the American Aircraft Industry, 1906–1940," *Business History Review*, Spring 1965, pp. 46–48.

25. Edwin H. Rutkowski, *The Politics of Military Aviation Procurement, 1926–1954*, (Ohio State University Press, Columbus, 1966), passim.

26. William Mitchell, *Our Air Force* (E.P. Dutton & Co., New York, 1921), pp. 200–203.

27. Memorandum for the Secretary of War, January 29, 1926 (with attachments), RG 18, Series 321.9, Box 484, "Air Corps Act," NA.

28. Billy Mitchell thought very little of Patrick's 1924 initiative, and when it was passed into law in 1926, Mitchell derided the results as quite inadequate because total independence was not achieved. Mitchell's attitude was unfortunate in that Patrick had smoothed things over during an ugly incident in the last months of Billy's first marriage,

when Mrs. Mitchell contacted senior Army officers about Billy's "recent erratic conduct." Patrick also went to bat for Mitchell with Secretary Weeks and supported Mitchell's reappointment as Assistant Chief in 1925. See Burke Davis, *The Billy Mitchell Affair* (Random House, New York, 1967), pp. 128–131, 203–204.

29. Patrick, "Report of the Chief of the Air Service," pp. 231, 234.

The U.S. Army Air Corps and the Search for Autonomy, 1926–1943

Roger G. Miller

By the time the United States entered World War I in April 1917, the European powers had learned the vital importance of aviation in the roles of reconnaissance and observation, tactical support, and, to a lesser extent, bombardment. The American Army had to digest quickly the crucial lesson already absorbed by the Europeans: that modern armies could ill afford to be without air power. Control of the air was a necessary preliminary to victory. By November 11, 1918, that lesson had been learned, and learned well. "Military forces can never be efficiently . . . operated without an air force," Gen. John J. Pershing, Commander of the American Expeditionary Force, affirmed in 1919.[1] Two stipulations, lessons of combat on the Western Front, qualified this conclusion. First, most Army leaders agreed that as important as aviation had become, it had failed to alter the essential nature of warfare; air power by itself could not influence the outcome of a war. "The arrival of new weapons operating in an element hitherto unavailable to mankind will not necessarily change the ultimate character of war," the Morrow Board affirmed in 1925. "The next war may well start in the air but in all probability will wind up, as the last one did, in the mud."[2] And second, U.S. Army leaders agreed that Army control of aviation was a necessity. "A military air force is an essential combat branch," Pershing asserted in 1920, "and should form an integral part of the army."[3]

For most airmen, however, experience on the Western Front suggested something different. Appalled by what they had seen in the trenches, entranced by the ideas of a small number of theorists, they came to believe that air power could be the decisive factor in war. And victory through air power, they concluded, could best be attained by an air force independent of ground leaders ignorant of the opportunities inherent in this new arena of warfare. In the biting words of Brig. Gen. William "Billy" Mitchell, a leading spokesman for the cause of independence, "to entrust the development of aviation to either the Army or the Navy is just as sensible as entrusting the development of the electric light to a candle factory."[4]

This controversy between ground officers who knew the value of air power to the Army and wanted to maintain aviation as an important auxiliary and airmen who sought to develop the full potential of air power by separating aviation from the Army dominated the history of military aviation prior to World War II. Gradually, the separatists won. The Army Air Service was established on June 4, 1920; the Army Air Corps on July 2, 1926; GHQ Air Force on March 1, 1935; and the U.S. Army Air Forces on June 20, 1941. A final organizational change on March 9, 1942, gave the airmen autonomy, but not yet independence. Under this organization, the U.S. Army Air Forces implemented and accomplished a strategic bombardment campaign of massive proportions that reduced German and Japanese production facilities, transportation systems, and cities to rubble. The performance of the U.S. Army Air Forces in its strategic and tactical roles during World War II earned independence from the U.S. Army on September 18, 1947.

Contrary to popular belief and traditional versions of history, it was to the advantage of military aviation that the Air Corps remained part of the U.S. Army during the period between 1926 and 1942. Army leaders believed that through such half measures as creating the Air Corps and GHQ Air Force they had ensured that land-based military aviation would remain the property of the U.S. Army. What they had actually accomplished, however, was to provide a protective nest within which Air Corps leaders could nurture their fledgling force. The U.S. Army Air Corps thus had the opportunity during the 1930s to gird itself with doctrine and mission, appropriate equipment, and savvy leaders, protected to a great extent by the U.S. Army from presidential and congressional budget-cutting and the need to develop, fund, and justify a separate support infrastructure. When the opportunity to demonstrate maturity arose, the Air Corps was prepared. By forestalling early independence, U.S. Army leaders ensured that independence and the ability to act independently came at the same time. One need look no further than to the words of the commander of the Army Air Forces during World War II. "Despite popular legend we could not have had any real power much sooner than we got it," Henry H. "Hap" Arnold later wrote. "By that, I mean the genuine nucleus of air power, able to expand quickly enough to meet whatever demands were made upon it."[5]

To understand the Air Corps during the 1930s one must begin by recognizing that, despite his great ability as a combat commander and his effectiveness as an oracle of air power, and for whatever good his flamboyant actions accomplished, Billy Mitchell thoroughly poisoned the well. Assuming the aspect of a messianic prophet, Mitchell came to believe that those who opposed him and his ideas were either stupid, immoral, or criminally negligent. His targets ultimately included not only Congress, Presidents, and the U.S. Navy, but also his own War Department. He failed to accept that budget austerity was as much a part of the problem as pettifogging generals and admirals with doctrinal ideas firmly rooted in the previous century. His attitude lent a special stridency and temper to his arguments and justified, in his own mind, any measures that he took. Mitchell's legacy and tactics passed to later Air Corps officers James E. Fechet and, especially, Benjamin D. Foulois, whose intemperate claims, constant complaints, and willingness to appeal to Congress and the public outside the chain of command alienated the War Department between 1928 and 1935. Initial distrust became outright hostility, and Army leaders ceased listening to their own airmen. In response, airmen developed a persecution complex in which the bureaucracy—the Army leadership, War Department, Executive Branch, Congress, Navy—was hostile to the air arm.[6]

Yet airmen did face legitimate obstacles that fueled the agitation for independence. Undoubtedly, the most important of these was Army unwillingness to recognize the potential of the airplane to become a decisive weapon and to accept a doctrine that sought to exploit that capability. In other grievances, separatists too often felt that they had little say in their own future. The Army promotion system denied them a voice in the higher levels of Army councils, the General Staff system provided a veto over aviation initiations, and the few senior airmen lacked access to the national leadership. This situation led them to make end runs to Congress, newspapers, and the public. Another factor was ennui, the boredom of a military force in peacetime, particularly when it lacks a credible outside threat. Even the uncomfortable Army uniform became a bone of contention. In the final analysis, budget problems were what fueled the push for independence, and abundant evidence suggests that had military aviation of the 1920s and 1930s developed during a period of abundant funding, airmen would have been less vocal. Denied the resources they believed necessary to their mission, however, Air Corps leaders fought for independence in a large part because they believed that independence would give them access to the budget.[7]

The conflict over the budget reflected two opposing views of military doctrine. U.S. Army leaders throughout the interwar years consistently maintained that trained, experienced personnel were the key to victory in war. Successive Army chiefs of staff logically and correctly stressed a balanced Army led by well-trained officers, and opposed supporting one branch of the service at the expense of the others.[8] Air Corps leaders, in contrast, placed their faith in technology, which was inordinately expensive. Between 1928 and 1933, Air Corps leaders consistently sought a disproportionate slice of the budget to fund that technology. While airmen sought independence for many reasons, one of the most significant was certainly access to the annual budget seemingly denied the Air Corps by the War Department.

Aviation writers and historians have generally accepted the claims that Army leaders unfairly starved the air arm of funding and that the Air Corps would have realized more of its potential had it been independent of the Army. Comparison of the annual appropriations between fiscal years 1926 and 1940 appears to support such claims. Generally speaking, the differences between the dollar amounts requested by the Air Corps and those approved by the Secretary of War during this period far exceeded similar differences between either the War Department and the Executive Branch or the Executive Branch and Congress. But it is the budget process that explains this circumstance, not an Army conspiracy. Army leaders were up against the parsimony of the Bureau of the Budget in the Executive Branch and pacifism in Congress. Between the two, the Bureau of the Budget was the greater hurdle. It spoke for the President, and thanks to the Budget and Accounting Act of 1921, once a decision was made, the War Department could not appeal the results to Congress. The Army, under the fiscal restrictions of the 1920s and 1930s, argued regularly for additional appropriations, but it was forced to bow to reality, making do with what it could get. Logically and justly, its leaders emphasized the whole Army, avoiding expensive programs that benefited part of the force to the detriment of the others.[9] The Executive Branch established basic budget guidelines to be followed by all parts of the government including the War Department, which submitted its budget within those parameters. Congress tended to pass the budget sent by the Executive Branch. The Air Corps, however, especially between 1928 and 1933, consistently submitted budgets far larger than the funding guidelines could accommodate.

At the height of the Great Depression, Air Corps leaders used the Five-Year Program established by the 1926 Air Corps Act as justification for outsized requests. The most significant provisions of the Air Corps Act of July 2, 1926, authorized the Air Corps a total of 1,650 officers and 15,000 enlisted men—an increase of 403 officers and 6,240 enlisted men—and provided for a total of 1,800 serviceable aircraft all to be reached by equal increments beginning in 1928. This Five-Year Program promised much, delivered much less, and inadvertently caused a serious rift between the Army and its airmen. Congress failed to appropriate sufficient funds, and the President determined to fund the program by economy in other areas. In short, for five years the Air Corps was built with money and men taken from the rest of the U.S. Army. Then, when the Great Depression set in, money literally dried up. The number and quality of aircraft lagged behind the expansion program, as did the numbers of officers and enlisted personnel. According to airman Lt. Gen. George H. Brett, intimately involved in this fight for air independence, it did not matter to the Army Air Corps leaders that money was severely limited; they still expected the Five-Year Program to be fully funded, even at the expense of the rest of the Army.[10]

And it was. The truth is that the air arm received a greater percentage of the military budget than its size justified, and it did so largely because Army leaders recognized that technology was expensive. Between 1920 and 1934, the Air Corps spent between 13.1 and 22.7 percent of the Army's annual budget. On the average, this branch—which comprised about 11 percent, or slightly over one-tenth, of the Army—spent 18.2 percent, almost one-fifth, of the annual budget each year. In 1931 alone, an Air Corps one-tenth the size of the Army received 20 percent of the annual appropriations for the year.

And the ground Army's technology suffered accordingly. It was much less well equipped by the early 1930s than the Air Corps. In 1934, for example, the Army had several hundred inferior light tanks of World War I vintage; of the new light tanks, the Army had 12 on hand and 64 on order. The field artillery was still equipped with the World War I French "seventy-five." The replacement for this weapon was markedly superior, but the Army had none. Throughout this period the Army asserted that the infantry won battles and wars, but this belief failed to translate into budget primacy. The 1903 Springfield rifle was arguably the finest infantry weapon of its day; however, by 1934 the Army had developed a superior semiautomatic weapon. It only had 80 with another 150 on order. And the Army was also far behind the times in developing a modern .50 caliber machine gun. Transport too remained in pitiable condition. Most Army vehicles, mostly commercial types dating from World War I, were unsuitable for military use and hard to maintain. Only in 1934 and 1935 did the Public Works Administration provide $10 million to fund partial mobilization for the Regular Army and National Guard. The U.S. Army ground forces were at least as badly off as the Air Corps. The Chief of Staff in 1934, Gen. Douglas MacArthur, noted that while the Army had failed to meet the Five-Year Program because of the drastic impact of economic conditions of the times, the Air Corps was reasonably well equipped, and some of its aircraft, the Martin B–10 especially, were comparable or superior to any aircraft in the world.[11]

The Air Corps also benefited in the area of manpower. The Five-Year Program required the Army to man the Air Corps fully even at the expense of its other branches. Under the Five-Year Program some 6,240 men transferred to the Air Corps, including one man from the Indian Scouts. As of 1929 these transfers had forced the army to inactivate five battalions of infantry and most of a field artillery regiment. Additionally, other items not envisioned under the Air Corps Act of 1926 had to be funded, including the costs of operations, research, technical construction, housing, and higher grades and special ratings for enlisted men. The Army accomplished these, as well, by curtailing activities and reducing troop strength further. In summary, Air Corps strength under the Five-Year Program expanded at the expense of the rest of the Army.[12]

The government and the Army, in short, did the best it could for its air arm, often at the expense of other missions. The air arm failed to receive all the support its leaders deemed necessary, less because of ignorance or neglect than because Army leaders refused to sacrifice the whole Army to fund one visionary branch that relied on, as of the mid-1930s, an unproven weapon. Further, there is little to suggest that an independent air force would have fared better. An independent force, in fact, would have been an obvious, vulnerable target for budget cutting. To repeat, its technology was both expensive and unproven.

The budget situation began to change after 1933. Jeff Underwood, in his excellent *The Wings of Democracy*, suggests that Air Corps leaders became smarter, ceased agitating for independence outside the chain of command, and turned their attention to advertising air power through spectacular demonstrations. There is some truth to this. Hap Arnold, for one, had learned his lesson after being exiled to Fort Riley in 1925. But, in fact, agitation for independence did not cease after 1933; it simply shifted headquarters. When Army leaders selected Frank Andrews to command GHQ Air Force in 1935, they unwittingly created a new center for air power advocacy. Andrews, a traditional officer on the surface, had actually long supported an independent force, as had his strident chief of staff, the brilliant Maj. Hugh Knerr. As an example, in 1934 Representative John McSwain submitted a bill to Congress calling for Air Corps autonomy that had been written secretly by the Chief of the Air Corps, Maj. Gen. Benjamin D. Foulois. When the War Department queried him about the bill, Foulois lied, denying knowledge of its origin. In 1937, as Underwood describes, Frank Andrews did nearly the same thing for Representative J. Mark Wilcox. Again, demonstrations of air power were a public relations tool of the air arm from its beginning. Billy Mitchell and Mason Patrick were masters of the technique. Events like the flight from Washington to Alaska of 1934 and the goodwill flights to Buenos Aires, Argentina, and Bogota, Columbia, in 1938 had their counterparts in the New York to Alaska flight of 1920, the round-the-world flight of 1924, and the Pan American Goodwill Flight of 1926–1927.[13]

Actually, the most significant reasons the budget situation changed lay outside the Air Corps. First, the new Roosevelt administration determined to fight the Great Depression partly by throwing money at it, and the War Department and its Air Corps received a reasonable percentage of these funds. Second, international events such as the Japanese aggression in Manchuria and China, the rise of Nazi Germany, and the failure of disarmament increasingly forced the Roosevelt administration to strengthen its military. The geopolitical position of the United States meant that the U.S. Navy and the Army's air arm benefited most from that policy. "A new regiment of artillery, or new barracks at an Army post in Wyoming, or new machine tools in an ordnance arsenal would not scare Hitler one blankety-blank-blank bit!," Arnold quoted President Roosevelt as saying during a critical meeting on November 14, 1938.[14]

Despite funding shortages and squabbles with the General Staff, War Department, and Congress, the Air Corps made great progress within the Army's protective nest during the interwar years. During this vital period, Army Air Corps leaders developed the doctrine, equipment, and, most of all, leaders for World War II and beyond.

The development of an air doctrine was intimately tied to the activities of the Air Corps Tactical School (ACTS) at Maxwell Field, Alabama. The ACTS provided the Army Air Corps with a body of professionally trained commanders and staff officers thoroughly indoctrinated with prevailing air power theories.[15] During the 1930s, the ACTS was led by a group of dynamic, innovative young instructors "concerned in determining how air power shall be employed in the next war and what constitutes the principles governing its employment," one of them, Maj. Harold L. George, explained.[16]

The school staff divided into two opposing camps. The Bombardment Section, led by Major George and men like 1st Lt. Kenneth N. Walker and Capt. Robert Olds, accepted that an offensive strategy built around the bomber was the proper role of an air force. "A well planned and well conducted bombardment attack, once launched, cannot be stopped," they proclaimed. While emphasis on bombardment dated at least from 1926, by 1933 the primacy of the bomber in air warfare was firmly established at the ACTS. In opposition to the bomber advocates stood the Pursuit Section headed by Capt. Claire Lee Chennault and including at various times Capt. George C. Kenney, Col. Millard F. Harmon, and Maj. Adlai H. Gilkeson. They believed in fighter aircraft as others did in the bomber. Chennault saw pursuit as an offensive, not a defensive, weapon and argued that this ability made it the basic arm of the air force.[17]

Technology decided in favor of the bomber. Chennault's arguments were difficult to refute until the arrival of the Martin B–10 and B–12 bombers, whose top speeds close or superior to that of the best available pursuit aircraft made interception difficult if not impossible. Chennault's answer was an early warning system based on a network of observers on the ground with telephones and radios for communications, a system he would use later to great effect in China. The obvious weakness in this system, however, was that it required a large land mass with a friendly population between the air bases and the enemy, something not always available.[18]

The Bombardment Section continued to refine its theories during the early 1930s. Instructors began emphasizing daylight bombing in place of night bombing, ensuring greater accuracy. Operating at greater altitudes provided increased safety. Another important development came in 1933 when Maj. Donald Wilson incorporated into the school text the concept of destroying key targets, thus disrupting the enemy's war-making capability. The ACTS came to accept such important targets as transportation, electricity, and steel production as the primary objectives of an air force. By 1935, the ACTS taught a fully developed theory of mass formation, high-altitude, daylight precision bombing of selected military and economic targets, the fundamental strategy of the U.S. Army Air Forces during World War II.[19]

It must be noted that, as Martha Byrd summarized in her recent biography of Kenneth Walker, "these pre–World War II aviation officers faced a complex scenario wherein experience was thin, money scarce, and encouragement scant. They based their arguments on theory, speculation, and faith."[20] Thus, as my colleague Rich Davis has discussed in *Carl A. Spaatz and the Air War in Europe*, much of the ACTS doctrine would turn out to be invalid. Industrial nations proved far more resilient than expected, airmen undervalued air defense and failed to anticipate improvements in air defenses, and, especially, they failed to anticipate the improvement in fighters that would make them superior to the bomber.[21] Further, according to George Brett, the rise of the strategic air power doctrine had the added effect of making Army leaders even more intransigent about Air Corps independence. They recognized that this doctrine justified independence because, if practicable, it "met the Army's criteria of being able to materially affect the outcome of war."[22]

It must also be emphasized that the tools necessary to implement this doctrine really did not exist until after 1940. The 1930s, however, were a time of profound technological advancement for the airplane. The Air Corps' standard equipment as late as 1932 would not have looked out of place on the Western Front fourteen years earlier. The performance of Keystone and Curtiss biplane bombers scarcely exceeded those of the bombers of 1918, and the Curtiss and Boeing pursuits that still equipped the Air Corps in 1932 often impersonated World War I fighters in movies and looked entirely the part.

By 1934, however, the major characteristics of modern aircraft had developed. They were streamlined, all-metal monoplanes that featured a retractable landing gear, controllable-pitch propeller, and a shielded radio. A cowling designed by the National Advisory Committee on Aeronautics increased the speed and efficiency of air-cooled engines, and the use of Prestone coolant in place of water worked the same improvement in liquid-cooled engines. For the first time engineers seriously and systematically addressed the problems of parasitic drag. As a result, the speed of the average airplane roughly doubled. The first of the modern bombers, the twin-engine Martin B–10 with a top speed of 213 mph, for example, entered military service in 1934. The twin-engine Douglas DC–2 transport, with a speed of 202 mph, also entered commercial service that year. And only one year later, the Boeing XB–17 raced along at over 250 mph. By the mid-1930s, a radical improvement in all significant performance attributes—speed, range, service ceiling, bombload—had taken place, with profound implications for the future of air power.[23]

The pivotal year, it can be argued, was 1936. The pursuit competition held in April led to an order for seventy-seven Seversky P–35s, the Air Corps' first modern, all-metal pursuit, as well as for three Curtiss development aircraft that became the P–36. Later, in November, the Air Corps Technical Committee defined the characteristics of a modern interceptor, and the Air Corps subsequently ordered the Curtiss XP–37, a development of the P–36, which became the P–40, and the Lockheed XP–38, the famous Lightning.[24]

For attack aircraft, the Air Corps purchased 117 Northrop A–17As, a version of the earlier A–17 with a retractable landing gear. For the primary flight training program, production began on twenty-six Stearman PT–13s, the first of thousands, and North American began delivery of eighty-two BT–9s, forerunners of a family of all-metal, low-wing basic and advanced trainers. The Air Corps also addressed cargo aircraft, and during the year, Douglas began delivery of eighteen C–33s, the military version of the DC–2, precursor of the ubiquitous C–47.[25]

Most important to Air Corps leaders were bombers. During October 1936 delivery began of eighty-two Douglas B–18 twin-engine medium bombers, and the Air Corps soon ordered another fifty. In September, Air Corps leaders exercised an option with Douglas for the production of an experimental bomber that flew finally in 1941 as the B–19. But it was the four-engine Boeing B–17 that airmen saw as the future of their force. It was the airplane that Air Corps leaders wanted above all others, and the weapon that strategic bombing doctrine demanded.[26] When he thought of the Flying Fortress and what it meant to air power, Hap Arnold became positively giddy:

> Our horizons had been strictly limited prior to the arrival of the four-engine bomber. Range, fire power, bombload—in all respects, our bombers before this had fallen short of the thing we all preached and hoped for, the "other" independent function of air power in which we had so long believed, which Billy Mitchell had described as if it were already there.[27]

In 1936, the Air Corps ordered thirteen YB–17s to keep the aircraft alive. Ultimately, these thirteen would be the only B–17s received prior to the summer of 1939, and less than 300 heavy bombers were on hand by Pearl Harbor, but they were a beginning.[28]

No component of an airplane was more vital than the engine, and 1930s saw vast improvement in these. During 1936, the liquid-cooled Allison V–1710–3 completed tests, and the Air Corps incorporated the resulting improvements into the V–1710–7, which was ready for type-testing at the end of the year. In other tests, the Pratt & Whitney R–985–11 air-cooled radial produced 400 bhp; the R–1535–11, 750 bhp; the R–1690–17, 850 bhp; and the XR–1830–9, 1,000 bhp. Another air-cooled radial, the Wright R–1820–45, also completed type-testing during 1936, producing a maximum of 930 bhp. A new gasoline increased engine power. During fiscal year 1936, the Air Corps began procurement of 100-octane fuel for use at Hamilton, March, and Selfridge Fields, and its use would soon extend to Barksdale Field. All told, the Air Corps purchased about 1,800,000 gallons during 1936.[29]

The status of the Army Air Corps on the eve of Pearl Harbor was mixed. On the negative side, front-line aircraft like the Curtiss P–36, Bell P–39, Curtiss P–40, Douglas B–18, and early versions of the B–17 were already obsolete or obsolescent, and there were too few even of these. On the positive side, virtually every first-line combat aircraft that fought the war was under development or in production before December 7, 1941. There is little reason to believe that an independent air force would have been better prepared. On the contrary, the controversy over procurement of the B–18 versus the B–17 in the late 1930s suggests that an independent air force might have placed its eggs in one basket, the B–17. The result might very well have been an unbalanced force equipped in December 1941, with more groups of early-model B–17s and fighters no better than the P–35 and P–36. How much greater our early losses might have been and how long it would have taken to prepare a force capable of taking on the Axis had that been the case is open to speculation.

Dynamic leadership, too, developed during the interwar years. According to Arnold, "the smallness of the Air Corps had at least the beneficial result of producing a fine esprit, of making the concepts of air power . . . well understood. Out of this nucleus unit came the air leaders of the war, at the Air Force, the Command, and Air Division, Wing, and Group levels."[30] The highest levels of World War II leadership, men like Hap Arnold, Joseph T. McNarney, Carl A. Spaatz, Ira C. Eaker, and George Kenney, developed their leadership, knowledge, and skills during the 1920s and 1930s. Other leaders who had left military aviation for various reasons returned to perform outstandingly during the war. These included Chennault, James H. Doolittle, and Hugh J. Knerr. Still others comprised a younger generation who not only carried the Army Air Forces through World War II, but developed the modern U.S. Air Force after 1947. Their names are legion. Individuals like Curtis E. LeMay, Lauris Norstad, William H. Tunner, Hoyt S. Vandenberg, Ennis C. Whitehead, and a host of others were the best products of the old Army Air Corps.

And here, one must point out the real significance of the Air Corps Tactical School beyond developing the basic doctrine for the Army Air Forces. Graduates of the ACTS were thoroughly indoctrinated in a "clear and decisive concept of the proper employment of airpower." These men included three full generals—McNarney, Spaatz, and Kenney—and eleven three-star generals—Delos C. Emmons, George Brett, Barton K. Yount, Ira Eaker, Barney M. Giles, Harold George, John K. Cannon, Hoyt Vandenberg, George E. Stratemeyer, Nathan F. Twining, and Ennis Whitehead. Of the 321 Army Air Forces generals during World War II, 261 were graduates of the ACTS, and many went on to four-star rank under the U.S. Air Force.[31]

One expects the Air Corps to produce its own leaders. Most interesting is the position of airmen within the larger Army during World War II, thanks primarily to the greatest American soldier of this century, George C. Marshall. If there is an unrecognized hero of Air Force independence, it is Marshall. Marshall was distinguished especially for his open mind and his willingness to apply new techniques. Shortly after he became chief of the War Plans Division in 1938, Frank Andrews, commander of GHQ Air Force, took him on an air tour of GHQ Air Force facilities and civilian aircraft factories on the West Coast. During the trip, Marshall learned a great deal about the advantages of long-range aircraft, the complexities of aircraft manufacturing, and the problems faced by military aviation. Most significantly he gained an immediate appreciation of the Army Air Corps airmen and leaders.[32]

Andrews, in fact, is a case in point. In the fall of 1938 Marshall overrode objections by Secretary of War Harry H. Woodring and Chief of Staff Gen. Malin Craig to promote Andrews to brigadier general, and assigned him to the War Department as G–3. Later, in 1941, Marshall placed Andrews in command of the air components of the Caribbean Defense Command, which had responsibility for the Panama Canal Zone, the most sensitive and important American overseas post. In September 1941 when Andrews took command of the Caribbean command, he became the first Air Corps general to command all ground and air units in a theater. When HQ North African Theater of Operations was established on February 4, 1942, the forces in England remained under the European Theater of Operations, United States Army, and Andrews took command on February 5th. It is true that when Andrews died in an aircraft accident in Iceland on May 3, 1943, an armored specialist, Lt. Gen. Jacob Devers, replaced him. However, Devers publicly stated that he supported strategic bombardment one hundred percent, and his chief of staff was a superb staff officer and airman, Maj. Gen. Idwal H. Edwards.[33]

Pearl Harbor provides another interesting example. When Marshall relieved Lt. Gen. Walter Short as commander of the U.S. Army in Hawaii following the Japanese attack, he chose veteran airman Maj. Gen. Herbert A. Dargue. Lest one think that this selection was an accident, when Dargue died in an airplane crash on the way to Hawaii, Marshall selected Lt. Gen. Delos Emmons, commander of GHQ Air Force, to replace him, underscoring his preference of a leader who understood air power for that vital command.[34]

In still another example, Marshall sent airman Maj. Gen. James E. Chaney to London in April 1942 as the chief of the Army Special Observation Group with Brig. Gen. Joseph T. McNarney as chief of staff. The choice of two Air Corps officers emphasized the importance attached to air power at this early date. As the command evolved over the next year, Chaney was responsible for developing the U.S. Army organizational structure in Great Britain, and he remained for some time the principal American officer in England in command of all ground and air forces in the European Theater of Operations. Chaney thus held the most important theater command in World War II.[35]

In another case, in mid-December 1941, Marshall selected Maj. Gen. George H. Brett as commander of United States Forces in Australia. An outstanding airman with extensive staff experience who was conveniently in the area at the time, Brett was in charge of the buildup of forces in Australia until the arrival of Douglas MacArthur in early 1942. Further, during the Arcadia

Conference, held from December 22, 1941, to January 14, 1942, the United States and Great Britain agreed on unity of theater command with all elements—air, ground, and sea—under a single commander. During this discussion, Marshall proposed British Gen. Sir Archibald Wavell as supreme commander in the Southwest Pacific with General Brett as his American deputy. The American-British-Dutch-Australian Command lasted only a short time, but was a sign of things to come.[36]

This list of assignments was almost shocking. For a short time in early 1942 *every* major overseas army command was held by an airman: Andrews in the Caribbean, Emmons at Pearl Harbor, Brett in Australia, and Chaney in England.

The most interesting example, though, is provided by Joseph T. McNarney. When President Roosevelt directed the first major increase in airplane production in November 1938, Arnold selected this tough, hard-nosed veteran of air war on the Western Front as part of the team that prepared the Air Corps expansion plan. Arnold later sent him to England, as was just mentioned, and McNarney was subsequently tapped for increasingly important posts outside the Air Corps. Marshall selected him to serve on the Roberts Commission that investigated the Pearl Harbor attack, when, as will be detailed, he ramrodded reorganization of the entire War Department early in 1942. McNarney subsequently served as Deputy Chief of Staff for the U.S. Army from March 9, 1942, through October 21, 1944. He finished the war as a full general and Deputy Supreme Commander in the Mediterranean, second in rank only to Arnold in the Army Air Forces.[37]

Many of these personnel decisions demonstrate the significant role assumed by air power upon American entry into World War II, whereas some indicate the availability of acceptable officers who happened to be on the scene. Beyond these factors, however, these events provide important evidence of Marshall's confidence in the command ability and judgment of many aviation officers. All told, it is difficult to imagine such appointments if someone like Gen. Hugh Drum, an inveterate opponent of an independent air force during the 1930s, had been chief of staff.

Probably no man had more to do with autonomy for Army aviation than George Catlett Marshall. Marshall gave Arnold autonomy after World War II began for three reasons, according to George Brett. First, President Roosevelt had accepted and emphasized the importance of air power. Second, the importance of air power was vividly demonstrated in Europe by the Germans in early 1940 and by the British in the Battle of Britain later that year. But third, and most important to Brett, was Arnold's "gentle prodding and Marshall's own appreciation of the capabilities of air war."[38]

Marshall learned from Andrews that the Air Corps lacked representation on the General Staff and that the officers on the General Staff had little interest in or understanding of aviation. Marshall himself found the General Staff actively hostile to the Air Corps. "When I got back to Washington, I . . . found the General Staff officers had little interest in the air—mostly antipathy, and it was quite marked," he told his biographer in 1957. "The General Staff at that time had little understanding of the air."[39] When Marshall had Andrews promoted to brigadier general and assigned to the War Department as G–3, as was earlier described, it was a major change.[40] Andrews, himself, immediately established the Air Section in G–3, "thereby causing lifted eyebrows all over the munitions building."[41]

In September 1939, General Marshall and Secretary Woodring approved a War Department Air Board report, based on a report by the Air Corps Board at Maxwell Field, that stated:

> Air Power is indispensable to our national defense, especially in the early stages of war. . . . Our aviation in peacetime, both its organization and equipment, must be designed primarily for the application of Air Power in the early days of war. The basis of Air Power is the bombardment plane.[42]

The Army embodied this report in Field Manual 1–5 *Employment of the Aviation of the Army*, published on April 15, 1940, that replaced Training Regulation 440–15.[43]

Now to back up a bit. The establishment of GHQ Air Force separate from the Army Air Corps in 1935 was a major step forward that taught numerous operational lessons. But it also led to conflict between the two organizations and dislocation to the Army aviation program. This situation could be tolerated for a time, but the rapid expansion of air forces in the Caribbean, Hawaii, Philippines, and Alaska after 1939 intensified the difficulties between GHQ Air Force and the Air Corps, forcing the Army to address this issue. On February 29, 1941, Tooey Spaatz, now brigadier general and head of the Air Corps Plans Division, recommended that the U.S. Army adopt the best features of the British unified command system. Arnold also protested the loss of time getting Air Corps business cleared through the General Staff. On March 26 and 27, 1941, Marshall conferred with Arnold and Lt. Gen. George Brett, Chief of the Air Corps. As a result, Army Regulation (AR) 95–5, issued on June 20, 1941, created the U.S. Army Air Forces consisting of the Army Air Corps and Air Force Combat Command. Arnold also remained Marshall's deputy, the principal spokesman for air power in the highest councils of the U.S. Army, and adviser to the President on military aviation. The Army Air Forces staff established under Arnold paralleled that of the Army's General Staff and included A–1 Personnel, A–2 Intelligence, A–3 Operations and Training, A–4 Supply and Maintenance, and an Air War Plans Division. The Army Air Forces also had its own budget but shared support services with the ground forces.[44] Brig. Gen. Leonard T. Gerow stated that the purpose of the new organization was to create, "so far as possible within the War Department, a complete autonomy similar in character to that exercised by the Marine Corps of the Navy."[45] And according to an Army official historian, Ray S. Cline: "The growth of a comparatively independent military organization, the Army Air Forces, out of one of the branches constituted the most radical change in War Department organization before World War II.[46]

The new organization, however, failed to deal with several serious problems. First, it failed to resolve the divisions between the Chief of the Air Corps and the Commander of Air Force Combat Command. Second, it left relationships with the War Department poorly defined, allowing for overlapping responsibilities. Third, airmen still believed that it failed to extend sufficient operational autonomy to the Army Air Forces in that the Army still considered itself responsible for all strategic plans. This last issue may have been the greatest sticking point for the Army Air Forces to negotiate. The War Plans Division of the General Staff still exercised a veto over any plan produced by the Air War Plans Division of Arnold's staff. Subsequently, air leaders engaged in a quiet but intense effort to have that arrangement changed, even proposing that AR 95–5 be written to rename the Air War Plans Division the Air Division of the General Staff. Their efforts failed, but circumstances would soon dramatically negate this problem.[47] The catalyst was AWPD–1.

On July 9 President Roosevelt asked the Joint Board of the Army and Navy to determine the production requirements for a war with Germany, Italy, and Japan, in accordance with the provisions of war plan Rainbow 5, which postulated fighting a defensive war in the Pacific while combining with England an France to achieve victory in Europe, then achieving victory in the Pacific. The War Plans Division of the General Staff was in charge of producing the Army's response. Lt. Col. Clayton Bissell, assigned to prepare the aviation requirements, asked Lt. Col. Harold George of the new Air War Plans Division to loan him some air officers. George, who believed that the War Plans Division had a conservative, ground-oriented view of warfare that would color any plan produced, proposed that the Air War Plans Division staff write the Army Air Forces portion of the war plan. General Gerow agreed and work began on August 4, 1941. Four former instructors at the ACTS prepared AWPD–1: Colonel George, Lt. Col. Kenneth N. Walker, Maj. Haywood S. Hansell, Jr., and Maj. Laurence S. Kuter.[48] "Suddenly," Hansell later wrote, "we found ourselves able to plan our own future."[49] Over the next few days these men poured into AWPD–1 the U.S. Army Air Forces concept of precision, daylight, strategic bombardment.

AWPD–1 called for a massive air offensive against Germany and Japan "to destroy the will and capability of those countries to continue the war; and to make an invasion either unnecessary or feasible without excessive cost." The primary objectives of the campaign were target systems that supported the German state and its ability to make war; the intermediate objective was the

German Air Force. This air offensive, according to AWPD–1, would occur before the ground Army even entered the picture, and it was thus necessary that the Army Air Forces be given priority for equipment, training, and deployment.[50]

In a surprising development given the amount of scrutiny Air Corps plans faced in previous years, AWPD–1 was rapidly approved. When the Army Air Forces submitted the plan to the heavily burdened, overworked War Plans Division, that office simply labeled it "ANNEX 2 Munitions Requirements of the AAF for the Defeat of Our Potential Enemies" and bundled it with the rest of the package off to the Government Printing Office for reproduction. A presentation to G–3 Operations went well, as did one to Spaatz and Gerow. The key briefing to Generals Marshall and Arnold took place on August 30. Marshall recommended that it be given to the Secretary of War, bypassing the Joint Army-Navy Board, thus avoiding review by the Navy. During the briefing to Secretary of War Henry L. Stimson and Assistant Secretary John J. McCloy on September 11 and 12, McCloy praised the plan for its offensive spirit in contrast with Army plans still grounded in the doctrine of hemispheric defense. The "Victory Program" went forward to the President on September 25, 1941.[51]

It is probable that under normal circumstances AWPD–1 might still have been modified heavily. However, at the time the Japanese attacked Pearl Harbor, AWPD–1 was the only logical, legitimate plan immediately available to the War Department. At the Arcadia Conference between December 22, 1941, and January 14, 1942, President Roosevelt, Prime Minister Winston Churchill, and the Combined Chiefs of Staff accepted AWPD–1 as the guide for the development of U.S. Army airpower.[52] Consequently, as Hansell later wrote: "AWPD–1, with minor modifications, was established as the schedule on which the Army Air Forces were created and developed. It also became (and remained) the established concept on which the strategic air offensive was based."[53] Furthermore, the "completion of the first major strategic air war plan by the newly formed Army Air Forces staff in only nine days was a notable achievement," according to historian Robert Futrell, "which marked both the apex of prewar air force doctrinal thought and a blueprint for the air war that would follow."[54]

In the meantime, General Marshall remained displeased with an Army staff organization that he found complicated and unresponsive. Marshall wanted an organization based on four principles. First, the Chief of Staff must deal with a minimum number of subordinates; second, each subordinate must have the means to do his job; third, along with the means must go the authority; and, fourth, the organization must follow functional lines. In August 1941 Lt. Col. William K. Harrison, Jr., of the Plans Group, War Plans Division, submitted a proposal to divide the Army into three separate services: the air forces, ground forces, and services of supply. Under this proposal, the General Staff would become a policy and planning agency for the Chief of Staff, and each of the three services would have its own planning staff. Harrison's proposal was apparently judged too radical at the time it was submitted.[55]

Army Air Forces leaders also disliked the existing organization. Tooey Spaatz prepared a plan similar to Harrison's, and Arnold offered it to the General Staff on November 14, 1941. The Army Air Forces' proposal argued that the war machine required unity of command within the air force, unity of command within the ground force, and unity of command over both of them. The organization of the Army Air Forces, it declared, solved the organization of the air arm. Now something similar needed to be done for the other elements of the Army, and a *superior* staff consisting of both ground and air personnel must be created. The General Staff could then deal effectively with the two fighting forces, each having its own planning staff. Further, both air and ground forces would have equal access to services and supply grouped under another commander. Arnold's proposal met Marshall's four goals for the Army's organization.[56]

Marshall appointed a War Plans Division committee to make a detailed study of the Army Air Forces proposal, and the composition of that committee was telling. The senior officer was General McNarney, who was assisted by Colonel Harrison and Major Kuter. The committee thus consisted of two airmen and the man who first proposed the concept under consideration. This committee quickly approved the plan.[57] On March 9, War Department Circular 59 implemented the new organization. This massive change marked a watershed in Army administration. A General Staff officer, Maj. Gen. Otto L. Nelson, Jr., later wrote that it was "the most drastic and fundamental change . . . since the establishment of the General Staff by Elihu Root in 1903."[58]

Only the shock of Pearl Harbor, the presence of a world war, and the determination of George C. Marshall made the reorganization possible. Marshall timed the change to coincide with vacancies in the office of two of the chiefs of combat arms and the expiration of the Adjutant General's time in office. He cleared the changes through Secretary Stimson to preempt White House meddling, and he made the changes quickly, keeping Congress out of the process.[59] Furthermore, Marshall picked airman Joseph McNarney to ramrod the reorganization. McNarney, mean enough to go nose to nose with the Navy's most irascible admiral, Richmond Kelly Turner, was, in Forrest Pogue's words "a tough hatchetman with a rhinoceros hide and the nerve to push through the reorganization in the face of rugged infighting."[60]

The reorganization created the Army Air Forces under Arnold, Army Ground Forces under Lt. Gen. Leslie J. McNair, and the Services of Supply (later Army Services Forces) under Maj. Gen. Brehon B. Somervell on a coequal basis. Most significantly, it radically reduced the size, power, and scope of the General Staff, and the staff that remained included equal numbers of ground, air, and service officers. Within the Army Air Forces, the reorganization eliminated Air Forces Combat Command and the Office of the Chief of the Air Corps. In March 1942 the U.S. Army Air Forces thus gained the degree of autonomy it needed to fight World War II successfully in accordance with strategic air power doctrine.[61]

Arnold's importance further enhanced Army Air Forces autonomy. In early 1942 he joined Marshall and Admirals Leahy and King as a member of the Joint Chiefs of Staff, and when working jointly with their British counterparts they became the Combined Chiefs of Staff.[62] Most significant, however, was Arnold's position in the U.S. command hierarchy. According to Craven and Cate, official historians of the Army Air Forces in World War II, "regardless of the legal position of the AAF as a service and training organization without combat functions, its chief was in fact a most powerful agent in the conduct of the war in several theaters."[63] The vital importance of air power in any combat action gave Arnold a "definite and direct" role in the planning and operation of combat activities in every theater. Arnold communicated with air commanders in the field often and personally, thus the Army Air Forces exercised an "informal but effective control of air operations, especially long-range strategic bombing, which cut across the boundaries of ground theaters." By the end of 1943, Army Air Forces planners were speaking and dealing openly with Operations Plans Division planners about strategic air forces outside of the theater commanders.[64]

Beyond an individual's position in an organization or command, and his personal reputation, it was performance that counted during World War II, and here the Army Air Forces provided the biggest argument for independence. According to George Brett:

> The convincing wartime contributions of the AAF served as the clincher. The Army's senior leaders no longer could, nor would, claim that air power was merely an auxiliary. The demonstrated effectiveness of strategic bombing destroyed the army's arguments of the 1920s and 1930s that the air arm did not warrant independent status because it could not independently influence the outcome of war.[65]

It is perhaps too much to say that, after the U.S. Army Air Forces' great contributions to victory during World War II, independence was inevitable. It must be remembered that, as in the case of the legislation that created the U.S. Air Service in 1918, the legislation that established the Army Air Forces in 1942 was temporary, good only for the duration of the war. It held no guarantees for postwar independence. The final step probably depended on a single individual. George Catlett Marshall recognized what was required, and in 1943 he directed his staff to prepare a study for an independent air force that would follow the victory to come.[66]

And perhaps independence was best as far as the U.S. Army was concerned. After all, the air leaders might have resolved upon a different goal. On May 8, 1943, Col. Samuel E. Anderson, later commander of IX Bomber Command in England, wrote to Brig. Gen. John E. Hull, Acting Assistant Chief of Staff, Operations Plans Division, concerning a dispute over British air-ground doctrine. The Air Forces, Colonel Anderson pointed out, are "vitally concerned with the success of our ground forces. But the Air Forces very properly do not try to influence ground force doctrine, tactics and technique, nor do the Air Forces want to command the Ground Forces or control them in any way." Colonel Anderson continued, "It may surprise you to learn that some naval aviation officers think this is a foolish attitude on the part of the Army Air Forces; that these same naval aviation officers do not want a separate air force but want *and expect* to control the Navy within a few years. They think the Army Air Forces could and should do the same with respect to the Army."[67]

Notes

1. Ltr, Gen. of the Armies John J. Pershing to Maj. Gen. Charles T. Menoher, Chief of A.S., Jan 12, 1920, quoted in Maj. Gen. Charles T. Menoher, Report of Chief of Air Service, *War Department Annual Reports for 1920*, p. 1459.

2. *Aircraft in National Defense*, Senate Document No. 16, 69th Cong., 1st sess., Nov 30, 1925, p. 91. On September 12, 1915 President Calvin Coolidge appointed a board headed by banker Dwight W. Morrow to study the use of aircraft in national defense. The board's report in November rejected an independent air force but led to establishment of the U.S. Army Air Corps.

3. See note 1 above.

4. Quoted in DeWitt S. Copp, *A Few Great Captains: The Men and Events That Shaped the Development of U.S. Air Power* (Garden City, N.Y.: Doubleday & Co. Inc., 1980), p. 281.

5. H.H. Arnold, *Global Mission* (New York: Harper & Bros., 1949), p. 157.

6. Jeffery S. Underwood, *The Wings of Democracy: The Influence of Air Power on the Roosevelt Administration, 1933–1941* (College Station: Texas A&M University Press, 1991), p. 4; James P. Tate, "The Army and Its Air Corps: A Study of the Evolution of Army Policy Towards Aviation, 1919–1941" (unpublished Ph.D. dissertation, Indiana University, 1976), pp. 89, 257.

7. Tate, "Army and Its Air Corps," pp. 251–255.

8. *Ibid.*, p. 132. The annual reports of the Chiefs of Staff for the period are consistent on this point. See, especially, Gen. Douglas MacArthur, Annual Report of the Chief of Staff, *Annual Reports, 1934*, p. 45.

9. Tate, "Army and Its Air Corps," pp. 44–46.

10. 44 Stat 721; R. Earl McClendon, *Autonomy of the Air Arm* (Maxwell AFB, Ala.: Air University, Jan 1954; Washington, D.C.: Air Force History & Museums Program, 1996), pp. 75–76; Tate, "Army and Its Air Corps," pp. 89–90, 53–54; George H. Brett, "The Air Force Struggle for Independence," *Air Power History*, Fall 1996, pp. 26–27.

11. Gen. Douglas MacArthur, Annual Report of the Chief of Staff, *Annual Reports, 1934*, pp. 40–41; *Ibid., Annual Reports, 1935*, pp. 52–53.

12. Tate, "Army and Its Air Corps," p. 153; Gen. Charles P. Summerall, Report of the Chief of Staff, *Annual Reports, 1930*, p. 124.

13. Underwood, *Wings of Democracy*, pp. 85–87; John F. Shiner, *Foulois and the U.S. Army Air Corps, 1931–1935* (Washington, D.C.: Office of Air Force History, 1983), pp. 11, 96–98; Maurer Maurer, *Aviation in the U.S. Army, 1919–1939* (Washington, D.C.: Office of Air Force History, 1987), pp. 174–190, 325–344, 352–361.

14. Arnold, *Global Mission*, p. 177.

15. The standard source on ACTS is Robert T. Finney, *History of the Air Corps Tactical School, 1920–1940* (Maxwell AFB, Ala.: Air University, 1955; Washington, D.C.: Center for Air Force History, 1992). See also the appropriate chapters in Robert Frank Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force, 1907–1960*, 2 vols. (Maxwell AFB, Ala.: Air University Press, Dec 1989), and Martha Byrd, *Kenneth N. Walker: Airpower's Untempered Crusader* (Maxwell AFB, Ala.,: Air University Press, Mar 1997), p. 37.

16. Quoted in Finney, *Air Corps Tactical School*, pp. 58–59.

17. Haywood S. Hansell, Jr., *The Air Plan That Defeated Hitler* (Atlanta, Ga.: Higgins-McArthur, 1972), pp. 12–20; Futrell, *Ideas, Concepts, Doctrine*, Vol. I, p. 82; Tate, "Army and Its Air Corps," p. 210; DeWitt S. Copp, *Forged in Fire: Strategy and Decisions in the Air War Over Europe, 1940–1945* (Garden City, N.Y.: Doubleday & Co., Inc., 1982), p. 197.

18. Hansell, *Air Plan That Defeated Hitler*, pp. 18–19, 22.

19. Finney, *Air Corps Tactical School*, pp. 64–68.

20. Byrd, *Kenneth N. Walker*, p. 37.

21. Richard G. Davis, *Carl A. Spaatz and the Air War in Europe* (Washington, D.C.: Center for Air Force History, 1993), p. 30.

22. Brett, "Air Force Struggle," p. 26.

23. Futrell, *Ideas, Concepts, Doctrine*, Vol. I, p. 64; Wesley Frank Craven and James Lea Cate, eds., *The Army Air Forces in World War II*, 7 vols. (Washington, D.C.: Office of Air Force History, 1983), Vol. I, p. 58.

24. Maj. Gen. Oscar Westover, Annual Report of the Chief of the Air Corps for the Fiscal Year 1936, *War Department Annual Reports, 1936*, p. 40; Futrell, *Ideas, Concepts, Doctrine*, Vol. I, pp. 82–83.

25. Westover, Annual Report of the Chief of the Air Corps for the Fiscal Year 1936, p. 40.

26. *Ibid.*; Craven and Cate, *Army Air Forces in World War II*, Vol. I, p. 69.

27. Arnold, *Global Mission*, p. 156.

28. Westover, Annual Report of the Chief of the Air Corps for the Fiscal Year 1936, p. 40; Craven and Cate, *Army Air Forces in World War II*, Vol. I, p. 69; Vol. VI, pp. 204–205.

29. Westover, Annual Report of the Chief of the Air Corps for the Fiscal Year 1936, pp. 54, 60.

30. Arnold, *Global Mission*, p. 167.

31. Finney, *Air Corps Technical School*, pp. 42–43.

32. Underwood, *Wings of Democracy*, pp. 120–122.

33. Craven and Cate, *Army Air Forces in World War II*, Vol. I, p. 165; Vol. II, pp. 115, 309, 635; Copp, *Forged in Fire*, pp. 393–394, 397; Forrest C. Pogue, *George C. Marshall: Ordeal and Hope, 1939–1942* (New York: Viking Press, 1966), p. 85.

34.Copp, *Forged in Fire*, pp. 218–219.

35. *Ibid.*, pp. 115, 262; Craven and Cate, *Army Air Forces in World War II*, Vol. I, pp. 577–578, 589.

36. Pogue, *George C. Marshall*, pp. 242, 281.

37. Ray S. Cline, *Washington Command Post: The Operations Division* (Washington, D.C.: Office of the Chief of Military History, 1951), p. 89.

38. Brett, "Air Force Struggle," p. 28.

39. Intvw, Marshall Jan 22, 1957, in Larry L. Bland, ed., *The Papers of George Catlett Marshall*, 2 vols. (Baltimore, Md.: The Johns Hopkins University Press, 1981), Vol. p. 618.
40. Pogue, *George C. Marshall*, p. 85.
41. Futrell, *Ideas, Concepts, Weapons*, Vol. I, p. 92.
42. Quoted in *Ibid.*, p. 95.
43. *Ibid.*
44. *Ibid.*, Vol. I, p. 104: Tate, "Army and Its Air Corps," p. 237.
45. Quoted in Cline, *Washington Command Post*, p. 23.
46. *Ibid.*, p. 22.
47. *Ibid.*, pp. 68–69; McClendon, *Autonomy of the Air Arm*, pp. 108–109.
48. Hansell, *Air Plan That Defeated Hitler*, pp. 60–65, 69–70; Davis, *Spaatz*, pp. 59–60; Underwood, *Wings of Democracy*, p. 149.
49. Hansell, *Air Plan That Defeated Hitler*, p. 65.
50. *Ibid.*, p. 91.
51. *Ibid.*, pp. 90, 93–97; Futrell, *Ideas, Concepts, Weapons*, Vol. I, p. 111.
52. Hansell, *Air Plan That Defeated Hitler*, p. 97–98.
53. *Ibid.*, p. 98.
54. Futrell, *Ideas, Concepts, Weapons*, Vol. I, p. 109.
55. Maj. Gen. Otto L. Nelson, Jr., *National Security and the General Staff* (Washington, D.C.: Infantry Journal Press, 1946), p. 336; Cline, *Washington Command Post*, pp. 70–71; Pogue, *George C. Marshall*, pp. 291–292.
56. Cline, *Washington Command Post*, pp. 69–70, 72; Pogue, *George C. Marshall*, pp. 291–292.
57. Cline, *Washington Command Post*, pp. 90–91.
58. Nelson, *National Security and the General Staff*, p. 335.
59. Pogue, *George C. Marshall*, pp. 292–298.
60. *Ibid.*, p. 292.
61. Nelson, *National Security and the General Staff*, pp. 337–350; McClendon, *Autonomy of the Air Arm*, pp. 124–126.
62. McClendon, *Autonomy of the air Arm*, pp. 126–128.
63. Craven and Cate, *Army Air Forces in World War II*, Vol. I, p. 576.
64. Cline, *Washington Command Post*, pp. 253–254.
65. Brett, "Air Force Struggle," p. 28.
66. *Ibid.*; McClendon, *Autonomy of the Air Arm*, pp. 126–128.
67. Memo, Col. Samuel E. Anderson to Brig. Gen. John E. Hull, Acting Assistant Chief of Staff, May 8, 1943, Box 1305, OPD-384, Record Group 165, National Archives.

Arnold, Eisenhower and Norstad: The Fight for Air Independence

Herman S. Wolk

From a retrospective of half a century, events and currents, some more definable than others, converged to make the institution we know today as the United States Air Force. The immediate post–World War II years saw a confluence of advocates, circumstance, politics and technology that led to the successful drive for a separate Air Force. The antecedents of the contentious postwar campaign for an independent Air Force first came to public notice in the interwar years, which were marked by the convening of Congressional committees to consider how to organize the Army air arm, and more important, in World War II, when airmen's long drive for a separate Air Force culminated.

Support for independence spread throughout the Army in the early postwar years. Besides Gen. Henry H. "Hap" Arnold, no other advocates were more influential than Gen. Dwight D. Eisenhower and Maj. Gen. Lauris Norstad. Not surprisingly, the earliest push for independence came from airmen, and Arnold's support for independence predated the war. Shortly after the Japanese attack on Pearl Harbor, General Arnold, now Commanding General of the Army Air Forces living with the day-to-day pressures of the war, nonetheless began formal planning for a postwar independent Air Force. At war's end, Eisenhower and Norstad joined him and other supporters of air independence as part of the move to redefine the national security establishment.

By 1945 the Army air arm had taken several important organizational steps towards autonomy. In 1926 the Army Air Corps was formed from the Air Service, giving military aviation the status of a combat arm of the U.S. Army. With the establishment of the General Headquarters Air Force in 1935, airmen assumed operational control of tactical air units. During World War II the so-called "Marshall reorganization" of March 1942 made the Army Air Forces (AAF) coequal to the Army Ground Forces and the Services of Supply. The AAF thereby achieved a degree of autonomy within the War Department, a move that Maj. Gen. Otto L. Nelson, Jr., of the War Department General Staff, called "the most drastic and fundamental change which the War Department had experienced since the establishment of the General Staff by Elihu Root in 1903."[1]

Because of General Arnold's presence on the Joint Chiefs of Staff and the Anglo-American Combined Chiefs of Staff, during the war the AAF held representation on JCS committees. The AAF's position in the highest joint planning and strategy councils amounted to an acceptance of the Army air element as a military service virtually equal to the Army and Navy.

The independent character of AAF wartime planning extended to worldwide strategic operations. General Arnold had long advocated "independent" strategic bombing operations, exempt from control by theater commanders. Centralized control of air forces by airmen became a reality in April 1944 with formation of the Twentieth Air Force, a strategic bombing force directly under Arnold's command as executive agent of the JCS. In effect, the Twentieth, whose B–29s conducted the bombing campaign against the Japanese home islands, gave the AAF equality with the ground and naval forces in the Pacific. Arnold had long viewed the B–29 as the means of defeating Japan without the necessity of an invasion. As he wrote in one of his final reports after the war, Japan was forced to surrender because "air attacks, actual and potential, had made possible the destruction of their capability and will for further resistance . . . those . . . attacks had as a primary objective the defeat of Japan without invasion."[2] Arnold also insisted on keeping the B–29s out of the hands of theater commanders, since he was convinced that a successful long-range campaign by the Superfortresses would cement the case for a postwar independent Air Force. It is not an exaggeration to describe Arnold's commitment to the B–29 as his great wartime obsession. His view was shared by Gen. George Kenney, MacArthur's air commander in the Pacific, who wrote to Arnold in 1943 that the B–29 was "the plane with which we will win the war." [3]

At the same time that the Joint Chiefs approved the Twentieth Air Force arrangement, in April 1944 Congress turned to the question of how to structure the postwar military. The Woodrum Committee hearings elicited Army and AAF support for postwar reorganization that would include a separate Air Force. Naval leaders, on the other hand, testified against creation of a single department of national defense and concluded that the entire subject of postwar organization required additional study.

The JCS wanted, however, to have a postwar plan in hand when the war ended. The following month, May 1944, the Joint Chiefs therefore appointed a Special Committee for Reorganization of National Defense. After ten months of study, the committee's report, with a dissent by Adm. James O. Richardson, recommended formation of an independent Air Force coequal with the Army and Navy. Richardson and the Navy's leadership—Admirals Leahy, King and Nimitz—opposed a single department, arguing it would produce neither economy nor efficiency. The Navy would suffer, they emphasized, in that its requirements would be subject to review by officials who had no responsibility for initiating them. The Navy would be weakened by people who failed to understand its needs. But in the wartime committee's review, the Navy was overruled.

World War II having ended over Hiroshima and Nagasaki with the dropping of atom bombs by B–29 Superfortresses of the Army Air Forces, General Arnold now looked ahead. There had been two Hap Arnolds during the war—the first a military officer who built and commanded the Army Air Forces, the second a thoughtful man of foresight who in the midst of the war planned for the organization and force structure of the postwar independent Air Force. Early in the war, he had formed several groups in AAF headquarters that considered a peacetime organization. With the Japanese surrender, the planning assumed a sense of urgency. Arnold's major objective was the establishment of a separate Air Force as part of the postwar national security setup. Intertwined with this overriding goal, he advocated unified command and provision for a proper research and development organization.

"Each new crisis in our history," Arnold emphasized, "has found our armed services far from effectively, efficiently or economically organized. With each crisis modernization and coordination have been hammered out under war pressure at great waste of resources, to be allowed in large measure to lapse when the crisis is over."[4] The lessons of the war demanded "coordinate organization" of ground, air and naval forces, each under its own commander, and each responsible to a supreme commander.

Arnold distinguished between "fundamental" air power and what he considered "manifestations" of air power as "auxiliaries of land and sea power." When the Japanese attacked the United States at Pearl Harbor, Arnold pointed out, "there was no Air Force, with the complete air mission. No one had single basic responsibility for the air."[5] In the postwar world, the United States required an independent service with total responsibility for the development and employment of fundamental air power.

Although the postwar revolution in national security thinking and organization had deep roots in the experience of World War II, the idea of an independent Air Force as a ready force, a force-in-being, would be unprecedented in peacetime twentieth-century America. This new entity would be a standing military force, alert to retaliate against an aggressor's capacity to wage war. Air power would become the primary instrument of American foreign policy.

General Arnold's concept of air power, evolving as it had from his familiarity with American military aviation from its earliest days, was linked in his mind with certain basic "principles of American democracy." Most important, "personnel casualties are distasteful. We will continue to fight mechanical rather than manpower wars."[6] World War II demonstrated that the cost of war in lives and resources had become prohibitive. The United States required a new postwar military establishment featuring the most modern weapons with minimum cost to the American taxpayer.[7] General Arnold believed in the consummate ability of the American people to understand the issues of national security and to act upon this understanding. "Air power," Arnold emphasized, "will always be the business of every American citizen." The American people "would decide whether this nation will continue to hold its air supremacy. In the final analysis, our air striking force belongs to those who come from the ranks of labor, management, the farms, the stores, the professions, the schools and colleges, and the legislative halls."[8]

Besides airmen, no uniformed officer backed the idea of an independent Air Force more forcefully than the Supreme Commander, General Eisenhower, whose experience in the war convinced him of the equality of ground, sea and air arms under unified command. "No system of joint command," Eisenhower stated, "could possibly have brought victory to our cause."[9] The military services comprised a single fighting team, according to Eisenhower, each supportive of the other. "We believe," he said, "that the fighting forces should rest on a three-legged stool with each leg equally important—Army, Navy, Air Forces."[10] In the several months after the end of the war, when the Navy unilaterally pursued its own postwar requirements, Eisenhower reiterated that no single service could be considered independently. The services were mutually supporting.[11]

Eisenhower observed that the postwar environment demanded strict economy and that three coequal military departments under a single overall defense establishment would deliver most for the taxpayer's dollar. Whether or not the proper legislation was passed by the Congress, Eisenhower directed his War Department Staff in December 1945 to proceed as if the law would be forthcoming. "My idea," he said, is "to go as far as we can within the legal limits imposed on us to carry out the basic idea . . . the Air Commander and his staff are an organization coordinate with and coequal to the land forces and the Navy. I realize that there can be other opinions . . . but that seems to me to be so logical from all our experiences in this war, such an inescapable conclusion that I, for one, can't even entertain any longer any doubt as to its wisdom."[12]

General Eisenhower's predecessor as President, Harry Truman, also strongly supported formation of an independent Air Force. In retrospect, their advocacy sealed the verdict. After the war, as a U.S. senator, Truman had been determined to reorganize the defense establishment. "One of the strongest convictions which I brought to the Presidency," Truman recalled in his memoirs, "was that the antiquated defense setup . . . had to be reorganized quickly as a step toward insuring our future safety and preserving world peace."[13] Truman had been especially critical of the Pearl Harbor failure, which he attributed to inadequate command organization and faulty communications. "We came to the conclusion," he said, "that any extended military effort required overall coordinated control in order to get the most out of the three armed forces. Had we not early in the war adopted this principle of a unified command for operations, our efforts, no matter how heroic, might have failed."[14]

It was time for a unified defense establishment, the new President emphasized. The military services could no longer go their separate ways. He proposed a Department of National Defense headed by a civilian with three "coordinated" branches representing the land, sea and air forces. Thus, an independent Air Force would take its place alongside the Army and Navy: "Air power has been developed to a point where its responsibilities are equal to those of land and sea power and its contribution to our strategic planning is as great."[15] In Truman's view, unification became evolutionary, with creation of a Department of National Defense being a first step. "Unification is much more than a matter of organization," the President maintained: "It will require new viewpoints, new doctrine, and new habits of thinking throughout the departmental structure."[16]

The Navy vehemently opposed the plan. "As the President knows," Secretary of the Navy Forrestal angrily responded, "I am so opposed to the fundamental concept expressed in the message that I do not believe there is any very helpful observation that I could make."[17] The naval leadership remained fearful that an independent Air Force would grab naval aviation and that the Army might even attempt to take over the Marine Corps. Secretary of the Navy Forrestal favored coordination through joint committees, as opposed to formation of a single Department of National Defense and a separate Air Force.

Despite the Navy's reluctance to join the War Department in supporting unification legislation, including formation of a separate Air Force, the Senate Military Affairs Committee established a subcommittee to draft the legislation. Maj. Gen. Lauris Norstad, Assistant Chief of Air Staff, Plans, and Vice Adm. Arthur W. Radford, Deputy Chief of Naval Operations (Air), were appointed as advisers to the subcommittee. Norstad brought impressive credentials to this task. He had come to Arnold's attention prior to American entry into the war, and in March 1942 the AAF Chief selected the young officer to become a member of his advisory council, a small, select group that advised Arnold on any number of matters. General Arnold then gave the thirty-five-year-old officer needed operational experience in England and the Mediterranean in 1943–1944 before bringing him back to Washington as Chief of Staff of the Twentieth Air Force, and then in the two-star position as Assistant Chief of Air Staff, Plans.

In the latter post Norstad took the lead in crafting the AAF's positions on postwar reorganization and unification. "I was intensely interested in this," he later recalled, "and I got an extra office in the Pentagon and I put up paragraph by paragraph, all of the proposals that had been made on every one of the pertinent subjects, on organizational relationships. . . . this did not require a hell of a lot of staff work. It required a little leg and arm work."[18]

In early 1946, Norstad and Radford sat in on the subcommittee's deliberations, and in April a bill (S. 2044) was reported to the Military Affairs

Committee that combined features of the Eberstadt report (given to Forrestal) and the War Department's Collins plan. In May, the Military Affairs Committee recommended to the Senate that S. 2044 be passed. This Common Defense Act of 1946 called for formation of a Department of Common Defense, coequal military services, and a Chief of Staff of Common Defense who would also serve as military adviser to the President.

Although the Navy continued to stonewall, Truman made clear to Secretary Forrestal and Secretary of War Robert Patterson that he wanted quick action to resolve the major issues. In late May Forrestal and Patterson found agreement on eight points, but they failed to resolve basic questions of a single defense department, establishment of an independent Air Force, land-based aviation and the status of the Marine Corps. Continuing to oppose a single department, the Navy argued that its own officers should make decisions regarding naval resources. The Navy remained fearful that a Secretary of National Defense might ultimately emasculate naval forces. However, Eisenhower, Norstad, and Commanding General of the AAF Gen. Carl A. Spaatz believed that in the postwar world the country could not afford a system that permitted unnecessary duplication. The services should be mutually supporting.

Truman welcomed agreement on the eight points but, disappointed with the lack of progress, directed Patterson and Forrestal to craft legislation for a Department of National Defense, to include a separate Air Force. The Navy would keep aircraft integral to the fleet, and the Marine Corps would continue to be part of the Navy Department. "The internal administration of the services," Truman asserted, "should be preserved in order that the high morale and esprit de corps of each service be retained."[19]

Forrestal then replaced Radford with Vice Adm. Forrest Sherman, Deputy Chief of Naval Operations (Operations), for the ongoing unification negotiations. The Joint Chiefs directed Norstad (now Director of Plans and Operations in the War Department General Staff) and Sherman in July 1946 to draft a unification plan. Norstad's move to the General Staff, specifically at General Eisenhower's request, indicated Eisenhower's confidence in Norstad and signaled the War Department's recognition of the air arm's maturity.

In the summer of 1946 Norstad and Sherman confronted the issue of how to organize unified commands in the overseas theaters. During the war in the Pacific the question of unified command had never been resolved. The Navy wanted command structured according to geographical areas while Norstad argued that commands should be organized functionally. In December President Truman approved the Outline Command Plan, as negotiated between Norstad and Sherman. It called for a system of unified command in which a single commander would control land, naval and air forces within a specific geographical area. Norstad called it "an idea whose time had come."[20]

Norstad and Sherman then worked out the details of a draft agreement on functions and organization. Patterson and Forrestal informed Truman that the proposed legislation would create an Office of the Secretary of National Defense and three civilian service secretaries. The Departments of the Army, Navy and Air Force would be under the overall direction of the Secretary of National Defense but administered as separate entities, each with its own military chief. The Joint Chiefs of Staff would comprise the military heads of the three services, subject to the direction of the Secretary of National Defense and supported by a Joint Staff.

Some issues remained unresolved. The Navy wanted roles and missions written into the unification act. General Eisenhower however, stressed that the unification bill should only chart basic principles and not become sidetracked in an effort to describe how each service would operate: "I believe that intelligent men can make almost any organization work as time goes on, if your law isn't too rigid."[21] Eisenhower and the AAF won this point; in February 1947 Truman sent Congress the draft of the National Security Act of 1947. Following Senate and House approval, on July 26, 1947, President Truman signed the legislation. On the same day, Truman signed Executive Order 9877, describing the functions of the armed services.

The National Security Act created a National Military Establishment, to include the Departments of the Army, Navy and Air Force. The Act stipulated that the Secretary of Defense would be a civilian appointed by the President as his principal assistant for national security. The Act specified that the Navy retain the Marine Corps and naval aviation, which would comprise combat, service and training elements and "land-based naval aviation, air transport essential for naval operations, all air weapons and air techniques involved in the operations and activities of the Navy."[22] The Navy would also be responsible for naval reconnaissance, antisubmarine warfare and protection of shipping. Like the Army and Navy, the Marine Corps would be allowed "such aviation as may be organic therein."[23] The Act stipulated that "the Air Force shall include aviation forces both combat and service not otherwise assigned. It shall be organized, trained and equipped primarily for prompt and sustained offensive and defensive air operations. The Air Force shall be responsible for the preparation of the air forces necessary for the effective prosecution of war except as otherwise assigned and, in accordance with integrated joint mobilization plans, for the expansion of the peacetime components of the Air Force to meet the needs of war."[24] The Air Force would be constituted as an executive department headed by a civilian secretary; the President would appoint the Chief of Staff, USAF, for a four-year term.

Stuart Symington, the first Secretary of the Air Force, correctly stated that promulgation of the National Security Act of 1947 amounted to a first step in the evolution of the postwar military establishment. The Act charted the fundamental national security organization for the second half of the twentieth century. It did not settle contentious roles and missions issues; these continued to flare up like alleged dying embers. James V. Forrestal, the first Secretary of Defense, perhaps put it best: "The mere passage of the National Security Act did not mean the accomplishment of its objective overnight. It is not strange that professional military men should think in terms of the service to which they have devoted their entire adult lives; it is to be expected. But unification calls for . . . a broader vision."[25]

The legislation was only a starting point in creating a truly integrated military establishment. Its passage had taken a long time, a great deal of effort, and much give-and-take by all concerned. Symington differed with those critics who believed that the Navy had succeeded in structuring the unification bill expressly to suit its own purposes. Nor did he share the resentment of those who felt that Norstad had capitulated to the Navy's demands in structuring the post of Secretary of Defense as a coordinator. The first Secretary of the Air Force argued that under the circumstances, Norstad had done an outstanding job. His task had not been easy. Of all the Air Force participants, Symington said, "Norstad should get the most credit for unification. In the days when it looked grim, he stuck to it."

In their deliberations on functions and organization, Norstad and Sherman faced some difficult compromises. They realized that President Truman had laid out the major tenets of unification organization, namely a single department of national defense and three coequal services, including a separate Air Force. The Navy lost on the issue of Air Force independence but won its point of having individual services and administration. Under the National Security Act, the Secretary of Defense would be a coordinator as the Navy wanted, not a strong administrator as desired by the Army and the Air Force.

After appointing Forrestal, Truman named Symington as Secretary of the Air Force, John L. Sullivan as Secretary of the Navy, and Kenneth C. Royall as Secretary of the Army. Having been Assistant Secretary of War for Air since January 1946, Symington brought top-flight management credentials to his new post. He had also shown uncommon ability to work effectively with Congress and had nurtured an excellent working relationship with General Spaatz. The Symington-Spaatz combination held the promise of unusually fine leadership for the newly independent Air Force.

The men who made the Air Force are sometimes criticized for parochialism, for being obsessed with technology. They were not thinkers, so the argument goes. However, a consideration of the record indicates that, as I noted on the twenty-fifth anniversary of the Air Force, they were idealistic as well as practical, visionaries as well as technologists. They supported the new United Nations organization, for example, and believed that it deserved a chance to build an institutional framework for a peaceful world order. In 1946, Gen. George C. Kenney became the AAF representative on the United Nations Military Staff Committee. Although a UN military force including an international Air Force was never established, the founders of the Air Force believed that air power could keep the peace, deter war and make the UN a credible institution.

They were, as a former editor of *Air University Quarterly Review* Col. Kenneth F. Gantz remarked, "the revolutionists of their time."[26] As we look back a half century, it is instructive to note their optimism, clear thinking, determination and integrity. These men painted a large canvas and set a high standard. We owe them a great debt.

Notes

1. See Maj. Gen. Otto L. Nelson, Jr., USA, *National Security and the General Staff*, Infantry Journal Press, Washington, D.C., 1946.
2. *Third Report of the Commanding General of the Army Air Forces to the Secretary of War*, Nov 12, 1945.
3. Notebooks of Gen. George C. Kenney, Vol. VI, Ltr, Kenney to Arnold, Jul 28, 1943.
4. Statement, Gen. H.H. Arnold to Senate Committee on Military Affairs, Oct 19, 1945.
5. *Ibid.*
6. Memo, for Theodore von Kármán from Gen. H.H. Arnold, subj: AAF Long Range Development Program, Nov 7, 1944, Gen. Carl A. Spaatz Collection, Box 58, Manuscript Division, Library of Congress.
7. See note 4 above.
8. *Third Report of the Commanding General of the Army Air Forces to the Secretary of War*, Nov 12, 1945, p. 71.
9. Testimony, Gen. Dwight D. Eisenhower to Senate Military Affairs Committee, Nov 16, 1945.
10. General Eisenhower's comments to the War Department General Staff, Dec 6, 1945, quoted in Third Mtng. of the Air Board, Aug 28, 1946, p. 148, in Record Group (RG) 340, Modern Military Branch (MMB), National Archives (NA).
11. Eisenhower testimony, Nov 16, 1945.
12. Eisenhower comments Dec 6, 1945.
13. Harry S. Truman, *Memoirs*, Vol. II: *Years of Trial and Hope*, Doubleday, Garden City, N.Y., 1956, p. 46.
14. Message, President Harry S. Truman to Congress, Dec 19, 1945.
15. *Ibid.*
16. *Ibid.*
17. Ltr., James V. Forrestal to Samuel Rosenman, Dec 18, 1945, cited in Richard F. Haynes, *The Awesome Power: Harry S. Truman as Commander-in-Chief*, Louisiana State University Press, Baton Rouge, 1973, p. 98.
18. Intvw, Hugh Ahmann, AFHRA, with Gen. Lauris Norstad, Feb & Oct 1979, K239.0512–1116.
19. Truman message to Congress, Dec, 19, 1945.
20. See Norstad essay in Paul Schratz, ed., *Evolution of the American Military Establishment Since World War II*, George C. Marshall Foundation, Lexington, Va., 1976.
21. Testimony, General Eisenhower to Patch Board, Sept 23, 1945, in RG 165, Patch-Simpson Bd. file, MMB, NA.
22. *The National Security Act of 1947*, Sec. 206 (a), "Department of the Navy."
23. *Ibid.*
24. *Ibid.*, Sec. 208 (f), "United States Air Force."
25. Secretary of Defense James V. Forrestal, *First Report on the National Military*

Establishment, 1948.

26. Intvw, Herman S. Wolk and Thomas A. Sturm with Col. Kenneth Gantz, Maxwell AFB, Feb, 16, 1972.

The Evolution of The Office of the Secretary of the Air Force

George M. Watson, Jr.

The Office of the Secretary of the Air Force (OSAF) had its roots in World War I when John D. Ryan became the second Assistant Secretary of War and Director of the Air Service. Ryan held the position for only three months, at which time the war ended. With his resignation, the position was disestablished.

After several years of postwar inactivity, in 1925 the Morrow Board, headed by Morgan Bank partner Dwight W. Morrow, produced a report that, along with other studies, encouraged Congress to undertake an extensive examination of American defense. As a result of these efforts Congress passed the 1926 Army Air Corps Act, which called for an expanded military program with more personnel and aircraft. The newly established Air Corps attained greater prestige than its predecessor, the Air Service, because, for the first time, aviation enjoyed representation on the Army General Staff.

World War I: Assistant Secretary of War for Air

Section Nine of the Air Corps Act also established a second Assistant Secretary of War for Air, the office first held by F. Trubee Davison. A graduate of Yale University and Columbia Law School, Davison became a member of the New York bar in 1922 and later served several terms in the New York State legislature. He had been instrumental in organizing the First Yale Unit, which formed the nucleus of the first Naval Reserve Flying Corps, and he served overseas in World War I. Among his many activities as Assistant Secretary of War for Air, Davison involved himself in the important area of procurement, helping the Air Corps to secure funding for its programs. (The focus on procurement would likewise become a prime concern of Secretary Robert A. Lovett during World War II.)

In the fall of 1932 Davison resigned from office to run for lieutenant governor of New York. President Herbert Hoover did not name a replacement, nor did his successor, President Franklin D. Roosevelt, who kept the position vacant. Roosevelt may have been influenced by his Secretary of War George

H. Dern who believed that air forces, like all other branches of the Army, should report directly to the Chief of Staff. (The Air Corps did not report directly to Davison.) The Army's General Staff had never really felt that the Air Corps warranted a special representative to the Secretary of War. Davison was convinced that the position remained unfilled because of the "jealousy of the older services."

World War II: Assistant Secretary of War for Air

Robert A. Lovett, who became Assistant Secretary of War for Air in 1941, was no stranger to his task. He knew the original Assistant Secretary of War (Aeronautics), having learned to fly during the summer of 1916 while staying at the Davison home in Long Island, New York. Like Davison, Lovett had served in the Naval Air Service in World War I. After the war, from 1919 to 1921, he studied both law and business administration at Harvard. In 1921 he joined the National Bank of Commerce in New York City and five years later became a partner in the investment firm of Brown Brothers Harriman and Company, staying there until resigning to become Special Assistant to the Secretary of War in December 1940. He maintained his interest in aviation throughout the interwar years, so he brought to his new job familiarity with the subject.

Although he held no statutory authority to direct procurement matters, as did Under Secretary of War Robert P. Patterson, Lovett remained actively involved in production problems. With Secretary of War Henry L. Stimson's encouragement, Lovett devoted his energies to the promotion of aircraft production. He advised Stimson and worked closely with the military at the same time, offering opinions on a variety of issues without undue concern about the formal chain of command.

Lovett focused on points in the process that posed the greatest threat to production schedules. He attempted to settle labor disputes and at times intervened when the Office of Production Management, and subsequently the War Production Board, failed to accord proper priority to Army Air Forces contractors, subcontractors and their suppliers. In 1942 and 1943 he disputed President Roosevelt's production goals, which he felt were excessively optimistic and therefore detrimental to the aircraft program. He also made an effort to strengthen the management of some government contractors. During the war Lovett served as a sounding board for industry's complaints and requests.

Stimson had a broad conception of Lovett's role. He told the air secretary that if anyone asked about his authority, tell them "whatever authority the Secretary of War has, you have." However, four years after Lovett became Assistant Secretary of War of Air, his duties still remained fairly general, if not ill-defined. Brig. Gen. George A. Brownell, Lovett's executive officer, claimed that the activities of the Assistant Secretary of War for Air touched upon every phase of Army Air Forces' activity at one time or another. These included "technical development, procurement, production, organization, finance, legislation, public relations, both foreign and domestic civil aviation, and to coordinate these and like matters with other governmental agencies concerned."

Lovett advised both Stimson and Patterson on production and procurement of aircraft and offered counsel to Generals Marshall and Arnold. Although Lovett issued orders to no one, his closeness to Stimson gave him considerable leverage. In shaping his duties he created a direct and personal line of communication between the Secretary of War and the air arm. Arnold credited Lovett with reducing the number of men involved in aircraft production decisions from nine to two—Patterson and Lovett himself.

Lovett's ability to form good working relationships with key military officers as well as civilians in the War Department was one of the most important attributes that he brought to his office. During the war he carried on a personal correspondence with such prominent AAF commanders as Gens. Carl A. Spaatz and George C. Kenney and Lt. Gen. Ira C. Eaker. Lovett's friendship with General Arnold was important to smooth communications with Army Chief of Staff Gen. George C. Marshall and with Secretary of War Stimson. Marshall prized the judgment, calm appraisal and intellectual balance that Lovett brought to policy meetings. Arnold and Lovett saw each other frequently, and since their offices adjoined, much of their work was done informally so that many of their decisions and discussions were not recorded.

With the reorganization of the Department of Defense in September 1947, Lovett's wartime organization became the Office of the Secretary of the Air Force. Lovett's conduct in public office and his vision of the Office of the Assistant Secretary of War for Air set the pattern in 1946–1947 for his successor Stuart Symington, who confronted similar problems. In a real sense, Secretary Lovett can be seen as an important bridge between Trubee Davison and Stuart Symington. In his exercise of responsibility and authority, he established continuity and legitimacy between the old and the new. Like Trubee Davison, Lovett made procurement his top priority. He was also influential in the realm of strategy and organization, playing a role in the AAF reorganization of May 1942 and helping determine the character of the postwar Air Force. The manner in which Lovett and General Arnold divided authority and responsibility set the pattern for the civilian-military relationship at the top echelon of the Air Force. Although his authority was not clearly defined by statue, and he largely dealt with procurement, Lovett was an able adviser in other areas as well.

In sum, as Assistant Secretary of War for Air, Lovett was a man who could maneuver adeptly within the sometimes tortuous channels of the War Department, form friendships with and earn the respect of most of those with whom he dealt, whether military personnel, government officials, or businessmen. His most important contribution, however, was helping to equip the world's largest and strongest air force, which in turn contributed to the defeat of Italy, Germany and Japan.

1947–1950: The First Secretary of the Air Force

World War II ended in August 1945, and the wartime Assistant Secretary of War for Air, Robert A. Lovett, left office in December. As his replacement, President Truman selected Stuart Symington, a successful businessman who had served with the U.S. Army in Europe during World War I. Between the wars Symington had earned a reputation for saving companies from bankruptcy and turning them into profitable enterprises. He had served as president and chairman of the board of one of those companies, Emerson Electric Company of St. Louis, Missouri. In 1941 the War Department asked Symington to accompany a group of aeronautical engineers to England to study aircraft armament, particularly the new British power-driven gun turrets. Upon his return to the United States, Symington turned the Emerson Company to wartime production, the company becoming the largest manufacturer of airplane armament.

During the war U.S. Senator Harry Truman had chaired a special committee investigating the National Defense Program. He became acquainted with Emerson Electric and came away impressed with its management. As President, Truman hoped to channel some of the talent he had discovered in the private sector into public service. Therefore, when the President asked him to join the government, following the advice of his father-in-law Senator James W. Wadsworth of New York, Symington resigned from Emerson. In July 1945 he became chairman of the Surplus Property Board, and the following October, administrator of the Surplus Property Administration.

Symington's work at Surplus Property undoubtedly contributed to Truman's decision to ask him to head the Air Force, which had a huge amount of property to dispose of and distribute after the war. Although Symington had planned to remain in government for only six months, the President wanted him to stay longer, so he offered him the choice of three positions: Assistant Secretary of the Navy for Air, Assistant Secretary of State, or Assistant Secretary of War for Air. Symington felt that his business background would be of greater service to the AAF than to the Navy. He had, after all, dealt with the AAF during the war, but even more important, the air arm seemed on the verge of independence. Here, he believed, lay the greatest challenge, one that his managerial and organizational talents could assist. According to Symington, it was his general business experience rather than his handling of surplus property that led to his selection as Assistant Secretary of War for Air in February 1946.

Symington was confident of his business skills, but he realized he was a novice at air operations. Thus, he left the day-to-day running of the air arm to military men. In this respect he established a precedent for future secretaries of the Air Force. He felt he could accomplish his managerial goals by persuading Congress of the importance of air power, in effect selling the operational programs devised by Gen. Carl Spaatz and other uniformed leaders. As Assistant Secretary of War for Air he showed himself unafraid to confront higher authorities in order to advance the cause of air power. He turned his attention therefore to work toward an independent Air Force and to establish a cost-control system within the AAF. He did not want the air arm dependent on elements of the War Department, for in the past the Army's technical services had sometimes dictated what quantity and types of equipment the AAF should have. Symington hoped to operate the AAF like Emerson Electric, with accurate information funneled into an office or center that had the ability to punish waste and reward efficiency. This businesslike approach represented a tremendous shift for the AAF because during the war there had been very few spending restraints. Now Symington wanted the AAF to perform its military mission and at the same time account for every dollar it spent for that purpose. Cost control would force the AAF to live within its means and to adjust to difficult times, traits required by any successful business. To enforce cost control, Symington instituted a system whereby the comptroller would function at the same staff level as the Deputy Chiefs of Staff for Personnel, Materiel, Plans and Operations. Lt. Gen. Edwin W. Rawlings became comptroller, and when this function became successful at headquarters, the same position was created at major commands. According to Symington, "the Air Force had an unusual opportunity to look toward efficiency, no past heritages, no barnacled procedures to first overcome."

On July 26, 1947, the National Security Act established the Department of the Air Force, now a separate service and the coequal of the Army and the Navy. On September 18 the Office of the Secretary of the Air Force was officially activated, and Stuart Symington took the oath of office as the first Secretary of the Air Force. He had a free hand in setting up his office—he was not forced into a predetermined organizational mold. He intended to establish the simplest, most effective and most efficient organization possible. He wanted close contact with the Air Staff and the OSAF so that he and Chief of Staff Carl Spaatz could delegate maximum authority to a handful of operating executives while maintaining close supervision over them and ensuring cooperation between the civilian and military staffs. As a result, both Symington and Spaatz could concentrate their individual and collaborative efforts on larger problems of their own choosing.

By law the OSAF was authorized one under secretary and two assistant secretaries. Symington asked Arthur Barrows, the former president and later vice chairman of the board of Sears, Roebuck, and Company, to become his under secretary. Barrows, who would concentrate upon procurement and production, research and development, soon gained a reputation among contractors as a no-nonsense type. As one example, when a contractor complained to Barrows that the Air Force did not like him, Barrows retorted, "We haven't said anything bad about you: we have just let it be known that we think you are a bunch of cheap, chiseling thieves."

Cornelius Vanderbilt Whitney, who became Assistant Secretary of the Air Force (Civil Affairs), worked with other government agencies on military-diplomatic air matters such as negotiating land purchases for air bases and protecting or defending U.S. bases on foreign soil. Whitney was a businessman who had worked on Eisenhower's staff during World War II and was a friend of the air secretary and a relative of his wife. Symington considered that the Whitney name, famous in finance and politics since the late nineteenth century, brought prestige to the Air Force.

Eugene M. Zuckert, who became the Assistant Secretary of the Air Force (Management) responsible for programming, cost control and organizational and budget planning, rounded out the staff. Zuckert had worked for Symington at the Surplus Property Administration and in the Office of the Assistant Secretary of War for Air. He would become Secretary of the Air Force in 1961.

Although it was clear that, as the senior civilian, Symington was in charge of the Department of the Air Force, he maintained good relationships with his Chiefs of Staff, Gens. Carl Spaatz and Hoyt Vandenberg. He respected his military staff and relied on them for advice on military matters. After they reached a decision, he would do his best to sell it on Capitol Hill. He once told the author that he operated on the premise, "Give me the ball and I will run it on the hill."

In 1947 the service secretaries were very powerful in relation to the Secretary of Defense. In fact, they were nearly equals. All sat on the National Security Council. Symington had some stiff go-arounds with Secretary of Defense Forrestal, who nearly fired Symington over a speech the latter made in Los Angeles.

During his tenure as Secretary, Symington consistently pushed for the 70-group Air Force. Although he argued that 70 groups were not enough to win a war, it would provide a bare means of survival against an initial onslaught by an enemy. Symington also helped lay the groundwork for two Air Force institutions—an Air Engineering Development Center and an Air Force Academy. The B–36 issue dominated the last year of Symington's tenure. It was charged that he and then Secretary of Defense Louis Johnson pursued the B–36 because of their friendship and interests in common with the manufacturer. Symington was exonerated; not one "scintilla" of evidence supported the charges, reports, rumors and innuendoes.

At the same time, Symington was troubled by his increased responsibilities to the Air Force without the means to fulfill them, so he resigned his position. Subsequently he commented that his greatest disappointment as secretary was his failure to achieve a 70-group program. However, shortly after he left office in April 1950 the 70-group issue became moot.With the beginning of the Korean War, federal coffers reopened, and a formerly austerity-minded administration and Congress pursued a how-much-do-you-need policy.

After his stint as Secretary, Symington ran for political office and continued to pursue his interest in the Air Force. Regrettably, secretaries who followed Symington possessed increasingly less power. Several pieces of legislation significantly diminished the role of the service secretaries, namely the 1949 Amendments to the National Security Act; Reorganization Plan No. 6 of June 30, 1953; and the Defense Reorganization Act of 1958.

As the first and most powerful Secretary of the Air Force to date, Symington endured an administration whose frugalities dampened his hope of securing a 70-group Air Force. Despite the paucity of funds, the Air Secretary managed to distribute sufficient Air Force contracts to keep the aviation industry afloat. He built a modern force as well as the research and development facilities to keep it going. W. Stuart Symington was the kind of leader the Air Force needed during its imperiled infancy.

Note: The source for this paper is *The Office of the Secretary of the Air Force, 1947–1965*, written by the author and published in 1993 by the Center for Air Force History, now the Air Force History and Museums Program.

Luncheon Address

History as Biography*

The Honorable Eugene M. Zuckert

I happen to believe that history is biography. So, as I began thinking about how I would celebrate the Air Force's fiftieth anniversary, my thoughts turned to three men who I believe laid the foundation for the Air Force as we know it today. In my estimation, our most remarkable early leaders were Hap Arnold, Tooey Spaatz, and Stuart Symington.

The first, Henry "Hap" Arnold, headed the air arm prior to World War II and remained as Chief of the Army Air Forces throughout the war. Hap Arnold was a magnificent leader who steered the growth of the air force from a few hundred airplanes and a few thousand people to an organization of 2.4 million people and more than a hundred thousand airplanes. That combat force, along with its supporting elements, could be projected to all corners of the globe. Hap Arnold graduated from West Point in 1907 and joined the air component of the Army in 1911. He was part of the Air Service through World War I, helped to lead the Air Corps throughout the interwar years, and commanded the Army Air Forces through World War II.

I personally dealt with Arnold on only a few occasions toward the end of his career. Despite the fact that other uniformed officers rose in rank and prominence during the war, nobody had any doubt as to who headed the Army Air Forces. Arnold was an amazing man, with a clear focus and the highest standards, as illustrated by one story that was passed around, even though it may be only apocryphal. The incident recounted was a time that Arnold was flying in his airplane over Nevada, above a B–17 training base. He looked down to see that all the airplanes were on the ground, and nobody was training. So he landed his aircraft at the field, sought out the base commander, fired him, and then took off again.

Obviously, Arnold saw the need for active leadership, but he also had a sense for drama. He was a great institution builder and a great judge of people, and he was not afraid to bring along young people. He was what I would

*RHC wishes to thank Dr. George M. Watson, who has interviewed Secretary Zuckert on several occasions, arranged for him to speak at the Aim High Symposium, and transcribed the former Secretary of the Air Force's remarks for publication.

call a multiplier—able to make things grow. But he had an additional quality that is worth remembering on the celebration of fifty years of the Air Force—he had vision. He knew that for the Air Force to become a separate service, as it inevitably would, it would have to be different; it would have to possess a wholly different philosophy, a wholly different method of operation. Also, it would have to bring in different kinds of people who could move beyond the illustrious combat experience of the war. As a result, Arnold instituted some new projects and organizations that permanently affected the character of the Air Force.

The RAND Corporation was one of Arnold's initiatives. He realized that the Air Force attracted men of action more than reflection. RAND was created to give the Air Force an in-house thinking capability. General Arnold recognized the importance of technology and appreciated the contribution that the scientific community could make to the Air Force. He therefore built upon his friendship with the great European scientist, Theodore von Kármán, to establish what became known as the Scientific Advisory Board that championed the application of advanced technology. The creation of the Arnold Engineering Development Center is further evidence of Hap Arnold's concern about the Air Force's investment in new technologies. Without Arnold's support for the partnership between the military and the scientific communities, the Air Force probably would not have achieved the substantial technological developments that followed.

The second hero that I would like to honor on the occasion of the fiftieth anniversary of the Air Force is Gen. Carl A. Spaatz, the first Chief of Staff of the United States Air Force. He is usually remembered as the Commander of the Eighth Air Force during World War II, the unit responsible for bombing targets all over Europe. General Spaatz, who sported a beautifully groomed moustache, looked like a Prussian general, and was probably descended from one. He had a wonderful face and an understated sense of humor. One of my favorite stories concerns the time that Secretary Symington asked him about a colonel, and Tooey (Spaatz' nickname) looked at him and said, "Well, Col. Babbitt is a very"—and Tooey stuttered a little bit—"a very thoughtful man. He always thinks things over very carefully before he goes off half-cocked."

Spaatz also had a sense of appropriateness that influenced the Air Force's development as a separate service. He was a dedicated believer in civilian control of the military, so he never forgave his good friend, Dwight D. Eisenhower, for running for president. General Spaatz believed that there were problems with civilian control over the military, but that there were more problems without civilian control. The Air Force has always been noted for its pattern of civilian control and civilian partnership with the military, and this precedent stems directly from Tooey Spaatz.

Spaatz also recognized how important it would be for the Air Force to mature. If airmen specialized in anything after World War II, it was inexperience. I do not think three people returning from the war could have told you where or how the Air Force got its money. I do not think we had three people who had ever testified before Congress. Tooey was determined that airmen learn the skills essential for managing a separate service. The Army and Navy had almost 200 years of experience in submitting budgets and negotiating with Congress. The Air Force, with no experience, was thrown into the middle of a very complicated process. I can assure you that this situation resulted in many humorous though painful episodes.

To help airmen learn more about congressional liaison, Tooey organized a school where he and others observed and listened to lectures about the political process. Tooey often got excited, and when he did, he tended to express himself in a kind of stuttering manner. "One thing that's most important," he stated during one of these classes. "One thing is most important," he repeated, "never, never tell a lie to a congressional committee." He stopped to think about what he had said for a moment and then concluded, "but that doesn't mean it's necessary to blab the truth."

In other instances Tooey showed that he possessed a natural political acumen. He was responsible for the existence of an Air Force National Guard. Some of the Young Turks in the Air Force thought that having states and local politicians involved in Air Force matters was a big mistake. Tooey responded with a simple question, "How many of these states have congressmen?" Thus, he insisted that we have, in addition to the Air Force Reserve, an Air Force National Guard.

Tooey was also a great judge of people. He and Stuart Symington forged a remarkable partnership that got the Air Force off to a running start. I am convinced that, through their abilities and personalities, they established a pattern for cooperative civilian-military relationships that persisted in the Air Force in the years that followed.

No doubt it is not surprising that my third hero is Stuart Symington, the first Secretary of the Air Force. For what he accomplished for the Air Force, I think he deserves to be listed among its heroes. Moreover, my own career owes a great deal to him. If there had not been a Stuart Symington, you never would have heard of me. He picked me from the bottom of the bush leagues, and in two years I went from being a lieutenant junior grade in the Navy to an Assistant Secretary of the United States Air Force.

Stuart was an amazing man, outrageous sometimes, but in ways that endeared him to everybody. For instance, he loved to tell southern congressmen that he had a grandfather who fought on the side of the Confederacy during the Civil War. He told the northern congressmen, which was also true, that he had a grandfather who fought for the Union during the Civil War.

The irreverent among our staff used to call him Golden Boy. He had everything. He was born into a not very affluent, but very distinguished Baltimore family. Everything he touched seemed to turn to gold. He was Yale.

He was good-looking, tall, a wonderful athlete, and his playmates at Yale were from families like the Whitneys. He seemed always to be associated with the best. He even had a fantastic marriage. His lovely wife was the daughter of the revered Senator Wadsworth, later a congressman from New York. It was Senator James Wadsworth who, after being defeated in a reelection to the Senate, returned to Congress as a U.S. representative, and who taught Symington a lot about politics, Washington, and about survival skills in that environment. Wadsworth's daughter, Symington's wife Edie, was talented herself. During the Great Depression, when Symington somewhat fell on hard times, his wife received favorable notice as a singer at the Waldorf Astoria in New York. Everybody loved Edie.

Symington had earned a reputation for salvaging near-bankrupt companies. He went to St. Louis where he exercised those skills with the Emerson Electric Company, becoming a successful industrialist. His affiliation with the Air Force began when his company became the largest manufacturer of B–17 bomb turrets. The Air Corps had asked him to go to England to study the British methods for designing bomber turrets. On his return, Emerson began manufacturing the turrets, and through this venture, Symington made contacts with various military and government offices. So, in 1946 when President Truman appointed him as Assistant Secretary of War for Air, succeeding the highly respected Robert Lovett who held that post during the war, Stuart was already known. He also had the advantage of a friendship with Truman. He was put in charge of the legislation that Truman wanted to push through Congress. He worked to establish the Air Force as a separate service through an organizational scheme that included three services under a Secretary of Defense.

Stuart Symington had an instinct for the jugular, and he was tireless. Those qualities took a toll on his physical condition. He suffered badly from high blood pressure, and we on the staff were frightened about his health because in the late afternoon he often looked so ill we were afraid that something really devastating was about to happen. His executive officer, Brig. Gen. Turner Simms, and I went up to the Capitol one night to speak to his father-in-law. We told Wadsworth that we feared that if Symington, who was so wound-up over the independence issue, ever testified before Congress on the unification bill, something terrible would happen to him. The congressman listened to us, and three or four days later we heard that Symington was going into the hospital. It was not until sometime later that I learned that Wadsworth had gone to Eisenhower, who was then Chief of Staff of the Army. I think it was Eisenhower, whom Symington adored, who persuaded Symington not to testify but to check into a hospital for an operation. That operation, which had not been very successful for others, worked for Symington. I was given the honor of reading Symington's testimony on unification before Congress.

Symington could inspire others, including younger people whom he hired to work for him. For example, in 1946 or 1947, we had a very young General Counsel in the Army Air Forces Secretariat. Symington hired this man over the strenuous objection of the Army Judge Advocate General. Our General Counsel was probably thirty-five years old. I too was thirty-five and had no experience except a teaching job at the Harvard Business School when Symington asked me to work for him. Symington appreciated the ability and energy young people could offer.

Yet Symington was not easy to work for. Steve Leo, who was Symington's marvelously dry-witted public relations man, told the staff, "I don't understand why Symington is so difficult. Actually he is a very tolerant man—he can tolerate anything except a mistake." Symington could also be impulsive. You never wanted to say to him, "Do you think it would be a good idea to call so-and-so?" because he would grab the phone and call so-and-so. Fortunately, he had tremendous intuition, a quick grasp of situations, and a feel for people.

Symington, like Spaatz, was concerned about the maturity of the Air Force. He knew that being a separate service was a different ball game from being the Army's air arm. He summoned me to his office one time and asked, "Why is it that when I want to do some calculations, I have to send out a search party to find the numbers?" He was determined that the Air Force was going to improve its method of managing resources. He commented that many of those in Congress had the impression of the Air Force as flying boys with white scarves and open cockpits and, "we have to change all that." We took a broad range of steps to correct the Air Force's system of financial management.

Symington also had a gift for understanding social issues. In 1948 President Truman issued the order integrating the Armed Forces. Symington was very proud of the fact that he had overseen the first factory in St. Louis that employed whites and blacks working on the same shop floor. He called in Generals Spaatz and [Ira C.] Eaker and me to tell us that the President had issued an order that the military services were going to be integrated, and that "we follow orders." With the respect that the military had for civilian control, and especially for Symington, the Air Force never had serious problems bringing about the integration of our forces.

* * * * *

In sum, I think that three people—Arnold, Spaatz, and Symington—deeply influenced the way the Air Force was born and the direction it grew. Arnold, as a wartime leader, engineered the Air Force's dramatic success, demonstrating for all time the important role of air power in war. That demonstration brought the independent Air Force into being.

Symington and Spaatz faced a different problem, that of operating a peacetime organization that had to gain respect and credibility and win the support of Congress. They also provided a fine model, by their own example, of how civilian control should function—military leaders making military decisions and the civilian side focused on the service's obligations to the public and to the Congress. The beautiful melding of viewpoints between Spaatz and Symington gave the Air Force the tremendous advantage of internal harmony.

Those two leaders also agreed on measures needed in order for the Air Force to mature. One was the importance of education, another the concern for efficient management. The Air Force has always had the goal, from Symington's time, of good management. Spaatz and Symington also emphasized a third area, technological development. In this, they followed in Arnold's footsteps. Like Arnold, they were determined that the Air Force should work with the scientific community, so they sought to develop a tone of cooperation that led to the advances we have seen in high-accuracy munitions and supersonic aircraft.

I could go on and on and on describing the ways in which the three men I have talked about brought order, efficiency, and vision to the early Air Force. The military and civilian leaders formed a wonderful partnership that worked remarkably well. I am confident that it continues to thrive today. We can celebrate fifty glorious years.

Roles and Missions

The Air Force and Strategic Air Power: Defining the Mission

Walton S. Moody

Some time ago I was giving my usual lecture on the origins of the Strategic Air Command, and someone asked if there was any prospect of the Air Force's breaking up Air Combat Command to recreate SAC and TAC. I'm afraid I didn't give as clear an answer to that as I should have, but the essential question to ask is what the mission of a separate strategic air command would be. For one thing, the Strategic Command we have now is a unified command, bringing in elements of more than one service. In any case, this is where the Air Force's inherent flexibility most closely intersects with national commitments and priorities. The ambiguity arises from the importance of strategic air power in the American air arm's history intersecting with its importance as a national mission. Furthermore, because it is a national mission, issues of command and strategy get intertwined.

Let me start by attempting to define strategic air power. In *Building a Strategic Air Force*, I attempted a multifaceted definition of the subject.[1] I was not entirely satisfied with what I came up with, and I'm still struggling with the problem. So maybe I will dispense with trying to be creative and just quote. What does Air Force Manual 1–1, *USAF Basic Doctrine,* say? It is significant that the current 1–1 de-emphasizes the definition of strategic air power. It is not one of the roles and missions mentioned in chapter 2, but under "Force application," one of the missions is strategic attack, defined as "to destroy or neutralize an enemy's war-sustaining capabilities or will to fight."[2] I might say in passing that Carl Spaatz knew that strategic attack can serve the aerospace control function as well. In the winter of 1944 he set out to win the battle for the air in Europe. To achieve this he employed a combination of strategic bombardment and escort pursuit.[3]

A lengthier definition is found in the functions statement of April 21, 1948, usually known as the Key West Agreement. This paper confers responsibility for strategic air warfare on the Air Force and then defines "strategic air warfare" as "Air combat and supporting operations designed to effect, through the systematic application of force to a selected series of vital targets, the progressive destruction and disintegration of the enemy's war-making capacity to a point where he no longer retains the ability or the will to wage war."[4] Clearly the newer and shorter definition is contained within the older one.

There are antecedents to these definitions. The distinction between tactical and strategic reconnaissance goes back to the specifications for the follow-on purchases of airplanes in 1912 after the early Wright acquisitions. The specifications distinguished between aircraft required for combat when enemy forces were in contact with friendly troops and when the enemy was at a distance.[5] In the 1920s and 1930s the Air Corps identified the main functions of the so-called Air Force as bombardment, pursuit, and attack. Bombardment was either tactical or strategic, depending on the targets.[6] This is what brings us to the Key West definition. The 1–1 is thus the more classical expression, more in tune with the older formulas of doctrine.

What these definitions have in common is a matter of targeting. But actual historical experience gives us pause. Before the Strategic Air Command, there was Spaatz' U.S. Army Strategic Air Forces (USASTAF) in the Pacific, the short-lived element of the war-ending structure. Before that, Spaatz had headed the U.S. Strategic Air Forces (USSTAF) in Europe. I will say more about these commands, but what they reflected was a national commitment to a mission of strategic bombardment. Even USSTAF, which was nominally under Eisenhower as theater commander, took its guidance for much of its time from the Combined Chiefs of Staff.[7] Here were organizations that had the word *Strategic* in their titles.

If the choice of word indicated that these commands were to engage in strategic bombardment, they were also responsive to the highest command authority. They represented in fact a national commitment to strategic bombardment. But they also addressed a long-standing issue of command. The model went back to Gorrell's Strategical Aviation staff in France in 1917 and 1918, which gave a precedent for the General Headquarters Air Force in interwar thinking, and which was established in 1935. Was the GHQ actually a theater command or was it part of the national command? Once it was clear that the Second World War would be a multitheater war, the air force concept meant that each theater required an air force of its own. Eighth Air Force, created in 1942, was formally the theater air force in Europe and was incorporated into USSTAF at the beginning of 1944.[8]

I need to carry the story further to place SAC in this context. The Unified Command Plan (UCP) of 1946 made SAC what would later be called a specified command. That is, it was an all–Air Force command reporting directly to the JCS. Unified commands included elements of more than one service. Thus SAC was directly under the highest command authority and would be assigned a mission determined at the national level. In contrast, the air element of a unified command got its mission from the theater commander.[9] Today's Joint Forces Air Component Commander embodies much of the old Air Force concept.

It would make a good deal of sense to define a strategic air force as being the force that is tasked directly by the highest authority. It's just that the historic definition of strategic bombing relates it to specific types of targets. But the separate strategic air force always existed when it had a specific mission, which was strategic attack. This was in essence the national mission to which I have been referring. The history of strategic air power in America has largely been the story of the national commitment to strategic bombardment, in response to specific military situations. But I want to say a few words about the context of strategic air power in the twentieth century.

As I like to describe it, the wars of the first half of the century were collisions between great industrial systems, sometimes known in the press as "war machines." In appearance, these systems were fragile, requiring a few hard blows to collapse them. The reality was very different: in fact they were robust, and only a grueling contest of attrition could bring them down. Douhet and other advocates of strategic air power believed that air power could deliver the knockout blow that would save everyone the painful war of attrition needed to wear down the enemy's industrial system. The idea of the knockout blow, whether through air power or armored thrusts or whatever, persisted throughout the 1920s and 1930s. In reality, strategic bombing turned out to be simply another, extremely effective, means of attrition. Likewise, Douhet thought of the knockout blow as beneficial to a poor country like Italy that could not sustain a long war of attrition.[10] In fact, strategic air power was a rich man's game, which only countries like America and Britain could afford.

To pick up the story, the experience of the First World War—when any alternative to the bleeding contest of the trenches was bound to have its supporters—illustrated how much effort was needed to build an effective strategic air force. In November 1918 the United States still had not one long-range squadron ready, although a number of Americans, including Robert Lovett, a future Secretary of Defense, had experience with allied long-range bombing units.

During the interwar years, as I have mentioned, the Air Corps discussed the Air Force concept, the role of bombardment, and the potential for strategic bombardment. I should say that the concept of daylight precision bombing by heavily armed, self-defending formations of long-range high-altitude bombers had great strengths as well as flaws. The theory provided a clear concept of how bombing could actually affect the outcome of a war, through the destruction of key points in the enemy's industrial system. Douhet and others had tended to assume that the morale effects of the attacks would somehow simply produce the enemy's collapse, that no other explanation was needed.

In America, the nation's isolationist mood robbed any hypothetical threat of credibility. The major achievement of the Air Corps in the field of strategic bombardment was the development of the B–17, but this was largely based on the argument that the range would be necessary for a variety of roles. Primarily it was the growing sense that Germany might be the enemy in the next war that encouraged Franklin Roosevelt and the rest of the nation's leadership to consider a commitment to strategic air power.

The story of strategic air power in the Second World War is well known. I will point out only a few issues. The Churchillian strategy of bombing Germany to achieve attrition fit well with Army Chief of Staff Gen. George C. Marshall's concept that bombing would help prepare the way for the land invasion. The United States in 1939 was no better prepared for strategic bombing than the Royal Air Force was, but before bombers started hitting Germany, the Air Corps used its time fairly effectively. There were still lessons to be learned—the one about the value of a long-range escort fighter being the best known. The Army Air Forces (AAF) commander, Henry H. Arnold, had to make clear to the British that American aircraft production was going to support an *American* bomber force, not just the RAF.[11]

The ABC–1 talks, the Rainbow 5 war plan, the Victory Program and AWPD–1, the Atlantic Conference, and Plan Bolero all built up a commitment to sending an American force to Europe to bomb Germany. Eighth Air Force was created as the theater air force for Europe, but it evolved into the force for the strategic bombing of Germany as envisioned in Anglo-American planning, as was USSTAF in its turn.

The B–29 and the atom bomb, both developed for the war against Germany, were employed strategically against Japan. As I mentioned, a command directly under the JCS handled these operations. The debate over the use of the atom bomb has helped point up the tremendous importance of strategic air power against Japan as one of the alternatives to a land invasion in the light of the Japanese reputation for fanatical opposition.

Although controversy over the effectiveness of the strategic air offensives against Germany and Japan has yet to end, many in and out of the Air Force were convinced that the nation would need such a capability in advance of future wars. The AAF in March 1946 thus created SAC, and in December 1946 the JCS in the UCP made SAC a command directly responsive to it, what would later be called a specified command. Thus SAC was to carry out a national mission.[12]

The B–36 had also been developed for the offensive against Germany. By the time money was needed to make it operational, the nation was facing the need to deter Soviet aggression. The Air Staff in 1951 and 1952 developed the Air Concept which articulated a strategy that had been evolving in American thinking for some time. Nuclear-armed air power directed against the warmaking potential of the Soviet Union was essential to a credible deterrent.[13]

Thus a commitment to a strategic air force equipped with bombers of intercontinental range (using air refueling if necessary) and nuclear weapons was central to America's strategy for the Cold War. The problem in 1947 and 1948 was that, although the national mission was in the war plans then in preparation, questions had arisen about its role, and SAC itself was in no condition to carry out its tasks. It was Curtis E. LeMay, who took command of SAC in October 1948, and turned it into an effective striking force. This meant that the Air Force was in a position to put up rather than to shut up.

In the Cold War era, SAC carried the load for some time as embodying the nation's commitment to strategic deterrence, but technology and service politics intervened to create the triad that consisted of bombers, ICBMs, and submarine-launched missiles. The SIOP came to be the nation's general war plan.[14] But the local wars of the Cold War era occurred at the theater level for the most part. And it was theater air forces that conducted bombing that was called strategic.

Anomalies resulted. With general war transformed into a deterrent standoff between the great industrial superpowers, local struggles assumed a new form. In the Korean War the real strategic targets were in Soviet territory and were not struck. When SAC intervened against genuine strategic objectives in Southeast Asia, it was by order of the President of the United States. In the Persian Gulf in 1991, the theater commander supported a strategic air campaign, and the Air Force was ready to respond.

This brings us back to the question I tried to answer before. In 1992 SAC went away, and a unified Strategic Command with Air Force components from ACC and other MAJCOMs took its place. This was still seen largely as a nuclear command. The story of strategic bombing has been affected by the emergence of precision conventional weapons. Above all, the question that nuclear weapons and strategic attack pose is whether the nation can define a mission for these capabilities. Until it does, as the Gulf War experience shows, the Air Force will have to be ready to respond.

Notes

1. Walton S. Moody, *Building a Strategic Air Force* (Washington: Air Force History & Museums Program, 1996), pp. ix–xi.
2. AFM 1–1, *Basic Aerospace Doctrine of the United States Air Force*, Mar 1992, pp. 6–7.
3. Richard G. Davis, *Carl A. Spaatz and the Air War in Europe* (Washington: Center for Air Force History, 1993), pp. 298–302.
4. Paper, "Functions of the Armed Forces and the Joint Chiefs of Staff," Apr 1948, in Alice C. Cole, Alfred Goldberg, *et al.*, eds. *The Department of Defense: Documents on Establishment and Organization, 1944–1978* (Washington: Office of the Secretary of Defense Historical Office, 1978), p. 285.
5. Juliette A. Hennessy, *The United States Army Air Arm, April 1861 to April 1917*, new imprint (Washington: Office of Air Force History, 1985), p. 58.

6. Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm, 1917–1941* new imprint (Washington: Office of Air Force History, 1985), pp. 9–10, 36–40.
7. Robert F. Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force, 1907–1960* (Maxwell AFB, Ala.: Air University Press, 1989), Vol. I, pp. 73–75, 147–165.
8. *Ibid.*, Vol. I., pp. 19–27, 73–75, 147–165.
9. Ronald H. Cole, Walter S. Poole, *et al.*, *The History of the Unified Command Plan, 1946–1993* (Washington: Joint History Office, 1995), pp.11–14.
10. David MacIsaac, "Voices from the Central Blue: The Air Power Theorists," in Peter Paret, ed., *Makers of Modern Strategy: From Machiavelli to the Nuclear Age* (Princeton, N.J.: Princeton University Press, 1986), p. 630.
11. Forrest C. Pogue, *George C. Marshall: Ordeal and Hope, 1939-1942* (New York: Viking, 1966), pp. 141, 145.
12. Moody, *Building a Strategic Air Force*, pp. vii, 132–134.
13. *Ibid.*, pp 445–461.
14. David A. Rosenberg, "The Origins of Overkill: Nuclear Weapons and American Strategy, 1945–1960," *International Security*, Vol VII (Spring 1983), pp. 24ff.

Air Force Space Missions: Prophecy Fulfilled? A Historical Overview*

George W. Bradley III

It is rare for any historian, even a historian of contemporary affairs, to be present at a seminal point in history and to realize its significance at the time. However, I believe I was privy to such an occurrence. On November 19, 1996, the Commander of Air Force Space Command, Gen. Howell M. Estes III, called his headquarters staff to a meeting. He informed us that, at the most recently held periodic conference known as Corona, the senior leaders of the Air Force had committed to a new view of the institutional Air Force. As General Estes put it, "The Air Force has decided that it is no longer an Air Force, it is an *Air and Space Force,* and is evolving towards a *Space and Air Force.*" He paused and, looking at his assembled staff, declared, "It is our job to make it happen." General Estes went on to comment that, interestingly enough, the four-star commanders of flying commands, rather than the Space Command leader, were the most vocal about the need for the new perspective.[1]

I recognized at the time that I was, perhaps, witnessing a sea change in the organization. Within months, the Air Force issued its new vision for the twenty-first century, entitled "Global Engagement." Capitalizing on the concepts embedded in a previous mission statement known as Global Power—Global Reach,[2] the new catechism spelled out the Air Force's core competencies and crystallized the Air Force leadership's current view of its space mission:

> Ensuring that air and space power continues to make its unique contributions to the nation's Joint Team will take the Air Force through a transition of enormous importance. We are now transitioning from an *air* force to an *air and space* force on an evolutionary path to a *space and air* force. The threats to Americans and

*I acknowledge the contributions of Dr. David N. Spires and of my colleagues at the Air Force Space Command History Office, Drs. Rick Sturdevant and Richard Eckert, who served with me as editors of Dr. Spires' book, *Beyond Horizons: A Half Century of Air Force Space Leadership.* The insights in the manuscript and during the chapter seminars led me to many of the views suggested in this paper.

> American forces from the use of space by adversaries are rising while our dependence on space assets is also increasing. The medium of space is one which cannot be ceded to our nation's adversaries. The Air Force must plan to prevail in the use of space.[3]

Less than fifty years after the establishment of the Air Force as a separate service, its corporate leaders elected to change the core nature of the Air Force to emphasize the importance of space missions. That change can be better appreciated by an understanding of how those missions came into being. It is impossible in a short time to mention all the policy and planning events that contributed to the Air Force's space missions, or the roles and missions debates among the military services, or the man-in-space missions that the Air Force never acquired. This paper will attempt, therefore, only a brief overview of the evolution of the Air Force's space missions, focusing on the critical elements of their development, and will conclude with a summary of today's space missions.

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In the closing years of World War II, in September 1944, Gen. Henry "Hap" Arnold, Commanding General of the Army Air Forces, asked his longtime friend and technical consultant, scientist Theodore von Kármán, to organize a study group that would look at the long-range implications of scientific and technological advances for the future of the Army Air Forces. In August 1945 von Kármán's group of about twenty leading scientists and engineers, eventually known as the Scientific Advisory Board, produced a preliminary study, *Where We Stand*, that explored the future possibilities of air power. Among its recommendations was a proposal that the Army Air Forces pursue long-range missiles.[4] Based on studies by the von Kármán group and other bodies, Arnold, in a report to the Secretary of War in November 1945, emphasized the importance of missiles and satellites to the nation's defense. By mid-December 1945 von Kármán's Scientific Advisory Board had completed its thirty-three volume report, *Toward New Horizons*. Although the report's authors believed that air-breathing rockets would be the near-term focus of research, they mentioned the potential of intercontinental ballistic missiles and artificial satellites that would orbit the earth.[5]

A more detailed definition of potential military space capabilities was revealed in the Research and Development Corporation (RAND) report entitled *Preliminary Design of an Experimental World-Circling Spaceship*, which was produced in early May 1946.[6] That report is important in that it not only argued for the feasibility of an artificial satellite, but it is one of the first articulations of the utility of military satellites. Noted radar expert Louis N. Ridenour's chapter, "The Significance of a Satellite Vehicle," laid out possible support roles, including weather, communications, and observation, and even briefly suggested a form of navigation. Equally important, Ridenour noted that rockets capable of propelling an ICBM might be used to launch satellites.[7] Thus, by the spring of 1946 the Air Force and its technical consultants had outlined a number of the crucial space missions that the Air Force would advocate, fund, and field over the next fifty years. To a great extent the satellite roles set out in RAND's *World-Circling Spaceship* would become the basis of the Air Force's space missions in the following decades.

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Despite the prophetic nature of the 1946 RAND report, the Air Force gave more lip service than real support to space missions. For example, although Gen. Hoyt Vandenberg, Air Force Chief of Staff, declared in a January 1948 policy statement that the Air Force had "the logical responsibility" for satellites, the Air Force failed to provide the funding necessary to pursue satellite development.[8] Nonetheless, RAND continued to produce report after report detailing the possibilities of satellites, especially in the area of reconnaissance, which continued to garner interest if not tangible support from Air Force leaders.

By 1954 national concerns about the possibility of a Soviet ICBM threat led a number of influential leaders such as Assistant Secretary of the Air Force Trevor Gardner, renowned Princeton mathematician Dr. John von Neumann, and Brig. Gen. Bernard Schriever to convince the Eisenhower administration of the need for a crash program to develop an American ICBM capable of delivering a nuclear weapon. That was a critical moment for the Air Force space mission since, as Ridenour had commented years earlier, the boosters necessary to propel ICBMs would be equally suited to launch satellites. In March 1954 RAND's Project Feed Back report advocated the first military satellite mission: reconnaissance. Adopting RAND's recommendation, the Air Force developed a study project and assigned it weapon system number 117L. WS–117L initially focused only on reconnaissance, but the project eventually included other aspects such as weather, observation, and warning (an early form of warning became known as MIDAS—Missile Defense Alarm System).

Thus, by 1954 the Air Force, primarily through its RAND studies, had spent nearly ten years investigating the possible uses of military satellites and was now beginning to pursue their development in earnest. What is remarkable is that the support roles envisioned in the 1946 RAND report remained virtually unchanged. Spurred by the Cold War, the Air Force, almost despite itself, began the inexorable march toward implementing those missions envisioned in 1946. Ironically, the reconnaissance mission, which had elicited the service's keenest interest, would eventually be taken from the Air Force and subsumed under the highly secret National Reconnaissance Office. The Air Force would retain what it considered the more mundane support functions such as weather, navigation, communications, and warning.

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The Soviet Union's launch of *Sputnik I* in October 1957 advanced American concern for its own space program as perhaps no other event could have done. Moreover, the earlier decision to develop a crash program for ICBMs had also provided the necessary boosters for satellites. Taking advantage of the anxiety about the space race fueled by Sputnik, during the final years of the Eisenhower administration and the early years of the Kennedy presidency the Air Force argued that it should be the preeminent service for space missions. The Air Force also began to define those missions more carefully. Over the years, reports by RAND and other think tanks, and by various committees and projects within the Air Force, had proposed a variety of space missions. They often competed with those of other services as well as with the new civilian agency that emerged from the Sputnik furor, the National Aeronautics and Space Administration.

The politics and overlapping and competing interests were Byzantine, but a critical decision was reached in 1961. The Kennedy administration, spurred on by congressional criticism, attempted to delineate areas of responsibility for the space program that had not been resolved by the National Aeronautics and Space Act of 1958. In March 1961 Secretary of Defense Robert McNamara issued a directive that delineated the Air Force role in space as "research, development, test and engineering of Department of Defense space development programs or projects."[9] Although the other services were allowed to conduct preliminary research, and operational assignment of space systems would be accomplished on a case-by-case basis, the directive established the Air Force's primacy in space. By the end of 1961, the Air Force had not only achieved a singular role in national space programs, but it was heavily invested in the space missions that eventually would become dominant. Those included missile detection and early warning, space surveillance, communications, navigation, and meteorology.

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While Air Force space missions were closely defined by specific projects and programs in the 1950s and 1960s, thereafter a more doctrinal approach to Air Force space missions developed. Today they are grouped into four areas. The first, Space Forces Support, includes space launch and control of satellites after deployment. The deployed systems include the Defense Meteorological Satellite Program (weather), the Defense Support Program (detection of missile and space launches as well as nuclear detonations), the Navstar Global Positioning System (a constellation of twenty-four operational navigational satellites), and the Milstar Satellite Communications System (a secure, jam-resistant, worldwide communications satellite system).

The second, Space Control, includes a wide variety of capabilities covering space surveillance, space system protection, and prevention and negation measures. Systems in this area include a ground-based space surveillance network that detects, identifies, and tracks objects in space; space-based missile launch detection and early warning satellites (the Defense Support Program constellation); and a network of ground-based early warning radars.

Force Enhancement, the third, involves using information from space to support theater warfighters in the areas of communications, navigation of forces, surveillance of the battlefield and the weather over it, and advanced warning of enemy missile launches. The fourth, Force Application, means exactly what it says: the application of force through space to achieve national ends, i.e., one leg of America's triad, the land-based ICBM force consisting of Minuteman III and Peacekeeper missiles.[10]

The Air Force Space Command oversees those four mission areas. What is remarkable is the similarity between the missions envisioned in RAND's 1946 *World-Circling Spaceship* report, and those conducted by the Air Force today, more than fifty years later.

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I began my comments by noting that we are witnessing a major change in the institutional nature of the Air Force, a change that became evident with the acknowledgment by Air Force leaders that space had played a significant role in winning the Gulf War. That conflict has even been called the first space war, although there is some disagreement on that point. In June 1992 Gen. Merrill A. McPeak, Chief of Staff of the Air Force, gave further credence to the importance of space in a speech at Maxwell AFB entitled "Does the Air Force Have a Mission?" General McPeak declared that the mission of the Air Force was to "defend the United States through control and exploitation of air and space."[11] For the first time, space was overtly stated to be part of the core mission of the Air Force. The adoption of that mission statement paved the way for a more recent elaboration by present chief of staff, Gen. Ronald Fogleman. In a speech in October 1996, he explained in greater detail what the gathering at the fall 1996 Corona meeting meant by the shift toward a space force:

> In keeping with our nature and focus as a global force capable of employment at the strategic, operational, and tactical levels of war—and in view of the continued integration of capabilities in space—we've combined air and space superiority into one core competency. This change reflects the transition to an air and space force and the need to control the entire vertical dimension—the domain of air and space power.[12]

The past does not predict the future. Certainly, however, the direction that the Air Force has taken these past fifty years seems to indicate that the space mission will continue to expand and dominate. I would like to conclude with an offhand remark heard during the fall 1996 Corona meeting to the effect that in the future we should expect to see, not a Captain or Admiral James T. Kirk of Star Fleet, but a Colonel or General Kirk of Space Forces.

Notes

1. G. Bradley, HQ AFSPC/HO, AFSPC/CC Staff Meeting, Nov 19, 1996.
2. See Pamphlet, Hon. Donald B. Rice, Secretary of the Air Force, *Reshaping for the Future*, Department of the Air Force, 1992.
3. Pamphlet, HQ USAF, *Global Engagement: A Vision for the 21st Century Air Force*, n.d., p 7.
4. Michael H. Gorn, *Harnessing the Genie* (Office of Air Force History, Washington, D.C., 1988), pp 23–31.
5. See Theodore von Kármán, *Toward New Horizons: Science the Key to Air Supremacy—Commemorative Edition, 1950–1992* (HQ Air Force Systems Command, 1992); also see Gorn, *Harnessing the Genie*, pp 35–50.
6. For the text of the report, see John M. Logsdon *et al.*, ed., *Exploring the Unknown: Selected Documents in the History of the U.S. Civil Space Program*, Volume I: *Organizing for Exploration* (NASA History Office, Washington, D.C., 1995), pp 236–244.
7. *Ibid.*
8. Robert L. Perry, *Origins of the USA Space Program, 1945–1956*, AFSC Publications Series 62-24-10, AFSC/Space Systems Division, 1961, p 23.
9. DOD Directive 5160.32, "Development of Space Systems," Mar 6, 1961.
10. Pamphlet, HQ AFSPC, *Guardians of the High Frontier*, n.d., pp 14–21; Pamphlet, HQ AFSPC/PA, "1995 Stakeholders Report," *The Guardian*, Feb 1996; Fact Sheet, "Air Force Space Command," Jun 1996.
11. Speech, Gen. Merrill McPeak, "Does the Air Force Have a Mission?" Maxwell AFB, Ala., Jun 19, 1992.
12. Speech, Gen. Ronald R. Fogleman, "Strategic Vision and Core Competencies," Air Force Association Symposium, Los Angeles, Calif., Oct 18, 1996.

Combat Support

Fifty Years of Air Force Logistics, 1947–1997

William W. Suit

By its very nature, the Air Force is more heavily weighted on the tail end of the tooth-to-tail equation. The inescapable fact is that, for the most part, a limited number of aircrews, special operations personnel and other miscellaneous groups carry out the Air Force's combat engagement mission with the support of a larger logistics tail. Over the past fifty years, the logistics menagerie has evolved along with the service's weapon and support systems, technology, roles, missions and combat experience. Rapid technological advances have allowed logisticians to dramatically improve both the quality and the timeliness of logistics support, and there is no reason to believe this trend will not continue into the future.[1]

When the United States Air Force (USAF) gained its independence from the Army in 1947, the United States faced no immediate military threat. Vanquished World War II enemies struggled to rebuild their countries while victorious European allies grappled with restoring their battered nations. America rapidly demobilized after the war, leaving mountains of air war materiel strewn about the globe and tens of thousands of aircraft stored around the United States. At the same time that the Air Force was dismantling its World War II–era piston-engine armada, it was embarking on the development of an atomic/jet air and space force. This task gained added urgency in the late 1940s when the country and its allies found themselves engaged in a marathon Cold War with the Soviet Union, China and their client states, and fighting a hot war in Korea. At the close of 1947, the Air Force numbered 339,000 military personnel and employed an additional 111,000 civilians, down from 2.3 million and 410,000, respectively, three years earlier. Aircraft on hand had fallen from a wartime high of 78,000 to 23,000 in 1947, and most of these were in storage.[2]

From a logistics viewpoint, the USAF faced two primary tasks in 1947: culling the vast store of materiel left over from World War II, and reequipping itself with modern aircraft and support equipment. The mass exodus of skilled support personnel from the Army Air Forces (AAF) following the war and a precipitous drop in defense spending hampered these efforts.

During the closing months of World War II, the Air Service Command began an aircraft storage and distribution program. By 1947, responsibility for the program had passed to the Air Materiel Command (AMC). Briefly, the program involved finding suitable storage sites for the aircraft, selecting aircraft for operational reserve or scrap, preparing the aircraft for storage and, when necessary, removing the aircraft from storage and returning them to operational units in serviceable condition. In 1946, AMC storage facilities held 16,000 aircraft. At first the AAF stored aircraft at dozens of locations. However, as AMC trimmed the inventory, a few climate-friendly sites came to serve as the primary storage facilities: Davis-Monthan Field, Arizona; Peyote Field, Texas; Hill Air Field, Utah; and Tinker Field, Oklahoma. Beginning in 1947, the Air Force began transferring excess aircraft to the Air Force Reserve, the Air National Guard and numerous foreign air forces.[3]

Dealing with surplus nonaircraft materiel and property proved more taxing. In the spring of 1947, AMC still did not know the content of its worldwide inventory. Immediately after World War II, the AAF began developing a World-Wide Stock Control and Reporting System as a tool to manage its inventory, but it was not fully implemented until after the Korean War. The bulk of the materiel in Europe, mostly in the United Kingdom, had been declared surplus and sold for token sums. The situation in the Pacific theater was more complicated. There, the materiel lay scattered across the Pacific at locations such as Guam, the Philippines, Australia, New Guinea, Japan and Okinawa. Immediately following the war, under Operation Packout, the AAF (and later the USAF) dispatched caretaker personnel to catalog, pack and assist in disposal of the supplies and equipment. However, as late as 1950 vast stores of materiel remained in place at the Pacific outposts. In the continental United States (CONUS), the USAF rapidly reduced its depot structure, but the service found disposal efforts very slow going. Working with the Reconstruction Finance Corporation, the Central Surplus Property Agency and later the General Services Administration, AMC chipped away at the mountains of USAF property and supplies that ranged from aircraft factories to spark plugs. Despite an accelerated disposal program begun in 1949, five years after the end of World War II, Air Force warehouses still bulged with war surplus.[4]

Between 1947 and 1948, the President's Air Policy Commission (Finletter Commission) and the Congressional Aviation Policy Board (Brewster Committee) examined the status of America's military air power and the country's aviation industry. Both committees concluded that the Air Force required a minimum of seventy combat groups (or wings), equipped with new aircraft, in order to meet the nation's security needs. Reaching this ambitious goal required a significant expansion of aircraft production with an accompanying increase in flight crews, support personnel and materiel support. To achieve this end, the Air Force established the Five-Year Aircraft

Procurement Program, to be executed from 1948 through 1952. However, President Harry S Truman worried that such a rapid Air Force buildup might be construed domestically and internationally as a threatening rearmament, and neither he nor Congress wanted to spend the money required. By 1950, a lack of funds compelled the Air Force to revise its procurement program to provide for only a forty-eight-group program. With the limited dollars available and development-to-production lead times growing, an all-jet combat fleet appeared to be many years away. On the eve of the Korean War, the Air Force had inched its way into the jet age, but the bulk of its aircraft still consisted of World War II designs. As noted, many of these aircraft remained in storage.[5]

During the peacetime interlude, the Air Force fine-tuned its maintenance procedures and organization. At the command level, AMC adopted a two-zone support system, dividing the CONUS into self-sufficient maintenance and materiel support zones along the Mississippi River, east and west. Air Materiel Areas (AMAs)—AMC's primary maintenance, repair and support facilities—and specialized depots provided support to the operational units within their zones. In 1947, in the area of aircraft maintenance, the Air Force replaced the four-echelon maintenance system developed by the AAF during World War II with a three-division system—organization, field and depot. Under the new system, the organization (unit ground crews) performed flight-line inspections and preventive maintenance. Field maintenance included repairs requiring fixed shops, skilled mechanics and heavy precision tooling and was performed at the air base level. Depot maintenance included aircraft and component overhaul and major modifications performed at a CONUS AMA or at one of the overseas depots located at RAF Burtonwood, England, or Tachikawa Air Base (AB), Japan. The same year, 1947, at the direction of HQ USAF, all wing/base organizations adopted a standard organizational structure that included maintenance and supply groups and airdrome groups (later renamed air base groups). The new organizational changes functioned well, but the mass exodus of skilled personnel following demobilization and a corresponding reduction-in-force among civilian workers left the flying units and depots short-handed and facing a skills imbalance. Retraining mechanics for jet aircraft support added further complications. By 1950, a concerted recruitment effort alleviated the military personnel problem, returning balance to the Air Force's skill and rank structure. Unfortunately, Washington did not provide the funds to rebuild the civilian depot work force, and the system was strained to the limit at the outbreak of the Korean War.[6]

North Korea's invasion of South Korea in June 1950 caught the United States by surprise, but not totally unprepared for the ensuing air war. To be sure, at first the Air Force scrambled to throw the right types of aircraft and trained personnel into the fight and hustled to provide the required support. However, even at the height of the Korean War, the Air Force committed no more than one-fourth of its resources to the Far East Air Forces (FEAF), which consisted of the Fifth, Thirteenth and Twentieth Air Forces. Throughout the war a sizable portion of FEAF remained committed to regional air defense. Despite the deliberately limited nature of the conflict, the impact of the war reached well beyond the Korean peninsula. More than demonstrating that the United States and its allies would use military force to contain communist aggression, the war spurred the expansion of the USAF and allied armed forces, particularly those of the North Atlantic Treaty Organization, the latter with considerable materiel assistance rendered through the Mutual Defense Assistance Program ([MDAP], later renamed the Military Assistance Program [MAP]).[7]

Within days of the first offensive air operations, the United Nations Command enjoyed air superiority over the North Koreans. Providing FEAF with additional aircraft, building air bases in Korea capable of supporting jet aircraft and heavy transports, establishing a supply line, creating in-theater base-level and depot-level maintenance capabilities, and expanding CONUS logistics support capabilities—all these tasks took longer.[8]

When the Korean War began, FEAF possessed a mix of approximately 1,200 aircraft, less than half in operational units, stationed on Guam (including 19th Bombardment Wing conventionally armed B–29s) and Okinawa and in the Philippines and Japan. Organized and equipped as a defensive force, the bulk of FEAF's air fleet consisted of F–80C fighters. Primarily configured for air-to-air combat, these F–80s were not particularly suited for the task at hand because they could not operate from the austere air fields in Korea, the battlefield lay at the limit of their range from the air bases in Japan, and they were not equipped to carry both bombs and external fuel tanks. None was equipped with pylon bomb racks. Nevertheless, FEAF easily made quick work of the North Korean Air Force, but immediately found itself in pressing need of more transports and ground attack aircraft both to augment the forces on hand and to provide attrition replacements. To fill FEAF's requirements, the Air Force transferred operational units from the CONUS and Alaska to FEAF, withdrew and reconditioned aircraft from storage, and took aircraft from Air Force Reserve and Air National Guard units, replacing their planes with ones withdrawn from storage. In this way the Air Force rapidly placed hundreds of additional F–51s, F–82s, newer model F–80s, B–26s, B–29s, transports, helicopters and reconnaissance planes under FEAF's operational control. As the war ground on and aircraft acquisitions accelerated, the Air Force introduced newer planes such as the F–84, F–86 and F–94.[9]

Few paved runways existed in Korea before the war, and none was suitable for sustained combat jet aircraft operations. Additionally, nearly every airfield of any consequence in both North and South Korea was damaged to some extent during the seesaw attacks and counterattacks of the first six months. Consequently, for the first months of the war, all USAF jet operations originated from bases in Japan. F–51s, C–46s, C–47s and C–54s could operate from the crude Korean air strips. These World War II aircraft proved invaluable, therefore, in the early fighting. The creation of a network of jet-capable air bases became absolutely necessary once the Chinese and North Koreans introduced MiG–15s into the war. This task fell to the combat engineers. When the United Nations forces broke out of the Pusan Perimeter and pushed north, engineer aviation units followed. These hybrid USAF–U.S. Army units (Special Category Army Personnel with Air Force), augmented by local contract labor, constructed the pierced-steel plank runways that first brought short-range F–80 jet fighters and RF–80 reconnaissance jets closer to the enemy. As the battlefront stabilized, the engineer aviation units constructed permanent air bases with concrete or asphalt runways that could better withstand the wear and tear of jet fighter and C–124 heavy transport traffic. After tenant USAF units moved into an air base (either temporary or permanent), USAF installations squadrons assumed responsibility for air base maintenance and improvement. As with the engineer aviation units, the installations squadrons relied heavily on local labor and materials.[10]

The Far East AMC, later redesignated the Far East Air Logistics Force (FEALOGFOR), managed the supply and maintenance of USAF forces in the theater. At first, FEAF relied on remaining World War II supplies and on the limited peacetime operating stocks available in the region. The high tempo of action, however, quickly depleted these sources. As the war escalated, FEAF materiel requirements mushroomed, increasing over fivefold by 1952 and straining the logistics pipeline stretching across the Pacific. Air Force issues of fuel alone increased from 591 million gallons in fiscal year 1950 to 2.1 billion gallons in fiscal year 1953.[11] The Sacramento AMA directed the flow of materiel to the growing supply and maintenance depots in Japan, Korea and the Philippines. In August 1950, to ease supply and maintenance efforts, HQ AMC established direct teletype communications with HQ FEAF. At first, AMC applied the "push" supply principle, which meant that the Air Force rushed to the theater all of the available supplies that AMC logisticians believed FEAF might need. In addition, AMC scrambled to ship the flood of specific high-priority supplies and spares requested by FEAF. The depot at Tachikawa was large enough to absorb most of the incoming materiel, but the limited port facilities in Korea quickly became saturated. All through the war AMC and FEALOGFOR made a determined effort to keep theater inventory levels at sufficient levels to meet consumption, but because consumption forecasting was not yet reliable, supply requirements and availability did not always match. Fortunately, given the distance between the sources of supply in the United States and the fighting forces in the Far East, Japan served well for theater procurement, quickly becoming a reliable source for raw materials and manufactured items that ranged from munitions to radios and aircraft external fuel tanks.[12]

With the Pacific Ocean standing between FEAF and its sources of supply in the United States, transportation loomed critical. Moving supplies to Korea did not become too difficult, but moving supplies within Korea and tracking individual shipments as they wound their way through the supply line did indeed prove troublesome. The Military Sea Transportation Service provided sea lift. The Military Air Transport Service airlifted high-priority supplies from the CONUS to either Japan or Korea. The 315th Air Division (Combat Cargo) conducted in-theater air transport, while the U.S. Army carried the burden of ground transportation in Korea.

Aircraft operating from Japan and Okinawa did not experience major maintenance difficulties. Flying units operating from airfields behind the ground troops in Korea encountered considerable maintenance and supply problems, and these difficulties remained unresolved until the battle line stabilized and the aircrews, support personnel and aircraft settled into permanent air bases. As noted, the Air Force aircraft maintenance system operated on a three-tier system that required field maintenance (utilizing fixed shops and precision equipment) be performed at the air base/wing level. As Air Force units moved north, then retreated, and again moved north, valuable truck-transported equipment was captured, destroyed and lost in the shuffle. In many cases, maintenance personnel simply did not have enough time to set up the necessary shops. Even when the battleline stabilized, crude forward base conditions and the high tempo of operations caused the quality of field-level maintenance to slip. The mechanical condition of aircraft deteriorated. To alleviate this situation, FEAF established Rear Echelon Maintenance Combined Operation (REMCO) shops. Located at secure rear-area bases, REMCO shops acted as in-theater maintenance centers, performing field maintenance and some depot-level functions such as battle damage repair, basic airframe overhaul, modifications and engine repair. Forward operating base mechanics performed only flight-line inspection and maintenance and simple field-level repair. Aircraft were flown back to REMCO shops for more complicated maintenance.[13]

The Korean War was the final event that nudged the United States into large-scale rearmament and an accompanying expansion of AMC depot activities. Until 1950, the Air Force had been cutting back on maintenance and supply personnel and facilities. The war reversed this trend. Activity at AMC's eight AMAs and eighteen supply depots expanded rapidly as the command, with contractor support, overhauled and modified increasing numbers of aircraft, engines and subsystems for the USAF and MDAP countries. The number of personnel (overwhelmingly civilian) within the command climbed from 101,000 in 1950 to 191,000 in 1953. In 1951, AMC overhauled 1,949 aircraft and 27,919 engines. In 1954, the Command reconditioned 4,512 aircraft and overhauled 27,500 engines. Acquisition, supply and maintenance activities remained at this high tempo until the aircraft buildup peaked in 1957.[14]

China's entry into the Korean War put an end to bureaucratic wrangling over the Five-Year Aircraft Procurement Program, radically changing the scope and pace of aircraft acquisition. The Air Force entered the war with a 48-wing fleet, but within six months both Congress and the President supported expanding the Air Force to 95 wings by June 1952. However, Washington did not want to disrupt the civilian economy. The Air Force therefore initiated a relatively gradual general rearmament program, as did the other services. Because the Air Force maintained an ongoing research and development program, private industry already had an array of new model aircraft in low-rate production, such as the F–86, F–89, B–47 and C–124, ready for immediate increased production. Aircraft set to move from research and development to production within a few years included the Century-series fighters, the B–52, the C–130 and the KC–135. Congress quickly provided money for new aircraft, increasing funding for aircraft acquisition from $1.5 billion at the beginning of 1951 to $10 billion by the end of the year. Unfortunately, Air Force industrial mobilization planning had not anticipated rearmament under a peacetime economy. As a result, the rearmament program proceeded without federal economic controls. The expansion program immediately encountered numerous difficulties such as manufacturers promising more than they could deliver, labor shortages, strikes and material shortages. Despite these problems, production steadily increased. To reach production goals for aircraft, engines and spares, the Air Force reactivated fourteen standby production plants for use by contractors. Additionally, private industry constructed new factories, reversing a retrenchment dating from 1945. At first, production focused on aircraft then in production, such as F–84s, F–86s, C–119s and B–47s. Between 1953 and 1957, production shifted to newer aircraft. In 1950 the Air Force acquired 1,652 new aircraft. By 1954 annual production climbed to 5,662 and then began to decline. As of December 1956, the Air Force had grown to 134 combat and troop carrier wings employing 25,000 aircraft.[15]

Congress, on October 6, 1949, enacted the Mutual Defense Assistance Act as a companion to the North Atlantic Treaty. The program was intended to rapidly rearm NATO, rejuvenate the Western European armaments industry, and boost the revival of Western Europe's economy. Subsequent funding legislation provided $1.5 billion in fiscal year 1950 for military assistance in the form of surplus military hardware, spares and cash grants for the purchase of new American-manufactured equipment, offshore (non-U.S.) procurement and in-country armament production. Congress appropriated tens of billions of dollars more over the following years. AMC, in coordination with other government entities, acted as the administrative agent for aircraft materiel assistance. Political and bureaucratic difficulties prevented the Air Force from obligating any funds until early summer 1950. As a result, the program got underway just as the Korean War broke out. The Air Force and its contractors thus faced the logistical task of simultaneously refurbishing surplus equipment and acquiring new equipment and spares for the forces engaged in the war, for the Air Force buildup and for MDAP. The Air Force depots and the American aircraft industry were immediately inundated with orders for aircraft, engines and spares. As noted, both the depots and private industry expanded to meet this demand. By September 1952, the USAF had supplied recipient countries with 4,000 aircraft, mostly refurbished World War II surplus. Military Assistance Advisory Groups (MAAGs) provided initial flight, maintenance and supply training. Five years later, MAP beneficiary air forces fielded approximately 8,000 aircraft provided or financed by the United States, primarily F–84s, F–86s, Hawker Hunters, T–6s and T–33s. Since then, the Air Force has continued providing aircraft, equipment and spares to friendly nations through Air Force Materiel Command's Air Force Security Assistance Center.[16]

When the fighting ceased in Korea, the USAF was in the midst of a significant transformation driven by technological advances and by an omnipresent struggle with the Soviet Union and China. American commitment to the global containment of communism led, in turn, to the worldwide deployment of Air Force units and to the creation of a hair-trigger strategic striking force. The creation of weapons of mass destruction, refinement of jet engines and airframes and the steady improvement in electronics and missile technology produced a whole new family of aircraft, armament and support equipment. Air Force logisticians responded to these changes, using rapidly advancing technology to improve support capabilities.

The AAF modified the first B–29s for atomic warfare in 1944 (under Project Silverplate), and by war's end forty-six aircraft had been so modified. By 1948, the number of operational atomic weapons–capable B–29s fell to thirty-two. That year, as part of an effort to mold Strategic Air Command (SAC) into a truly credible strategic striking force, AMC undertook an extensive program to modify over three hundred B–29s, B–36s and B–50s for atomic warfare under Projects Saddletree and Gem. These modifications included adding in-flight refueling capability, winterizing the aircraft for arctic operations and adding global navigation electronics. A companion program converted several hundred B–29s to tankers. In 1951 under Project Back Breaker, AMC began modifying F–84s and B–45s for tactical atomic warfare. These early atomic warfare modification programs did not run smoothly for several reasons. Foremost, the secrecy and compartmentalization of all atomic weapons programs continually led to "the right hand not knowing what the left hand was doing." Scheduling aircraft for depot modification, producing modification kits and preparing field modification teams in advance could not be reliably planned. In addition, beginning in June 1950, Gem and Saddletree had to compete with Korean War B–29 requirements and with USAF's commitment to provide B–29s to Great Britain under MDAP. These concurrent obligations saturated the Air Force's B–29 and B–50 depot facilities, resulting in a heavy reliance on contractors who were also quickly overburdened. Fortunately, as atomic carrier-designed B–47s and B–52s entered service, modification demands subsided. At the combat command level, the unique operational requirements of SAC led to the establishment of unique maintenance and support procedures and organizations. Experience gained with SAC was soon applied to other Air Force organizations.[17]

The policy of Massive Retaliation placed an arduous burden first on the Air Force's strategic bomber fleet and later on its missile forces. Until the mid-1960s, SAC bomber aircraft served as the primary delivery vehicles for weapons of mass destruction. Therefore, entire SAC wings could be called on short notice to deploy from the United States to forward operating bases scattered from Guam to Morocco, and by the mid-1950s SAC units routinely deployed during such exercises. Ever vigilant, the command kept large numbers of aircraft on alert at all times, and when intermediate-range ballistic missiles (IRBMs) and intercontinental ballistic missiles (ICBMs) entered service under the command's operational control, they too remained on alert at all times. Although constant readiness and rapid deployment planning first focused on SAC's bomber and fighter units, the Air Force soon organized, trained and equipped tactical units for rapid mobility as well.

In 1949, SAC reviewed its capabilities versus its target commitments identified in the command's emergency war plan and found that, because of poor bomber in-commission rates, these commitments could not be met. To correct this situation, over the next few years SAC overhauled its supply and maintenance organization and procedures, centralizing administrative responsibilities and putting maintenance on more of a production-line basis. Simultaneous with the increase in the number of aircraft, the complexity of SAC's aircraft and subsystems (radar, electronics, engines) increased. This combination of developments forced base-level maintenance to inspect and repair growing numbers of complex systems, which required the skills and specialized equipment of increasing numbers of technicians. To best employ manpower and equipment, the command pooled these resources at wing/base-level shops and adhered to a strict maintenance regimen. Depot maintenance was streamlined by establishing a strict and controlled flow of aircraft from SAC to the AMAs and contractor facilities. The sheer number of personnel needed to support a SAC wing mushroomed as the complexity of its aircraft increased. For instance, a B–47 wing with forty-five operational bombers required 2,653 personnel whereas a B–52 wing with forty-five operational bombers employed 4,756 personnel. Fighter wings experienced a similar transformation.[18]

War planners in the early 1950s assumed that a general war would be decided within the first 180 days. The Air Force planned accordingly. First, SAC squadrons, then other combat flying units, began to organize and equip to rush combat forces to overseas locations on short notice. During this period, SAC established a series of forward operating bases stocked with fuel, oil, munitions, water, basic food supplies and shelter. The development of large capacity, long-range cargo aircraft gave the Air Force the capability to airlift initial sustainment spares and equipment with deploying squadrons. Each squadron assembled equipment, spares and basic supplies in prepackaged air-transportable flyaway kits. These kits were configured to support particular aircraft types for thirty days and remained on hand at all times. In addition, the Air Force developed air-transportable station sets to provide ninety-day support for combat units deployed to austere forward operating bases. Station sets contained support equipment such as electronic, hydraulic and engine repair equipment. The Air Force also assembled prepackaged, air-transportable housekeeping sets designed to provide deployed units with administrative, sleeping and messing facilities. Though limited amounts of munitions could be airlifted, the Air Force remained dependent upon pre-positioning and sealift for the bulk of conventional munitions support.[19]

Weapons of mass destruction could not be handled the same as conventional weapons. Until the mid-1950s, the Atomic Energy Commission (AEC) and Armed Forces Special Weapons Project (AFSWP) retained strict control over all aspects of atomic weapons from production to the flightline. In 1950, the Air Force established the Special Weapons Command at Kirtland Air Force Base, New Mexico, marking a shift in special weapons support responsibility away from AEC and AFSWP to the Air Force. However, AEC retained tight control over atomic weapons production and testing, and AFSWP kept physical control over the special weapons stockpile. AMC designated San Antonio AMA the lead AMA for special weapons equipment support and acquisition, and established a special weapons depot at Kelly AFB. The Air Force supported the AEC testing program through the Special Weapons Command. As the atomic weapons stockpile grew in number and as the warheads were mated to missiles, Air Research and Development Command (ARDC) and AMC assumed increasingly important roles in the development and acquisition of delivery systems and support equipment. Beginning in 1952, AMC established new units named Aviation Depot Groups (later redesignated Aviation Depot Squadrons). Collocated with SAC wings, these units provided special weapons storage and maintenance support. Although very stringent controls and safeguards remained in place for all weapons of mass destruction, logistics support became more routine as the 1950s progressed.[20]

Beginning in the 1940s, all three services engaged in guided-missile research. This research began to pay dividends in the 1950s with the steady introduction into service of numerous missiles, ranging from the radar-guided Falcon air-to-air missile to the Thor intermediate-range ballistic missile. Air-to-air missiles required a relatively small amount of logistics support; they were vacuum-packed and stored until used, modified or periodically overhauled. Development and deployment of liquid-fuel IRBMs and ICBMs presented a whole new set of logistics support needs. Keeping these weapons on alert required that they be mounted on above-ground launchers or in under-ground silos, ready to be fueled and launched at a moment's notice. Their first flight was their last, so their rocket motors, guidance system or warhead had to perform faultlessly. Technicians did routine maintenance and made minor modifications on-site. For major repair, modification or overhaul, the missiles were loaded aboard transports and flown back to the depot or to a contractor facility.[21] Only a limited number of the very expensive liquid-fuel missiles (such as Atlas, Titan, Jupiter and Thor) were produced, and all were marked for rapid obsolescence. As a result, the cost of spares was very high, and few such spares were procured. Likewise, the Air Force saw no point in developing an extensive organic depot support capability for the weapons, and it therefore relied heavily on contractor support. The Air Force did establish the Heath Maintenance Annex in Heath, Ohio, as a central repair, modification, overhaul and calibration facility for intricate missile and aircraft guidance systems and precision instruments. The launch complexes themselves (including control-room equipment, launch equipment and liquid-fuel storage facilities) required meticulous maintenance. Introduction of the Minuteman solid-fuel ICBM in the early 1960s eased logistics support difficulties, but ICBMs and their launch facilities remained complicated systems requiring constant maintenance and upgrading. The Minuteman, however, has proved its durability, and the much improved Minuteman III remains in service to the present.[22]

Previous war experience taught the Air Force the importance of being able to apply counter air and tactical air power as early as possible in a conflict. Accordingly, the Air Force made great strides towards creating mobile tactical air units during the 1950s. Fighters and tactical bombers received air-to-air refueling capability, enabling them to fly from the United States to potential war zones in either the Far East or Europe. Development of long-range heavy transports like the C–124 and C–133 provided airlift for both prepackaged spares and maintenance equipment and for the technicians and mechanics who kept the planes flying. However, in the many areas where the West faced massive communist armed forces across heavily fortified borders, only permanently stationed forward-based air power offered a credible deterrent. In the case of a no-warning war, CONUS-based units could only serve as reinforcements. Accordingly, the Air Force expanded its global presence, ringing Europe and Asia with dozens of USAF air bases and stockpiled munitions, spares, supplies and equipment as war reserve materiel at forward locations. To help keep the aircraft flying, the Air Force expanded its overseas maintenance and supply capabilities. Large Air Force depots operated at Burtonwood, England; Chateauroux, France; Erding, Germany; Nouasseur, French Morocco; Tachikawa AB, Japan; Iwakuni AB, Japan; and Clark AB, Philippines. The four Overseas Logistics Control Agencies, located at Newark (New Jersey), Sacramento (California), Ogden (Utah), and New Orleans (Louisiana), served as clearinghouses for overseas and Alaskan supplies, receiving daily supply requisitions via radio transmission or, in the case of stock replenishment items, by air mail. Air materiel forces in the Far East and Europe managed offshore procurement for both American forces and MAP recipients.[23]

By the end of the 1950s, advances in computers, communications and transportation allowed the Air Force to reduce the size of its depot system both in the United States and abroad. However, owing to the increasing complexity of weapon systems and support equipment, the number of individual spares and supply items grew. Calculating spares and supplies requirements and managing the supply system became an enormous task. By 1955, the Air Force inventory included 1.2 million separately defined items. Managing this huge inventory required the production and analysis of over 350 recurring reports. By the mid-1950s, digital computers provided the technology to streamline the job. In 1954, HQ AMC received its first digital computer, a Remington Rand UNIVAC. Soon after, the AMAs began acquiring digital computers. Eventually, the use of computers eliminated tens of thousands of man-hours per depot per year formerly devoted to inventory management. In addition to improving inventory management, AMC made a determined effort to eliminate excess items through programs such as High Value, which identified expensive excess spares purchases. The Air Force significantly reduced information transfer time when, in 1955, it began operating a transceiver system that used leased telephone lines to transmit coded computer punch-card impressions from a punch-card reading machine to a punch-card reproduction machine. This system proved to be a great advantage over teletype communication because it minimized human error. Cutting transportation time offered the Air Force a means with which to shorten the spares pipeline and thus reduce inventory requirements and improve service to the flying units. With these goals in mind, and with an eye toward cutting growing commercial air delivery costs, AMC in 1954 initiated the contract freight air service, Mercury Service, later renamed LOGAIR, that connected CONUS AMAs with daily flights. AMC eventually extended this service to operational command air bases, thus dramatically reducing high-priority shipping times.[24]

By the close of the 1950s, the USAF possessed the personnel, facilities and materiel with which to wage all-out, or general, war against the Warsaw Pact and China. For the Air Force, general war meant not only the use of strategic nuclear weapons, but also the immediate use of tactical nuclear weapons to counter the enemy's numerical superiority in troops and equipment. Tactical fighter and bomber units were trained and equipped for general war, and preparations for limited conventional war consequently suffered. Air Force war planners assumed that limited war deployments could be supported with the same air-mobile and pre-positioned assets developed for a general war. Large-scale USAF deployments during the Lebanon and Taiwan crises of 1958 exposed weaknesses with logistics support. Deployed units experienced serious difficulties with spares support and in gaining access to pre-positioned support equipment. War reserve materiel (WRM) proved inadequate and was not always properly distributed. These problems forced the service to rethink its conventional limited war planning. From 1958 through 1960, the Air Force carefully studied limited war requirements and began developing plans to reflect the growing importance of conflicts below the level of general war. Newly elected President John F. Kennedy and his Secretary of Defense Robert S. McNamara articulated a revised national security policy known as Flexible Response. It led to an immediate acceleration in conventional warfare preparation that, for the Air Force, meant that combat units could be called on to generate higher sortie rates over longer periods of time than would be necessary if tactical nuclear weapons were used. This change in turn required the Air Force to recalculate war materiel requirements.[25]

During the first half of the 1960s, the Air Force began accumulating, pre-packaging and pre-positioning materiel for limited conventional war. The USAF Wartime Guidance Document, Annex X, provided specific wartime materiel support data. Air Force Logistics Command's (AFLC's) War Consumable Distribution Objective defined Air Force war consumable objectives and served as the basis for the pre-positioning of WRM. WRM consisted of six categories of supply: war consumables (drop fuel tanks; petroleum, oil, and lubricants [POL]; air munitions; chaff and other nonreusable supplies); spares (war readiness spares kits [WRSK] and spares for aerospace ground equipment); station sets (direct mission support equipment, such as aerospace ground equipment, required to be in place prior to the arrival of combat units); housekeeping sets (tents, messing, typewriters and other personnel support items); Gray Eagle packages (combination station sets and housekeeping sets for bare-base operations); and field rations. CONUS-based units kept air transportable WRM, such as WRSK, on hand and ready for deployment with each squadron. Other WRM, such as POL and munitions, were pre-positioned overseas in areas of potential conflict. The Air Force managed the WRM inventory through the use of electronic data processing (computers) and the Automatic Digital Information Network (AUTODIN), a secure worldwide communications system. The major commands monitored the status of their WRM and provided monthly reports to HQ USAF and to AFLC, who then identified and corrected deficiencies. Regional war could erupt at one or more of numerous hot spots, but prudence dictated that USAF's primary focus remain directed toward the continuing standoff with the Warsaw Pact in Europe. Should the United States go to war elsewhere, war planners reasoned, it would be in response to the invasion of an allied country. No one envisioned the United States slowly becoming involved in a sustained conventional war, but that is exactly what happened in Southeast Asia.[26]

The first USAF units that deployed to South Vietnam in 1961 and 1962 under Operations Farm Gate, Mule Train and Ranch Hand found rudimentary airfields and only limited maintenance and supply facilities that had been constructed with MAP assistance. Port facilities were no better than those found in South Korea ten years earlier. This mattered little, at first, for the USAF's initial deployment in support of South Vietnam's war against the Viet Cong rebels consisted of only a handful of propeller-driven aircraft. The thirty-day deployment kits (resupplied through Clark AB, Philippines) and mobile maintenance vans sufficed to provide supply and maintenance support. As the number of aircraft increased and as RF–101 reconnaissance jets joined the USAF units, supply and maintenance requirements increased. Following the August 1964 Gulf of Tonkin Resolution and the November 1964 U.S. presidential election, the USAF commitment to Southeast Asia rapidly escalated.[27]

The U.S. buildup began in earnest in 1965. The Air Force decided to base its theater presence on a combination of simple forward operating bases and large, well-equipped main operating bases (MOBs). The Air Force eventually established nineteen MOBs in South Vietnam, Thailand, the Philippines and Okinawa, including eleven newly constructed bases and eight others expanded for this purpose. AFLC undertook Project Bitterwine to assemble and ship the necessary equipment and supplies required for this large-scale base buildup. Coincidentally, the Air Force was in the process of phasing out four of its nine CONUS AMAs and closing numerous excess air bases. The Air Force therefore had excess maintenance materiel and supplies available for shipment to the MOBs. The first units to arrive at a base utilized prepackaged Gray Eagle tent and housekeeping kits. Prime BEEF (Base Engineering Emergency Force) teams and RED HORSE (Rapid Engineer Deployable, Heavy Operations Repair Squadrons, Engineer) squadrons assembled the temporary shelters and then began building permanent housing, runways, water and sewage lines, drainage systems, roads, revetments, fuel storage and dispensing systems, and the myriad of other required structures. As in Korea, local labor and supply, and Army and Navy civil engineer units, provided a great deal of support. Base Civil Engineer units, with the assistance of contractors, maintained, repaired and expanded the operational bases and provided numerous base support functions such as fire fighting, electrical power generation and air conditioning maintenance.[28]

The rush of materiel into Southeast Asia quickly overwhelmed the personnel and supply system at the receiving end. Relocation of air units from one base to another, long cargo delays at the congested ports, and inexperience on the part of base supply personnel all contributed to the confusion. To assist overburdened Pacific Air Forces (PACAF) supply personnel, AFLC constituted and deployed specialized, primarily civilian volunteer, temporary duty logistics teams. Rapid Area Transportation Support (RATS) teams assisted with cargo packaging, shipping and receiving, and trained the South Vietnamese in these skills. Rapid Area Supply Support (RASS) teams helped PACAF personnel institute viable accounting, inventory, storage and issue procedures and practices. Installation and checkout teams aided with maintenance equipment, mobile precision measurement laboratories and computers. The Air Force eventually installed UNIVAC 1050–II computers at seventeen MOBs, vastly enhancing supply management, requisition processing and requirements forecasting. The Air Force assembled three additional air-mobile computer vans to serve as emergency backups. With the help of the specialized teams, modern data processing and AUTODIN communications, PACAF logisticians were able to establish normal "pull" supply practices and procedures after the initial buildup.[29]

Because of the sheer bulk involved, air munitions supply presented a unique problem. At first, the Military Sea Transport System (MSTS) shipped air munitions to Subic Bay in the Philippines, where they were unloaded and shipped by truck to the munitions depot at Clark AB. When the munitions were trucked back to Subic Bay, loaded on ships and forwarded to Southeast Asia. As munitions expenditures climbed, the system proved wholly unsatisfactory. Shipping the munitions directly to South Vietnam and Thailand appeared preferable but infeasible because of the lack of adequate port facilities and munitions depots in Southeast Asia. Therefore, AFLC and MSTS initiated Project Special Express whereby commercial ships under contract to MSTS loaded munitions on the U.S. West Coast, sailed to the Philippines to take on fresh water and supplies, then traveled on to South Vietnam where they anchored offshore to act as floating warehouses. Munitions were offloaded onto Navy landing craft for transport ashore. When empty, the ships returned to the United States for additional cargo. At its peak in 1967, Special Express operated nineteen munitions ships. By late 1967, South Vietnam's port facilities and munitions depots had been expanded enough to allow for normal port-to-port shipments. Air transport played a small, but important, role in CONUS-to-theater munitions support. Between 1966 and 1969, under Project SEAIR, Military Airlift Command (MAC) flew emergency munitions, fuses and bomb wires directly from Hill AFB (Utah) to Southeast Asia aboard regularly scheduled C–141 flights.[30]

The Military Sea Transportation Service, heavily dependent on commercially contracted ships, provided the primary link between the supply sources in the United States and the forces in Southeast Asia. As in Korea, the 315th Air Division provided Pacific theater airlift, utilizing C–123s, C–124s and C–130s. As the war progressed, a very large fleet of C–7s, C–123s and C–130s grew to provide in-country cargo and personnel movement. In addition, the Army operated a vast armada of helicopters. Contract air carriers augmented in-country transport. Military Air Transport Service, redesignated Military Airlift Command in 1966, provided CONUS-to-theater airlift. When jet-powered C–141s (1966) and C–5s (1970) entered service in Southeast Asia, MAC gained the ability to provide fast global transportation. Capable of intercontinental flight while carrying substantial cargo or personnel loads, these aircraft revolutionized air transport. The development of the rugged reusable 463L pallet and tie-down net system allowed the Air Force to rapidly load and unload aircraft. The 463L was essential for efficient C–123, C–130, C–141 and C–5 cargo handling. Unfortunately, these lightweight pallets also served well as tent floors, bunker walls and bunker roofs. Once palletized cargo left a main aerial port for a forward base, there was a good chance the pallet would not return. As would happen again during Desert Storm, the one-way flow of 463L pallets came close to creating a cargo transport emergency. Frantic worldwide stock searches and emergency manufacturer production averted the crisis.[31]

The Air Force utilized a three-level maintenance system throughout the Southeast Asia war, but as noted, PACAF did not attempt to establish base-level support shops at forward operating bases in South Vietnam. Instead, aircrews flew the aircraft to one of the MOBs for base-level maintenance and some depot-type repair and modification. Because of the great distance between the theater and the CONUS AMAs, the Air Force established depot-level repair and overhaul capabilities at five air bases in Japan, Okinawa and the Philippines. To provide unique aircraft battle damage expertise, AFLC dispatched Rapid Area Maintenance (RAM) teams to Southeast Asia. These primarily civilian units repaired battle damage, prepared heavily damaged aircraft for one-time flights or shipment back to a depot, and processed aircraft for salvage. Their work often took them into crash sites in the field. Over the course of the war, RAM teams handled over 1,000 aircraft, including 845 that were repaired on-site. The RAM, RASS and other civilian volunteer special teams provided valuable support, but because they operated in combat zones, the Air Force much preferred that military personnel perform the work. Accordingly, in late 1967, AFLC began assembling all-military Combat Logistics Support Squadrons (CLSSs) to perform the functions of the specialized civilian logistics teams. The CLSSs, however, were not organized, trained and equipped in time for effective service in Southeast Asia.[32]

The Southeast Asia war temporarily reversed the overall military reduction underway since the late 1950s. The introduction of IRBMs and ICBMs allowed the Air Force to withdraw from service thousands of B–47s, B–52s, SAC fighters and support aircraft. Improvements in communications, transportation, data-processing and material-handling equipment further reduced manpower requirements. Once the United States began disengaging from South Vietnam, military retrenchment resumed and budgets declined. Inexorably, advancements in technology marched on, and the Air Force again required new weapon systems, new support equipment and infrastructure upgrades.

The Department of Defense (DOD) and the Air Force began reducing and reorganizing CONUS and European logistics support infrastructure in the early 1960s and continued the process through 1997. In 1961, the Air Force established the Air Force Logistics Command and the Air Force Systems Command (AFSC), replacing AMC and ARDC. AFSC assumed responsibility for research and development, weapon system acquisition and weapon system test and evaluation. AFLC concentrated on supply, maintenance, modifications and mission support. That same year, DOD announced the establishment of the Defense Supply Agency (DSA), later redesignated as the Defense Logistics Agency (DLA). This new organization henceforth contracted and managed common-use services and supplies for all military branches. As the number of aircraft in the inventory fell, beginning in the late 1950s, excess depot capacity grew. To alleviate this imbalance, the Air Force began closing installations. By 1960, all overseas AMAs had been discontinued, and between 1966 and 1969 the Air Force closed five of the nine CONUS AMAs. In addition, the Air Force shut down numerous supply depots and turned others over to the DSA.[33]

Technology advanced, but not fast enough for the Air Force's logisticians. AFLC attempted to use 1970s computer technology to create a single closed-loop, real-time, all-encompassing system for logistics operations, designated the Advanced Logistics System (ALS). The ALS proved to be far too ambitious for the computer technology available, and the effort was canceled by Congress in 1975. Seven years later, the Air Force undertook the creation of the Logistics Management System (LMS), which was divided into incrementally developed interconnected component programs. The leap in computer capability represented by the refinement in microprocessor technology gave logisticians the tools to make this new system work. Between the early 1980s and early 1990s, AFLC brought into operation nine component systems such as the Weapon System Management Information System, which assessed the Air Force's warfighting capabilities and requirements, and the Local Area Network–Intersite Gateway system that provided computer communications links between all LMS components and locations.[34]

In 1971, AFLC embarked on the most concerted construction effort at the depots since World War II. A 1969 study revealed that sixty-eight percent of AFLC's depot facilities had been acquired between 1937 and 1945, and forty-five percent of all Air Force facilities were acquired between 1937 and 1953. By 1979, AFLC had three programs underway involving warehouse construction, plant equipment modernization and depot facility and technology modernization. Unfortunately, by the mid-1980s, AFLC still possessed only half of the adequate warehouse space required and again undertook a warehouse expansion and modernization program.[35]

Between 1974 and 1976, AFLC streamlined its repair workload distribution system by redistributing the repair work previously done at the Command's fifty-two work centers to twenty-three technology repair centers located at the five Air Logistics Centers ([ALCs], formerly AMAs). Items were divided into eighteen commodity groups, based on technological similarities. The repair workload was then distributed among the ALCs by commodity group, allowing each center to become expert in the repair of particular items and eliminating duplicate maintenance facilities.[36]

Space logistics responsibilities grew slowly and initially involved supporting the rockets that hurtled Air Force satellites into orbit. As the number of Air Force space systems and ground support systems grew, space logistics transitioned from the world of the esoteric to the realm of normal logistics. In particular, development of the Space Shuttle provided the means with which to retrieve expensive satellites from orbit, overhaul and modify them, then return the upgraded systems to space. In 1988, after several years of study, AFLC began providing support for thirty-five space systems. Very soon thereafter AFLC assumed program management responsibility for the Defense Meteorological Satellite Program, marking the first time a space system was managed just as other operational systems.[37]

The Air Force budget, in constant fiscal 1998 dollars, rose to $391.5 billion in 1968, declined to $314.3 billion in 1972, and fell further to $261.9 billion by 1976.[38] Funds for maintenance, spares and training decreased accordingly. At the same time that budgets fell, the Air Force began a long-term acquisition effort that eventually brought into the inventory the aircraft that performed so well during the 1991 Persian Gulf War. With new aircraft under development, the Air Force acquired relatively few fighters during the 1970s. As the operational air fleet aged, the need for maintenance, modification and spares support increased. However, lacking funds, the Air Force could not afford to meet spares and maintenance requirements, which contributed directly to the creation of the post-Vietnam "Hollow Force." Between 1972 and 1975, the not operationally ready–supply rate for Tactical Air Command aircraft climbed from 4.9 percent to 10 percent.[39]

By the late 1970s, new aircraft such as the A–10, F–15 and F–16 began entering service. In 1979, the Soviet Union militarily intervened in Afghanistan, sparking a rise in U.S. defense spending that peaked in 1986 under Ronald Reagan's presidency. The 1986 fiscal year defense budget totaled $414 billion in fiscal 1998 dollars.[40] With funding available, the Air Force replaced its aging fighters and bought new B–1B bombers and KC–10 tankers. Contractors and the ALCs upgraded and modified proven systems such as the F–111, KC–135 and B–52. Moving air warfare technology to a new plateau, the Air Force acquired fifty-nine stealthy F–117 fighter-bombers. Filled with state-of-the-art avionics and armed with costly precision guided munitions, the new weapon systems cost much more than their predecessors. For example, in 1973 an F–4E cost $2.48 million,[41] whereas in 1990 an F–15E cost $42.8 million.[42] Logistics support costs likewise increased. Fortunately, Congress provided generous funding that enabled the Air Force to purchase adequate spares and upgrade logistics support capabilities. High-technology weapons required equally "high-tech" support equipment.[43] The investment in supplies, spares and support equipment paid off. By fiscal year 1988, the fleetwide Not Mission Capable Supply rate stood at four percent and the total mission capable rate hovered around eighty-one percent.[44]

Mikhail Gorbachev's rise to power in the Soviet Union during the latter

1980s and the ensuing collapse of both the Soviet empire and the Warsaw Pact fundamentally altered U.S. defense requirements. Additionally, the need to bring U.S. government spending in line with revenues forced the DOD to operate with declining budgets after 1986. This combination of factors led to basic changes in the acquisition and logistics processes and to a sweeping overall reorganization of the Air Force that saw the inactivation of AFSC and AFLC, which were replaced in 1992 by a single new command, Air Force Materiel Command (AFMC). In the midst of this transformation, the Air Force supported a modest military intervention in Panama and engaged in a major regional war against Iraq.

Rapidly deteriorating relations between the United States and the Panamanian government led by Gen. Manuel Antonio Noriega precipitated an American invasion of Panama (codenamed Operation Just Cause) in December 1989. Organized Panamanian resistance collapsed in the first hours of the assault, and General Noriega surrendered several days later. The rapid conclusion of hostilities and the sparse use of nonairlift aircraft limited the need for air logistics support. Deficiencies surfaced in operations planning and communications that, while not critical to the operation, merited review and correction. Limited in scope from an air logistics planning perspective, Operation Just Cause nonetheless highlighted the role logistics operations could expect to play in future air operations, and experience gained in Panama was put to use soon thereafter during Operations Desert Shield and Desert Storm.[45]

Iraq's invasion of Kuwait in August 1990 sparked an unprecedented international response, culminating in the liberation of the tiny emirate by force of arms. In January 1991, after a massive U.S.-led military buildup in the Persian Gulf (Operation Desert Shield), the coalition of forces assembled against Iraq launched a crushing military assault (Operation Desert Storm) that drove Iraq's occupying forces from Kuwait.[46] The Air Force's logistical successes during the war were the result of long-term planning and preparation. Though Europe remained the focus of U.S. military thinking through 1990, presciently the Air Force and U.S. Central Command (CENTCOM) also trained and prepared for a war in the Middle East. With the Air Force geared for a "standing start" war against the potent Warsaw Pact and fleshed out by the defense buildup begun in 1979, Air Force logisticians made what the AFLC commander, Gen. Charles C. McDonald, described as "an almost transparent transition to wartime operations."[47]

Given little advance notice, the Air Force rapidly moved substantial combat forces, support personnel and war materiel to Saudi Arabia. Key to that effort, each squadron kept on hand necessary munitions, spares and equipment in air transportable configurations, including WRSK; standard air munitions packages (STAMPs); and standard tank, rack, adapter and pylon packages (STRAPPs). Each of the F–15 squadrons rushed to Saudi Arabia during the first days of the crisis deployed with the equivalent of twenty C–141 cargo loads of materiel and with five hundred personnel. Hundreds of additional aircraft followed during the ensuing weeks. Building the logistics base necessary to sustain the forces eventually employed during Desert Storm required a massive effort.[48]

Infrastructure conditions in the host Gulf nations differed markedly from those encountered in Korea and South Vietnam during the initial stages of the earlier wars. The first USAF aircraft to fly into Saudi Arabia found state-of-the-art facilities, such as King Khalid Military City and Dhahran Airport, at their disposal. As the buildup continued, Coalition air forces set up operations at modern military and commercial airfields in all of the Gulf Cooperation Council (GCC) countries.[49] In addition to the considerable existing runway and ramp space made available to the Coalition air forces, the Saudi Arabian cities of Jabail and Dhahran provided large port facilities. With modern air and sea terminals available immediately, MAC (strengthened by the Civil Reserve Air Fleet) and Military Sea Lift Command ([MSC] augmented by the Ready Reserve Fleet and commercial freighters and tankers) moved hundreds of thousands of troops and billions of pounds of materiel into the theater with unprecedented dispatch. The Air Force relied heavily on the sea and surface transportation network established by U.S. Transportation Command and CENTCOM for the intertheater and intratheater movement of such bulky items as fuel, munitions and vehicles. U.S. Air Force Component, CENTCOM (CENTAF) C–130s provided in-theater airlift.[50]

The host nations, Saudi Arabia in particular, provided more than just dock space and runways. The Saudis also supplied water, housing and transportation equipment, utilizing every available resource in support of the Coalition forces. Saudi oil refineries produced aviation fuel. Construction material and labor came from local building contractors and vendors. Local caterers fed the arriving troops, and local cleaning services washed their uniforms. Grateful for the Coalition's support, the Saudi government eventually paid for all services rendered. Coalition forces gathered in other GCC countries received similar support, though on a smaller scale.[51]

Pre-positioned assets represented the second major source of materiel support available in-theater. Large quantities of war supplies and equipment lay dispersed in warehouses and on ships throughout the region. USAF items pre-positioned ashore included bare-base assets such as prefabricated aircraft hangars, vehicles, air flight support equipment and munitions. The afloat pre-positioned items included aircraft ammunition, general-purpose bombs, cluster bomb units, rockets, chaff, flares and miscellaneous asset hardware. The Air Force also maintained fuel and POL tankers in the area. Pre-positioned materiel saved 1,800 airlift missions and provided supplies and infrastructure materiel for twenty-one of the principal airfields.[52]

The bulk of the assets pre-positioned in the Persian Gulf, as well as those procured for use in Southwest Asia but held in storage in the U.S., comprised bare-base assets. These proved invaluable when overcrowding at the main GCC air bases forced USAF units to operate from barren airfields. The Air Force developed three types of bare-base systems: Harvest Bare, a collection of prefabricated hardwall shelters; Harvest Eagle, sets of tents designed for housekeeping support; and Harvest Falcon, a comprehensive segmented system designed specifically for Southwest Asia that included shelters, tents, kitchens, water systems and electrical and air conditioning systems. In addition to the bare-base systems, the Air Force also deployed fifteen air transportable hospitals, each a fifty-bed unit.[53]

The engineering and support units and teams formed as a result of Korean and Vietnam War experience proved their value in Southwest Asia. Prime BEEF teams assembled prepackaged assets and RED HORSE units performed heavy construction tasks such as constructing runways, drilling wells and building revetments. Readiness in Base Services (Prime RIBS) teams followed to provide kitchen, billeting, laundry and mortuary services. CLSS Aircraft Battle Damage Repair (ABDR) teams provided ABDR and maintenance support. Rapid Area Distribution Support teams assisted with supply, storage, transportation, shipping and receiving.[54]

Pre-positioned stocks and STAMP provided only enough munitions for limited duration combat and contained very limited amounts of preferred guided air-to-ground bombs and missiles. During the early months of Desert Shield, munitions activities centered on distributing the pre-positioned stocks and on improving munitions storage facilities. However, as the tempo and volume of munitions shipments and distribution activity increased, the lack of a central munitions depot began to hinder munitions logistics. CENTAF therefore constituted the 4401st Munitions Maintenance Squadron and established a provisional munitions depot at Al Kharj, Saudi Arabia. Given the cushion of time and the elimination of the Soviet threat, the Air Force was free to draw on CONUS-, U.S. Air Forces, Europe (USAFE)-, and PACAF-preferred munitions stocks. Upon arrival in Saudi Arabia, munitions were shipped to Al Kharj and redistributed to operating locations by tactical airlift or by truck.[55]

As noted, the aircraft that deployed to the Persian Gulf brought along WRSK and STRAPP to provide an immediate thirty-day combat support capability. CENTAF logisticians decided to keep the WRSK intact and use them as tools for spares inventory control. The supply specialists decided to follow this course because the Air Force did not deploy the Tactical Shelter Systems (which included full-up supply computers), but each unit did deploy their Combat Supply System computers, which were designed to maintain the accountability and inventory accuracy of the WRSK. Initially, deployed units received stock replenishment and Mission Incapable Parts (MICAP) support from their home stations.[56] Having each unit resupplied through its home station proved too slow and cumbersome. CENTAF therefore established and began operating the CENTAF Supply Support Activity (CSSA) in October

1990. The CSSA normalized in-theater supply accounts by channeling requirements from all theater supply accounts through a single theater location to the CSSA at Langley AFB, Virginia, via secure satellite link and ground lines. The CSSA then forwarded the supply requirements to the appropriate ALC or DLA supply center.[57]

Keeping track of the items in the supply pipeline vexed early supply efforts. Both MAC and MSC tracked items from the time they took possession until the item was offloaded from their ship or aircraft. Because AFLC, MAC and MSC tracking systems were not linked, finding a particular item in the logistics pipeline proved very difficult and time-consuming. Computer specialists at AFLC solved this problem by developing the Air Force Logistics Information File (AFLIF), a computerized information system that tapped into MAC and MSC databases, allowing AFLC to track the movement of every item from the time it left an AFLC facility until it was offloaded in the theater.[58]

Establishing intermediate-level maintenance (ILM) capability in-theater proved to be a key to the achievement of the high sortie rates sustained by USAF aircraft. The tactical air units deployed with a mix of aviation packages (including maintenance, avionics ILM for F–15s, electronic countermeasures test stations, and low-altitude navigation and targeting infrared for night [LANTIRN] test stations), ILM packages, WRSK and follow-on spares kits. Thirty days into the operation, CENTAF deployed additional ILM packages to provide sustained jet engine intermediate maintenance, avionics intermediate maintenance, and heavy fabrication intermediate maintenance. To avoid shipping engines all the way back to the United States for overhaul and repair, CENTAF arranged to have engines shipped to USAFE jet engine intermediate maintenance facilities in Europe. Adding to in-theater C–130 support capabilities, MAC established a propeller shop in Saudi Arabia. In addition, one avionics intermediate station deployed to each Persian Gulf air base, and CENTAF established a single precision measurement equipment laboratory at Riyadh to service the entire theater.[59]

Due in great part to excellent logistics support, USAF aircrews, ground crews, aircraft, subsystems and weapons performed admirably. Through six weeks of unrelenting combat operations, support personnel kept the complex aircraft mission-capable rates higher than normal peacetime rates. Mission-capable rates varied between 81 percent for the B–52G to 95.9 percent for the F–15E.[60] Investment in supply, maintenance, transportation and training reaped welcome dividends. The success of the Coalition's air war clearly demonstrated the combat prowess of modern air power and highlighted the notable superiority that the USAF enjoyed over all other air forces. Victory in the Persian Gulf, however, did not stop the military retrenchment underway in the United States and the corresponding drawdowns affecting almost every major military power.

The Air Force–wide reforms and reorganizations begun in the 1980s continued unabated during the Persian Gulf War. In 1986, the President's Blue Ribbon Commission on Defense Management (the Packard Commission) issued its final report, which called for centralizing control of DOD acquisition in the new office of the Under Secretary of Defense for Acquisition and for shifting acquisition authority away from AFSC's system program offices to newly created service acquisition executives and program executive officers.[61] In 1989, President George Bush initiated the Defense Management Report, which spawned a series of Defense Management Review Decisions (DMRDs) including DMRD 943, which led directly to the disestablishment of AFSC and AFLC and the establishment of AFMC;[62] DMRD 902, which transferred the Air Force's wholesale supply responsibilities from AFLC to DLA; DMRD 926, which directed the gradual transfer of the military's consumable supplies to the DLA; and DMRD 908, which called for the Air Force to divest itself of unnecessary depot capacity.[63] As a result of a 1993 Commission on Base Realignment and Closure (BRAC) decision, the Air Force, in 1996, closed the Aerospace Guidance and Metrology Center (AGMC) at Newark AFB, Ohio, and turned the entire operation over to a contractor through a process called privatization-in-place.[64] In June 1995, the Commission on BRAC recommended, and Congress and the President agreed, that the Air Force would close the Sacramento and San Antonio ALCs by 2001, leaving the Air Force with only three air logistics centers. As of 1997, DOD was working to privatize-in-place the workload of the two ALCs selected for closure.[65] In a related initiative, designed to reduce depot maintenance costs, the Air Force, in 1990, began competing non–core depot maintenance workloads between the ALCs, other DOD depots and private industry.[66]

By 1997, the combined Air Force active military and civilian population approximated that of 1947, and continued to decline. During the same period the population of the United States grew by over 100 million. Defense spending as a percent of the gross domestic product slipped to 3.3 percent, the lowest since the immediate pre–World War II years. The USAF total active aircraft inventory as of late 1996 stood at 4,495. DOD modernization plans called for the acquisition of a new generation of aircraft, but not in sufficient numbers to replace every old airframe with a new one. A one-for-one replacement was not necessary because a smaller air fleet did not necessarily translate directly into reduced combat capability. The newest weapon systems were more capable and designed to require less maintenance. Though expensive, the latest USAF aircraft far outclassed all contemporary challengers. As of 1997, no other air force owned a combat aircraft as sophisticated as the USAF's thirteen-year-old stealthy F–117. As the United States prepared for the twenty-first century, the Air Force continued acquiring other peerless aircraft such as the B–2 bomber, C–17 transport and F–22 fighter. Because no other country possessed both the expertise and money to produce such an array of weapon systems, the United

States appeared to hold an unprecedented technological lead over all potential adversaries.

As had always been the case, the Air Force worked to drive down the logistics support cost of its new weapon systems. Beginning in the 1970s, the Air Force embraced the Integrated Logistics Support concept that required that logistics supportability of a weapon system be considered during the earliest design stages. In this way, the Air Force achieved total system planning by integrating support requirements into design, development and engineering. As a result, the newer aircraft and major subsystems were more reliable and required less maintenance.[67] The logistics support advancements allowed the Air Force to initiate a major change in maintenance procedures. Beginning in 1992, the Air Force began transitioning to two-level maintenance in which component repair formerly performed at intermediate-level shops was instead accomplished at AFMC's air logistics centers. Maintenance crews at the operational bases performed only flight-line maintenance and component removal and replacement. Elimination of base-level repair shops and technicians greatly reduced the number of personnel and the amount of support equipment that deployed with each squadron, resulting in money saved, reduced airlift requirements and simplified deployments.[68] Of course, two-level maintenance could only work if deployed units received rapid and reliable spares support. The combination of advanced computerized integrated logistics management systems and fast transportation provided this capability. Also, by cutting the time spares spent in transit, the Air Force was able to reduce the overall number of spares in the logistics pipeline. Given the very high cost of many line replaceable units (i.e., black boxes) and mechanical components, the Air Force saved a substantial amount of money simply by acquiring fewer spares.[69]

Since 1947, the Air Force has fought three "hot wars" and stood vigil until almost the entire communist world collapsed upon itself. Though still armed with weapons of mass destruction, Russia no longer represents a mortal threat to the free world. Now, after nearly a decade of downsizing, the USAF still has no equal. Because of its success, the Air Force of 1997 faces similar challenges to those confronted fifty years earlier. Davis-Monthan AFB is packed with mothballed aircraft, the Air Force has more depot capacity than it can use, and DOD warehouses are filled with billions of dollars worth of excess spares and supplies. The Air Force currently is flying primarily the technologically advanced, but aging, aircraft that faced down the Warsaw Pact and triumphed in Desert Storm. That conflict, however, is several years past, and all of the services need new weapon and support systems to deter future threats. But, as was the case in the late 1940s, securing funds for modernization will be difficult. One can hope that Congress and the President will ensure that the Air Force maintains its qualitative edge and retains the logistics base necessary to keep its fighting machine ready for any challenge.

Notes

1. Few comprehensive studies cover the history of USAF logistics. For an account concentrating on operational logistics, see *The Logistics of Waging War: American Logistics, 1774–1985, Emphasizing the Development of Airpower*, ed. Lt. Col. David C. Rutenberg (USAF), and Jane S. Allen, Air Force Logistics Management Center, Gunter Air Force Station, Ala., 1985. For an account concentrating on depot maintenance and supply (including systems acquisition and modification), see Bernard J. Termena, Layne B. Peiffer, and H.P. Carlin, *Logistics: An Illustrated History of AFLC and Its Antecedents, 1921–1981*, Office of History, HQ Air Force Logistics Command (AFLC), Wright-Patterson Air Force Base (W-PAFB), Ohio, 1981.

2. *United States Air Force Statistical Digest, 1947*, Director of Statistical Services, Comptroller, HQ USAF, Washington, D.C., 1948, 15–16, 72, 132, 134. Unless otherwise noted, all documents cited are held in HQ Air Force Materiel Command (AFMC), Office of History Archives, W-PAFB, Ohio. All numbered Air Force–produced studies are available at the Air Force Historical Research Agency, Maxwell AFB, Ala.

3. The Aircraft Storage and Distribution Program is described in detail in Dorothy W. Trester, AMC Historical Study (H.S.) No. 264, "History of the AF Storage and Withdrawal Program (1945–1952)," Historical Division, HQ Air Materiel Command (AMC), W-PAFB, Ohio, Apr 1954.

4. Air Force surplus property disposal efforts between World War II and the Korean War are described in E. Clifford Snyder, AMC H.S. No. 269, "History of USAF Supply Programs and Problems (1945–1949)," Historical Office, HQ AMC, W-PAFB, Ohio, Nov 1950, 21–118; Sarah A. Zimmerman, AMC H.S. No. 245, "History of USAF Packaging and Deterioration Control, 1942–1952," Historical Office, HQ AMC, W-PAFB, Ohio, Apr 1953, 53–82; and Dorothy Miller, AMC H.S. No. 181, "USAF Surplus Property Disposal, 1 Jul 49–30 June 1950," Historical Office, HQ AMC, W-PAFB, Ohio, Sep 1951. Early development of an Air Force World-Wide Stock Control and Reporting System is described in Louis E. Baer, AMC H.S. No. 182, "Case History of the USAF World-Wide Stock Reporting System," Historical Office, HQ AMC, W-PAFB, Ohio, Nov 1952.

5. The Five Year Aircraft Procurement Program is described in Mary R. Self, AMC H.S. No. 247, "History of the Five Year Aircraft Procurement Program (1 January 1948–1 July 1949)," Historical Office, HQ AMC, W-PAFB, Ohio, Dec 1949; Ethel M. DeHaven, AMC H.S. No. 248, "History of the USAF Five Year Aircraft Procurement Program, 1 July 1949–31 December 1949," AMC Historical Office, W-PAFB, Ohio, Sep 1950; Ethel M. DeHaven, AMC H.S. No. 249, "History of the USAF Five-Year Aircraft Procurement Program, 1 January–30 June 1950," AMC Historical Office, W-PAFB, Ohio, Aug 1952. Also see "Survival in the Air Age," Report by the President's Air Policy Commission, GPO, Washington, D.C., January 1, 1948; and Report of the Board of Officers to the Chief of Staff, USAF, Recommending General Policy and Air Force Action Regarding the President's Air Policy Commission Report and the Congressional Aviation Policy Board Report, HQ USAF, Mar 23, 1948. Excerpts relevant to USAF aircraft procurement from Senate Report 949, Report of the Congressional Aviation Policy Board, National Aviation Policy, 80th Congress, 2d Session, are included as a supporting document in Self, AMC H.S. No. 247, "History of the Five Year Aircraft Procurement Program." In July 1950 the USAF's combat strength consisted primarily of a little over 2,000 B–29s and B–50s, 96 jet-powered B–45s, 79 B–36s, approximately 2,000 first-line jet fighters (F–80s, F–84s and F–86s), 81 F–82 piston-engine Twin Mustangs, 3,500 second-line fighters (mostly propeller-driven F–47s and F–51s) and 1,200 second-line medium bombers (B–25s and B–26s). Aircraft figures are from *United States Air Force Statistical Digest*, Director of Statistical Services, Deputy Chief of Staff, Comptroller, HQ USAF, Washington, D.C., Nov 1952, 162–164.

6. Sarah A. Zimmerman, AMC H.S. No. 234, "History of AMC Maintenance

Programs and Problems," Historical Office, HQ AMC, W-PAFB, Ohio, Nov 1952, 1–28; Strategic Air Command (SAC) H.S. No. 67, "Strategic Air Command Specialized Aircraft Maintenance (Early Development through July 1957)," Historical Division, SAC, Offutt AFB, Nebr., 1958, 3–19. World War II AAF aircraft maintenance is described in *The Official Guide to the Army Air Forces*, Army Air Forces Aid Society (New York: Pocket Books, Inc., 1944), 197–203.

7. For a contemporary overview of the air war in Korea, see Gen. Otto O. Weyland (USAF), "The Air Campaign in Korea," *Air University Quarterly Review* 6 (Fall 1953): 3–28. The most comprehensive analysis of the USAF role in this war is Robert F. Futrell, *The United States Air Force in Korea, 1950–1953*, rev. ed. (Washington: Office of Air Force History, GPO, 1983). The creation of the MDAP, with an emphasis on NATO, is described in Lawrence S. Kaplan, *A Community of Interests: NATO and the Military Assistance Program, 1948–1951* (Washington: Historical Office, Office of the Secretary of Defense, GPO, 1980).

8. For a broad view of USAF Korean War logistics support, see Maj. Gen. Paul E. Ruestow (USAF), "Air Force Logistics in the Theater of Operations," *Air University Quarterly Review* 6 (Summer 1953): 46–56; *Logistics of Waging War*, 135–141; and Termena *et al.*, *Logistics: An Illustrated History*, 99–104.

9. Frederick A. Alling *et al.*, AMC H.S. No. 229, "History of Air Materiel Command Support of the Far East Air Force in the Korean Conflict, June–November 1950," Historical Office, HQ AMC, W-PAFB, Ohio, Dec 1950, 18–28.

10. Col. R.I. Millberry (USAF), "Engineer Aviation Forces in Korea," *Air University Quarterly Review* 6 (Fall 1953): 114–119; Maj. Leonard B. Reppert (USAF), "The Installations Squadron in Korea," *Air University Quarterly Review* 5 (Spring 1952): 87–97.

11. *United States Air Force Statistical Digest, Jan 1949–Jun 1950*, Operations Statistics Division, Deputy Chief of Staff, Comptroller, Washington, D.C., Apr 1951, 264; *United States Air Force Statistical Digest, Fiscal Year 1953*, Directorate of Statistical Services, Deputy Chief of Staff , Comptroller, Washington, D.C., Dec 1953, 246.

12. Dorothy L. Miller, AMC H.S. 268, "History of Supply of Overseas Air Forces, 1947–1954," Historical Division, HQ AMC, W-PAFB, Ohio, 1955, 30–37; Ruestow, "Air Force Logistics in the Theater of Operations," 48–53; Col. Hugh J. Mattia (USAF), "Air Force Procurement in Japan," *Air University Quarterly Review* 6 (Fall 1953): 123–127.

13. Ruestow, "Air Force Logistics in the Theater of Operations," 49–50; Maj. Carl G. Nelson (USAF), "REMCO, a Korean War Development," *Air University Quarterly Review* 6 (Summer 1953): 78–85. For a description of maintenance support provided the 82d Tactical Reconnaissance Squadron, see Gen. Bryce Poe II (USAF, Ret.), "Korean War Combat Support: A Lieutenant's Journal," *Air Force Journal of Logistics* 13 (Fall 1989): 3–7.

14. Termena *et al.*, *Logistics: An Illustrated History*, 99–104, 261. For the weeks of Aug 4, 1952, and Aug 16, 1954, *Aviation Week* devoted the entire issue to very detailed examinations of Air Materiel Command. For in-depth analysis of AMC activities during 1952 and 1954, see those volumes.

15. "Logistics," *Air Force*, Aug 1957, 365–370; E. Clifford Snyder, AMC H.S. No. 253, "History of Production Problems during the Air Force Buildup 1950–1954," Historical Division, HQ AMC, W-PAFB, 1956. Century-series fighters included those with numerical designations of 100 and higher. As of June 1957, the Air Force active inventory included 1,535 B-47s, 170 B-52s, 279 B-57s, 3,095 F-86s, 1,513 F-100s, 423 F-102s, 791 KC-97s, 113 C-130s and numerous other new aircraft. Figures cited are from *United States Air Force Statistical Digest, Fiscal Year 1957*, Directorate of Statistical Services, Comptroller of the Air Force, Washington, D.C., 1957, 112–114.

16. *USAF Statistical Digest, FY53*, 306-308; *USAF Statistical Digest, FY 1957*, 216–221. Early efforts to get the aircraft portion of MDAP underway are described in Maurer Maurer, AMC H.S. No. 240, "History of USAF Activities in Support of the

Mutual Defense Assistance Program, Part I: To 1 July 1950," Historical Office, HQ AMC, W-PAFB, Ohio, Apr 1951; Maurer Maurer, AMC H.S. No. 241, "History of USAF Activities in Support of the Mutual Defense Assistance Program, Part II: 1 July to 31 December 1950," Historical Office, HQ AMC, W-PAFB, Ohio, Nov 1951; and Maurer Maurer, AMC H.S. No. 242, "History of USAF Activities in Support of the Mutual Defense Assistance Program, Part III: 1 January to 30 June 1951," Historical Office, HQ AMC, W-PAFB, Ohio, May 1952. The state of the Air Force part of the MAP, as of the early 1960s, is described in "Military Assistance Program, Information and Guidance," Assistant for Mutual Security, Deputy Chief of Staff, S&L, HQ USAF, Jan 1962. The most recent description of USAF foreign military assistance efforts is "1996 Annual Report," Air Force Security Assistance Center, W-PAFB, Ohio, Mar 1997.

17. Programs to modify USAF atomic weapons carriers through 1954 are described in Amy C. Fenwick, AMC H.S. No. 8, "History of Silverplate Project," Historical Office, HQ AMC, W-PAFB, Ohio, Jun 1952; Amy C. Fenwick, AMC H.S. No. 7, "History of Saddletree Project," Historical Office, HQ AMC, W-PAFB, Ohio, May 1953; and Frederick A. Alling, AMC H.S. No. 305 (excised version), "History of Modification of USAF Aircraft for Atomic Weapons Delivery, 1948–1954," Historical Division, HQ AMC, W-PAFB, Ohio, Feb 1955.

18. The refinement of SAC maintenance is described in "Strategic Air Command Specialized Maintenance," 8–69. SAC's organization and mission as of 1957 are described in "Strategic Air Command—The Deterrent Force," *Air Force*, Aug 1957, 243–249.

19. Lt. Col. Shadrach E. Davis (USAF), "USAF War Readiness Materiel, 1946–1966," *Air University Review* 18 (Jul–Aug 1967): 10–11; Mary R. Self, AMC H.S. No. 265, "History of the Support of the Strategic Air Command 1946–1952," Historical Division, HQ AMC, W-PAFB, Ohio, Jun 1954, 35–166.

20. Early Air Force atomic weapons logistics support is described in Frederick A. Alling, AMC H.S. No. 306 (excised version), "History of Atomic Logistics, 1948–1955," Historical Division, HQ AMC, W-PAFB, Ohio, Jul 1956. During the 1950s the Air Force was also involved with the development of biological weapons. See Dorothy L. Miller, AMC H.S. No. 303 (excised version), "History of Air Force Participation in the Biological Warfare Program, 1951–1954," Historical Division, HQ AMC, W-PAFB, Ohio, Jan 1957.

21. San Bernardino AMA (Calif.) served as the first missile depot, but when it closed in the 1960s the workload was shifted to the Ogden AMA (Utah).

22. Termena *et al.*, *Logistics: An Illustrated History*, 120–128; Bernard J. Termena, AMC H.S. 328, "Missile Logistics, 1951–1959," Historical Division, HQ AMC, W-PAFB, Ohio, Oct 1960.

23. "Tactical Air Command, Versatile Strike Force," *Air Force*, Aug 1958, 111–114; "Pacific Air Forces, Keeping Peace in the Far East," *Air Force*, Aug 1958, 117–120; "United States Air Forces in Europe, from Britain to Pakistan," *Air Force*, Aug 1958, 123–126; "How AMC Fills Overseas Lifelines," *Aviation Week*, Aug 16, 1954, 43–55; Termena *et al.*, *Logistics: An Illustrated History*, 135–139.

24. Termena *et al.*, *Logistics: An Illustrated History*, 113–120; "Airlift Helps AMC Cut Logistics Knots," *Aviation Week*, Aug 16, 1954, 44–48; Gen. E.W. Rawlings (USAF), "A New Equation for Jet-Age Logistics," *Air University Quarterly Review* 7 (Spring 1955): 8–29; Robert Kipp, AMC H.S. No. 187, "History of the AMC Contract Airlift System (LOGAIR), 1954–1955," Historical Division, HQ AMC, W-PAFB, Ohio, Mar 1956.

25. Charles H. Hildreth, "USAF Logistics Preparations for Limited War, 1958–1961," USAF Historical Division Liaison Office, Washington, D.C., Oct 1962.

26. Davis, "USAF War Readiness Materiel, 1946–1966," 11–16.

27. Early USAF involvement in Southeast Asia and the limited logistics support required are described in Carl Berger, ed., *The United States Air Force in Southeast Asia, 1961–1973: An Illustrated Account*, rev. ed. (Washington, D.C.: Office of Air Force History, 1984), 3–33; and Termena *et al.*, *Logistics: An Illustrated History*, 158–159.

28. Col. France E. Torr (USAF), "The Air Force Civil Engineers' Role in Counterinsurgency," *Air University Review* 15 (Jul-Aug 1964): 64–72; Maj. Gen. R.H. Curtin (USAF), "The Air Force Engineers' Problems in Southeast Asia," *Air University Review* 18 (Nov–Dec 1966): 76-84; Termena *et al., Logistics: An Illustrated History*, 159–164. A thorough examination of the base buildup and Project Bitterwine is included in H.P. Carlin "Pacer Sort: A Test of Logistics in Vietnam," *Air Force Journal of Logistics* 10 (Fall 1986): 12–14; and Bernard J. Termena, AFLC H.S. No. 358, "AFLC Support of Forces in Southeast Asia: Supply Support. Vol. I: Base Buildup, 1964–1966," HQ AFLC, Historical Research Division, W-PAFB, Ohio, Jul 1968.

29. H.P. Carlin, "Logisticians in War: The Experience of Special Teams in the Vietnam Era," *Air Force Journal of Logistics* 18 (Spring–Summer 1994): 35–39; Termena *et al., Logistics: An Illustrated History*, 170–172; Berger, ed., *USAF in Southeast Asia*, 250–251.

30. Lt. Col. Ruskin M. Bland (USAF), "Special Express," *Air University Review* 18 (Jul–Aug 1967): 36–42; Termena *et al., Logistics: An Illustrated History*, 165–170; Berger, ed., *USAF in Southeast Asia*, 251, 254. Special Express and SEAIR are examined in detail in Wilbur E. Clemmer, AFLC H.S. No. 356, "AFLC Support of Forces in Southeast Asia: Transportation Support 1964–1966," HQ AFLC, Office of History, Mar 1968, 11–34. The development of a munitions support system is described in detail in Wilbur E. Clemmer, AFLC H.S. No. 364, "AFLC Support of Forces in Southeast Asia: Munitions Support, 1964–1967," HQ AFLC, Office of History, W-PAFB, Ohio, Mar 1969.

31. Airlift support is described in Berger, ed., *USAF in Southeast Asia*, 169–199, and Clemmer, "Transportation Support," 1–10. The 463L pallet shortage problem and response is described in Clemmer, Transportation Support," 101–114.

32. Termena *et al., Logistics: An Illustrated History*, 178–181; Carlin, "Logisticians in War," 36–39.

33. The state of USAF logistics upon the establishment of AFLC is described in Gen. Samuel E. Anderson (USAF), "Aerospace Logistics," *Air University Quarterly Review* 12 (Winter & Spring 1960–1961): 161–175. The events within the Air Force leading up to the establishment of the Defense Supply Agency are analyzed in Barr O. Braman, AFLC H.S. No. 338, "Impact of the Development of a Common Supply System Upon AFLC," Vol. II, "The Trend Leading Toward the DSA Decision (1958–1961)," Historical Division, HQ AFLC, W-PAFB, Ohio, Nov 1962. DSA organization and activities, as of 1968, are examined in Lt. Gen. Earl C. Hedlund (USAF), "The Defense Supply Agency: An Achievement in Integrated Management," *Air University Review* 19 (May–Jun 1968): 2–12. AFLC's depot closure reasoning and planning are recounted in Frederick A. Alling, AFLC H.S. 357, "Phase-Out of the Middletown, Mobile, and San Bernardino Air Materiel Areas. Vol. I, The Rationale and the Plan," Historical Research Division, HQ AFLC, W-PAFB, Ohio, May 1968.

34. William Elliott, AFLC H.S. 415 (Draft), "To the Third Generation: A History of the Advanced Logistics System, 1967–1977," Office of History, HQ AFLC, W-PAFB, Ohio, 1991; Frederick Alling *et al.*, AFLC H.S. 329, rev. ed. "Air Force Logistics Command, 1917–1992," Office of History, HQ AFMC, W-PAFB, Ohio, Apr 1997, 65–67.

35. Alling *et al.*, "Air Force Logistics Command," 55–56.

36. *Ibid.*, 54–55.

37. *Ibid.*, 69–70.

38. "Federal Budget Categories," *Air Force Magazine*, May 1997, 40.

39. "Air Force Logistics Command Fact Book, Fiscal Year 1972," HQ AFLC, W-PAFB, Ohio, Sep 1972, 5; "Air Force Logistics Command Fact Book, Fiscal Year 1975," HQ AFLC, W-PAFB, Ohio, Oct 1975, 7.

40. "Federal Budget Categories," 40.

41. Marcelle S. Knack, *Post-World War II Fighters, 1945–1973* (Washington, D.C.: Office of Air Force History, 1986), 283.

42. "McDonnell Douglas F–15 Eagle," *Military Aircraft Forecast*, Forecast International, Newton, Conn., Feb. 1993.

43. The demands of providing logistics support to electronics- and computer-laden aircraft is described in Gorton R. England and J. Kristen Henderson, "The Coming Revolution in Avionics Logistics," *Air Force Journal of Logistics* 6 (Summer 1982): 29–31; and Gary H. Lunsford *et al.*, "Logistics and Advanced Technology," *Air Force Journal of Logistics* 6 (Summer 1982): 32–35.

44. *United States Air Force Statistical Digest* (abridged), Assistant Secretary of the Air Force, Financial Management and Comptroller of the Air Force, Washington, D.C., 1991, E34.

45. USAF participation in Operation Just Cause is described in "Operation Just Cause," *Air Force Times*, Jan 1, 1990, R1–R8.

46. For thorough analyses of the air war, see Thomas A. Keaney and Eliot A. Cohen, *Gulf War Air Power Survey: Summary Report* (Washington: GPO, 1993); James A. Winnefeld *et al.*, *A League of Airmen: U.S. Air Power in the Gulf War* (Santa Monica, Calif., RAND, 1994); and Richard P. Hallion, *Storm Over Iraq: Air Power and the Gulf War* (Washington. D.C.: Smithsonian Institution Press, 1992). USAF Gulf War logistics activities are described in William W. Suit, "Sustaining the War Machine: U.S. Air Force Logistics Support during the Gulf War," in William Head and Earl H Tilford, Jr., eds., *The Eagle in the Desert: Looking Back on U.S. Involvement in the Persian Gulf War* (Westport, Conn.: Praeger Publishers, 1996), 87–105; and in Keaney and Cohen, *Gulf War Air Power Survey: Summary Report*, 207–222.

47. Gen. Charles C. McDonald, quoted in "AFLC Chief Sees War Tab Reaching $1.1 Billion," *Fairborn Daily Herald*, Apr 23, 1991.

48. Aircraft that deployed during wartime relied on WRSKs for initial spares support, whereas units that expected to fight in place, such as those located in Korea and Europe, relied on Base Level Self Sufficiency Spares for initial wartime spares support. For a comparison of these wartime spares management tools, see AFLAMC Report LS902011, "Base Level Self Sufficiency Spares Versus War Readiness Spares Kit Analysis," Air Force Logistics Management Center, Gunter AFB, Ala., May 1991. An AFLC view of USAF Gulf War logistics is expressed in White Paper, HQ AFMC/XPOX, "Air Force Logistics Command Operations in Desert Storm," Jul 1990, copy held in HQ Air Force Materiel Command, Office of History (HQ AFMC/HO) archives.

49. The Gulf Cooperation Council was a collective security organization formed by Kuwait, Bahrain, the United Arab Emirates, Oman, Qatar and Saudi Arabia in May 1981. For a discussion of this organization see "GCC: Safety in Numbers," *Jane's Defence Weekly*, Mar 31, 1990, 587–588, 590–591, 594– 595, 597–602; and W. Jack Dees, "Gulf Security and the Gulf Arab Contribution," Naval War College, Jun 6, 1991, microfiche reproduction held by HQ AFMC/HO archives.

50. "U.S. Buildup Puts Strain on Saudis, Hosts Hand Over Air Bases, Box Lunches to Massing Americans," *Washington Post*, Aug 27, 1990; David F. Bond, "Troop and Materiel Deployment Missions Central Elements in Desert Storm Success," *Aviation Week & Space Technology*, Apr 22, 1991, 94–95; James Kitfield, "Dash to the Desert," *Government Executive*, Nov 1990, 14–32. The most comprehensive accounts of the overall logistics effort are William G. Pagonis and Jeffrey L. Cruikshank, *Moving Mountains: Lessons in Leadership and Logistics from the Gulf War* (Boston: Harvard Business School Press, 1992); and George T. Raach *et al.*, *Conduct of the Persian Gulf War*, Appendix F, *Logistics Buildup and Sustainment,* Final Report to Congress, 3 Vols., U.S. DOD, Apr 1992.

51. Michael Wines, "Saudis Plan to Supply U.S. with Fuel for Military Use," *Wall Street Journal*, Aug 23, 1990; John J. Fialka, "U.S. Troops Replace Building Boom as Source of Profit for Saudi Business," *Wall Street Journal*, Dec 27, 1990; Katsukai L. Terasawa and William R. Gates, "Burden Sharing in the Persian Gulf War: Lessons Learned and Implications for the Future," Naval Postgraduate School, Monterey, Calif.,

Aug 1992, microfiche reproduction held in HQ AFMC/HO archives.

52. Peter Grier, "Middle East: Laying the Groundwork," *Military Logistics Forum* (Sep 1987): 19–25; Ray P. Linville, "Maritime Prepositioning: A Logistics Readiness and Sustainability Enhancement," *Air Force Journal of Logistics* (Winter 1984): 2–7; Briefing, AFLC Director of Operations and Contingency Plans to USAF Scientific Advisory Board Cross Matrix Panel, "AFLC—Partners in Warfighting," W-PAFB, Apr 24, 1991.

53. Briefing, HQ AFMC/XP, "Desert Shield/Storm Lessons Learned," Jul 12–13, 1991, copy held in HQ AFMC/HO archives; Talking Paper, HQ AFLC/XRCO, "Desert Shield/Desert Storm Bare Base Support," *ca.* Apr 1991, copy held in HQ AFMC/HO archives.

54. Ronald B. Hartzer, "Engineering and Services in Operation Desert Shield," *Air Power History* (Fall 1991): 20–27; Talking Paper, AFLC/LGMA, "Combat Logistics Support Squadron Maintenance," *ca.* Jul 12; Talking Paper, AFLC/LGTX, "Combat Logistics Support Squadron (CLSS) Rapid Area Distribution Support (RADS)," Jun 19, 1991, copy held in HQ AFMC/HO archives.

55. Briefing, AFLC/LGW, "Desert Shield/Desert Storm AFLC Munitions Experience," Apr 25, 1991, copy held in HQ AFMC/HO archives; "Desert Shield/Desert Storm Lessons Learned," Air Force Logistics Management Center, Gunter AFB, Ala., Apr 1993, microfiche reproduction held in HQ AFMC/HO archives; Benjamin Weiser, "No Shortage of Bombs, Missiles Foreseen for U.S.," *Washington Post*, Jan 25, 1991; William Neikirk, "War Barely Dented U.S. Arsenal," *Chicago Tribune*, Mar 15, 1991.

56. AFLC/XP, "Lessons Learned"; USAF JULLS Rpt No. 32857-54653 (00009), "War Readiness Spares Kit Deployment," Apr 2, 1991, copies held in HQ AFMC/HO archives.

57. Talking Paper, AFLC/XRII, "CENTAF Supply Support Activity (CSSA)," Jun 19, 1991, copy held in HQ AFMC archives.

58. Briefing, AFLC/LGT, "Air Logistics Information File," Apr 25, 1991, copy held in HQ AFMC/HO archives.

59. Summary Report, HQ AFLC, "Logistics Support for Desert Shield and Desert Storm," Mar 30, 1991, 2–4, copy held in HQ AFMC/HO archives.

60. White Paper, HQ USAF, "Air Force Performance in Desert Storm," Apr 1991, 3–6, copy held in HQ AFMC/HO archives.

61. "Defense Management Report to the President," by Secretary of Defense Dick Cheney, Jul 1989, 8–9, copy held in HQ AFMC/HO archives.

62. The establishment of AFMC is described in detail in H.P. Carlin, AFMC H.S. No. 01, "Building a New Foundation: Plans and Preparations for Establishing the Air Force Materiel Command," HQ AFMC, Office of the Command Historian, W-PAFB, Ohio, Dec 1992.

63. DMRD 902, DMRD 926 and DMRD 908 are discussed in detail in Carol J. August *et al.*, AFLC H.S. No. 416, "History of the Air Force Logistics Command, Fiscal Year 1990," HQ AFLC, Office of History, W-PAFB, Ohio, Apr 1991, 69–82.

64. The closing of AGMC and the transfer of its workload to a private contractor is discussed in Carol J. August *et al.*, AFMC H.S. No. 05, "History of the Air Force Materiel Command, 1 October 1993–30 September 1994," HQ AFMC, Office of the Command Historian, Apr 1995, 25–27.

65. Carol J. August *et al.*, AFMC H.S. No. 06, "History of the Air Force Materiel Command, 1 October 1994–30 September 1995," HQ AFMC, Office of the Command Historian, W-PAFB, Ohio, Apr 1996, 31–40, 101–124.

66. Gary R. Akin *et al.*, AFMC H.S. No. 03, "History of the Air Force Materiel Command, 1 July 1992–30 September 1993," HQ AFMC, Office of the Command Historian, W-PAFB, Ohio, Apr 1994, 122–130; Carol J. August *et al.*, AFMC H.S. No. 07, "History of the Air Force Materiel Command, 1 October 1995–30 September 1996," Office of the Command Historian, W-PAFB, Ohio, Apr 1997, 142–145.

67. Termena *et al.*, *Logistics: An Illustrated History*, 201–203.

68. Akin, AFMC H.S. No. 03, 135–142; August *et al.*, AFMC H.S. No. 05, 134–141.

69. The effort to reduce the spares pipeline cycle and thus cut the number of required spares was called Lean Logistics. See August *et al.*, AFMC H.S. No. 05, 124–128; August *et al.,* AFMC H.S. No. 06, 132–136.

Eight Decades of American Military Airlift

Daniel L. Haulman

Do fighters and bombers fly into your head when you think of the Air Force? Perhaps transports should appear instead. An air-to-air kill or a precision strike on a key target may be more spectacular, but airlift is much more frequently used as an instrument of national policy. Airlift missions go on year after year, whether we are at war or not, and they have claimed increasing percentages of Air Force operations. But airlift is not new. In the following remarks I would like to highlight some of the events that illustrate the role and contributions of U.S. Air Force airlift since the early days of American military aviation.

World War I cultivated the airplane as a weapon and established the essential missions of air power, which included airlift. Two of the four Air Service members to earn the Medal of Honor in World War I lost their lives while attempting aerial resupply of a lost battalion along the front in October 1918.[1]

Between the world wars airlifts continued in humanitarian operations. As early as 1919 airplanes from Kelly Field, Texas, dropped food to Rio Grande flood victims.[2] Ten years later military airplanes from Maxwell Field air-dropped more than twenty-seven tons of food, clothing, blankets, medical supplies, and outboard motors to the victims of a flood in south Alabama.[3] In 1932 bombers dropped supplies to Navajo Indians who had become snowbound by severe blizzards in Arizona.[4] In 1936 and 1937 the Air Corps flew food to flood victims in Pennsylvania and Illinois.[5] Other nations also benefited from humanitarian airlift before World War II, as for example in February 1939 when the Army delivered medical supplies by air to the victims of an earthquake in Chile.[6]

World War II stimulated the growth of airlift as nothing before or since. Until then, surface transportation moved virtually all troops and war materiel. The German Luftwaffe demonstrated the utility of airborne operations, using gliders during the conquest of the Low Countries and dropping paratroops to conquer Crete.[7] The Allies soon adopted the same techniques. Gen. George F. Kenney's Fifth Air Force transported General MacArthur's forces from Australia to New Guinea in 1942.[8] Allied transports sustained more than 150,000 surrounded British troops in eastern India for three months in 1944.[9] In Europe, American troop-carrying aircraft led the Allied airborne invasions of Sicily, Italy, Normandy, the Netherlands, and Germany.

One of the most important operations in World War II was Air Transport Command's flying of the Hump to airlift fuel and war materiel from British India over the Himalayas to China after Japanese forces had cut off all land and sea routes. American cargo airplanes fought turbulence and icing as they flew over the world's highest mountain range. Under the leadership of Gen. William H. Tunner, the Hump airlift delivered 550,000 tons of cargo in its last year of operation.[10]

During World War II the Air Transport Command (ATC) also ferried thousands of airplanes to England and Russia, flying hazardous routes across the North Atlantic and across western Canada and Alaska. In the month of July 1945, the ATC had 3,700 airplanes flying 275,000 passengers and 100,000 tons of cargo and mail over a worldwide network of air routes.[11]

Not long after the birth of the United States Air Force as an independent service in 1947, President Truman authorized the creation of the Military Air Transport Service (MATS), which combined the strategic airlift resources of the ATC and the Navy.[12] Other commands managed tactical airlift resources.

In 1948 the Soviet Union blocked all land routes between West Berlin and the free world. To sustain two million people, the United States and the United Kingdom launched the largest airlift operation that had ever been flown, and General Tunner was called upon to direct it. The United States Air Forces in Europe began the larger American phase of the operation, which was called Operation Vittles, but the C–47s in the theater were not adequate for the large quantities of cargo needed. MATS therefore sent four-engine C–54s from all over the world for use in Europe. By 1949 Tunner had a C–54 landing in Berlin every ninety seconds. Between June 1948 and September 1949, American and British transports airlifted 2.3 million tons to the besieged city. Frustrated, the Soviet Union abandoned the blockade, allowing the Allies to achieve their strategic objectives without having to engage in warfare. In terms of tonnage and sorties, Operation Vittles remains the largest humanitarian airlift operation in history.[13]

Shortly thereafter another war required major airlift support. In 1950 communist North Korea invaded South Korea in a brutal attempt to substitute force for free elections. MATS airlifted priority cargo and personnel from the United States to the Far East. Between June 1950 and July 1953, MATS airlifted 214,000 passengers and 80,000 tons of cargo to Japan. It also transported tens of thousands of combat casualties and patients from the Far East to the United States.[14]

While MATS handled strategic airlift between the United States and Asia, Combat Cargo Command airlifted troops and their equipment from Japan to Korea and within Korea. General Tunner, hero of the Hump and

Berlin, commanded the intratheater airlift, using mostly C–47s and C–119 Flying Boxcars.[15] In November and December 1950, as communist Chinese forces swarmed into Korea and threatened to entrap American troops in the Chosin Reservoir area, Tunner's transports evacuated thousands of American ground troops.[16] During the war, theater cargo aircraft airdropped 15,000 tons of supplies and equipment.[17] When the Korean War ended in 1953, North Korea released thousands of Americans it had been holding as prisoners. Most returned to the United States by ship, but several hundred, too sick or wounded to endure a long voyage, went by air.[18]

During the 1950s President Dwight D. Eisenhower attempted to avoid conflicts like the Korean War with a policy of massive retaliation, but he was forced to use airlift extensively as a diplomatic instrument. In 1956, after a failed Hungarian uprising against Soviet domination, MATS carried more than 10,000 refugees from Europe to the United States.[19] Airlift also reinforced American foreign policy in the Middle East. During the same year American aircraft airlifted 1,300 United Nations peacekeeping troops from Colombia and India to patrol a cease-fire between Egypt and Israel after the Suez War.[20] In 1958, subversion threatened the peace of Lebanon, and the United States airlifted more than 5,000 American troops from Europe to Beirut. They and a large force of U.S. Marine Corps personnel, who landed by sea, restored stability that was to last for two decades.[21]

President Eisenhower also used airlift in Latin America, often to provide humanitarian relief after natural disasters. In 1960, after severe earthquakes struck Chile, the Air Force airlifted 1,000 tons of food, clothing, medical supplies, and other humanitarian cargo 4,500 miles to Chile in an operation called Amigos. The cargo included helicopters and two complete Army field hospitals.[22]

On the heels of the humanitarian airlift to Chile in 1960, another crisis in Africa demanded Eisenhower's attention and his airlift resources. The Congo had just become independent from Belgium, and competing factions struggled for power. To restore order, the United Nations authorized an international airlift of troops. Twenty thousand United Nations troops from sixteen nations eventually participated, and the United States airlifted ninety percent of them. The operation, called New Tape, was the largest airlift since Berlin, and it lasted for more than two years. The Air Force committed as many as sixty cargo aircraft at a time.

Powerful congressmen such as L. Mendel Rivers of South Carolina, aware of the importance of such worldwide airlift operations to American foreign policy, recommended modernization of the airlift fleet. His recommendations fit well into the new administration's national security policies. President John F. Kennedy, who took office in 1961, promised a flexible response to international crises anywhere in the world. He therefore supported the acquisition of four-engine jet transport aircraft such as the C–135 and the C–141

Starlifter.[23] Like Eisenhower before him, Kennedy used airlift as an instrument of a global foreign policy. When China invaded India in 1962, Kennedy launched Operation Long Skip, deploying C–130 Hercules aircraft to airlift Indian troops to where they were most needed.[24] In October 1963, just a month before he was assassinated, Kennedy demonstrated the ability of the United States to project its forces rapidly to wherever they were required. In an operation called Big Lift, he tapped the Air Force to transport 15,000 American troops and a million pounds of battle equipment 5,600 miles from the United States to Europe in only three days.[25]

President Lyndon B. Johnson took Kennedy's energetic foreign policy to new heights in Asia, Africa, and Latin America. In November 1964 he sent American C–130s to help rescue American and European hostages being held by rebels in Stanleyville in the Congo. In an operation called Dragon Rouge, fifteen of the planes dropped Belgian paratroopers, refueled at Leopoldville, and returned to retrieve them and the surviving liberated hostages.[26] To quell political disturbances in the Dominican Republic in 1965, which threatened to turn the country into another Cuba, Johnson sent in American troops. Air Force cargo aircraft airlifted the majority of nearly 24,000 soldiers, including 1,800 paratroopers, to the island nation, stabilizing the government and preventing a dictatorship.[27]

In Vietnam President Johnson used his airlift resources to the fullest extent. The new C–141 Starlifter carried American troops rapidly from the United States to Southeast Asia to reinforce the President's policy of escalation. In January 1966, the same month that MATS became the Military Airlift Command (MAC), the Air Force airlifted a brigade of 3,000 men and their equipment from Hawaii to South Vietnam. In a larger operation at the end of 1967, MAC transported a division of more than 10,000 men from Kentucky to Vietnam.[28]

While C–141s were carrying strategic airlift loads to Vietnam, as many as 26 squadrons of smaller cargo aircraft such as the C–130 Hercules, C–123 Provider, and C–7 Caribou performed tactical airlift missions in Southeast Asia. They hauled about 7 million tons in the theater between 1962 and 1972. By moving troops and cargo rapidly from place to place, they counteracted the enemy's advantages of initiative and surprise. In Operation Junction City in 1967, 23 tactical transports dropped 780 American paratroops and their equipment in an area northwest of Saigon. It was the largest American paratroop operation of the Vietnam War. In April of that year, 16 Hercules aircraft moved a brigade of 3,500 troops and 4,000 tons of equipment from Chu Lai to Tay Ninh.[29] One of the most heroic episodes of the Vietnam airlift was the 1968 evacuation of Kham Duc, an American camp surrounded by enemy forces armed with antiaircraft artillery. Close-in air strikes allowed C–130s and C–123s to land and evacuate the defenders. Lt. Col. Joe M. Jackson, a Provider pilot, earned the Medal of Honor by evacuating three American combat controllers after the enemy had gained control of the camp. His plane was constantly under fire during landing, retrieval, and takeoff.[30]

Besides dropping paratroopers and moving troops from place to place, the tactical airlifters in Vietnam supplied ground forces. During the successful defense of the U.S. Marine base at Khe Sanh between January and April of 1968, as many as eighteen C–130s landed per day, flying half-hour missions from Da Nang. Because of enemy shelling, no more than two were permitted on the ground at a time. Defenders took cover during landings because the aircraft attracted mortar fire. When enemy shelling prevented the supply planes from landing, the C–130s air-dropped cargoes, using container delivery, low-altitude parachute extraction, and ground proximity extraction systems.[31]

President Richard Nixon reversed Johnson's policy of escalation in Vietnam and began the withdrawal of American troops, but the war continued into the 1970s. By then Nixon had a new airlift tool to use in Southeast Asia: the C–5A Galaxy. It was the largest aircraft in the world, capable of carrying bulkier and heavier cargo than any airplane in history. Nonetheless, because of its cost the Galaxy aroused considerable criticism. Senator William Proxmire, for example, ridiculed the Galaxy as a fiscal disaster.[32]

In 1972, near the end of the war, when North Vietnam launched a large-scale invasion of South Vietnam, Nixon responded with air power, and airlift again contributed generously. MAC helped move the 49th Tactical Fighter Wing from New Mexico to Thailand in only nine days.[33] The wing's four fighter squadrons helped stall the invasion. When the war finally ended for America the following year, 590 Americans who had been held as prisoners of war returned to the United States on MAC transports. Operation Homecoming was one of the most popular of all airlifts.[34]

Later the same year American airlift contributed to quelling hostilities in the Middle East. Egypt and Syria suddenly attacked Israeli forces in the Sinai and Golan Heights in October. In an operation called Nickel Grass, the Air Force transported more than 22,000 tons of tanks, artillery, and other military cargo from the United States to Israel.[35] The operation countered a massive Soviet airlift of equipment and supplies to the Arabs. The war was over before the first sea-delivered supplies arrived.[36]

In 1973 and 1974, no longer faced with the drain of military resources in Vietnam, the United States was able to employ airlift in two of the largest humanitarian operations in history. Operations Authentic Assistance and King Grain provided more than 18,600 tons of food and other relief supplies to the African nations of Mali, Chad, and Mauritania, which were dealing with one of their worst famines.[37]

Operations such as these proved the awkwardness of relying upon two or more major commands for airlift resources. During the mid-1970s, the Air Force consolidated airlift under MAC. In 1974 and 1975 MAC acquired the C–130s of the Tactical Air Command, the United States Air Forces in Europe, and the Pacific Air Forces, which it used in concert with its strategic airlift C–5s and C–141s.[38]

The fall of Southeast Asia to communist forces in 1975 put the new airlift structure to the test. In what became the largest refugee airlift in history, the Air Force evacuated tens of thousands of refugees from Vietnam and Cambodia to the United States. Air Force aircraft moved about 50,000 people, and civilian airliners under MAC contract transported thousands more.[39]

Despite declining defense spending in the wake of Vietnam, the Air Force was able to secure funding to improve its military transports. In the late 1970s, the service stretched each of its C–141 Starlifters about 23 feet to extend their cargo capacities and to allow them to refuel in flight.[40] After the election of Ronald Reagan in 1980, funding for strategic mobility doubled, and Congress authorized the purchase of 50 new C–5Bs and 44 KC–10 tankers that could also serve as cargo airplanes. The Air Force also proposed a fleet of new C–17 Globemaster IIIs, which would combine a wide body like the C–5's with the ability to use short forward airfields like those available to the C–130. Planners expected the C–17 to replace the aging C–141s.[41] Legislation in the mid-1980s also allowed the Air Force to transport privately donated humanitarian cargo on routine training flights, at no cost to the donors or recipients, and permitted the airlift of surplus nonlethal Defense Department property to developing nations in need.[42]

Both Presidents Reagan and his successor George Bush used the Air Force's airlift resources to resolve crises in Latin America. Reagan invaded the small island of Grenada in 1983 in order to evacuate American citizens, eliminate a Cuban military presence, and establish a stable democratic government. While the marines went ashore, MAC transports delivered Army troops to the island. Some of the airplanes evacuated more than 700 American citizens on return flights to the United States.[43] President Bush invaded Panama in December 1989 to capture Gen. Manuel Noriega, who had established a drug-dealing dictatorship. In the initial invasion, 84 MAC cargo airplanes, flying at 500 feet, dropped close to 5,000 troops across Panama. It was the largest nighttime airborne operation since World War II.[44]

The new joint Transportation Command, created in 1987, faced a bigger test in 1990 when Iraqi forces suddenly invaded and occupied tiny Kuwait. President Bush responded with Desert Shield and Desert Storm, which eventually liberated Kuwait. Gen. Norman Schwarzkopf, the theater commander, relied heavily on air power, not only to attack Iraqi strategic and tactical targets, but also for mobility. Although the vast majority of Desert Shield and Desert Storm cargo arrived in Saudi Arabia by sea, airplanes carried more than 500,000 troops and 544,000 tons of cargo to the Persian Gulf area.[45] At the height of the airlift, 127 transports landed daily in the theater.[46] For the first time, the Defense Department activated the Civil Reserve Air Fleet.[47]

Tactical airlift was no less important. General Schwarzkopf relied on about 150 intratheater C–130s, which were supplied by regular, Air Force Reserve, and Air National Guard units. Hercules aircraft moved 14,000 troops and over 9,000 tons of equipment to the west for Schwarzkopf's famous "left hook" maneuver, contributing to the liberation of Kuwait.[48]

The end of the Cold War in the late 1980s and early 1990s reduced the need for American armaments. The fall of communist governments in Eastern Europe, the end of the Warsaw Pact, the unification of Germany under a democratic regime as a member of the North Atlantic Treaty Organization, the dissolution of the Soviet Union, and a move toward democracy in Russia all increased the security of the United States. Like the other military services, the Air Force began to shrink. Between 1991 and 1995 the Air Force closed more than 30 major installations, trimmed over 1,400 airplanes, and released more than 110,000 personnel.[49] With reductions came reorganization. In 1992 the Air Mobility Command (AMC) replaced MAC and acquired tankers from the inactivated Strategic Air Command. AMC combined them with jet transports to create a more efficient strategic airlift instrument.[50] At the same time the command gained tankers, it began to lose its tactical airlifters. In 1992 the United States Air Forces in Europe and the Pacific Air Forces each gained a C–130 wing, and intratheater airlift transferred from AMC to theater control.[51] The next year AMC transferred its remaining C–130 tactical airlift assets to the new Air Combat Command.[52] This transfer, however, proved to be temporary since in 1997 Air Combat Command returned its C–130 units to AMC in the interest of what was called "seamless mobility."[53]

Although the Air Force grew smaller, demands for airlift actually increased. With the demise of the Soviet Union, the United States was the only country left in the world with the capacity to airlift large numbers of troops and materiel promptly to any part of the world.[54] The collapse of socialist economies in Eastern Europe generated the need for relief at the same time the region opened to American military transports. The whole world became eligible for American relief. Whereas in its first forty years the Air Force participated in an average of twelve humanitarian airlifts per year, in 1991 and 1992 the annual average was twenty.

During those two years, President Bush launched a series of five Provide operations to help people in need or to secure peace around the world. Provide Comfort aided the Kurds in northern Iraq; Provide Hope delivered food, medicine, and other relief supplies to citizens of the former Soviet republics; Provide Relief carried humanitarian cargo to refugees of the Somali civil war in eastern Africa; Provide Transition separated troops of recently warring factions in Angola; and Provide Promise airlifted food, medicine, and other relief cargo to Bosnia, a remnant of the former Yugoslavia, where Serbs, Muslims, and Croats contended for domination. Lasting from 1992 to early 1996, Provide Promise became the longest sustained humanitarian airlift operation in history.[55]

As Air Force cargo aircraft flew all over the world on the Provide missions, they also responded to emergencies at home. The most significant of these was Hurricane Andrew, which devastated southern Florida in 1992. In one month the Air Force airlifted 21,400 tons and 13,500 passengers, using the resources of Air Mobility Command, the Air Force Reserve, and the Air National Guard. In quantity of personnel and cargo, it was the largest domestic airlift in history.[56]

President Clinton also used the airlift resources at his disposal to secure a more stable and democratic world. He continued President Bush's Operation Restore Hope, which airlifted American forces to Somalia to provide security for relief workers and cargo in Somalia threatened by feuding factions.[57] In 1994 he authorized the airlift of almost 15,000 tons of humanitarian aid to Rwandan refugees in central Africa who had fled ethnic violence between the Hutu and Tutsi tribes.[58] That same year American troops flew to Haiti to help that nation's transition to democracy and to end a mass exodus of refugees to the United States.[59] The President followed up Provide Promise in Bosnia with Operation Joint Endeavor to secure the peace agreement negotiated at Dayton, Ohio, in 1995.[60]

In today's military, airlift increasingly reflects the Total Force concept, combining resources of Regular Air Force, Air Force Reserve, and Air National Guard units. By May of 1993 more than half the airlift wings and groups were Reserve or Guard organizations.[61] The Civil Reserve Air Fleet has shown its ability to carry more troops than military aircraft on strategic airlift deployments, and up to thirty percent of the cargo.[62] Technological improvements have also modernized Air Mobility Command. In 1993 the first operational C–17 finally entered the Air Force inventory.[63] A total of 120 C–17 Globemaster IIIs are on order and will eventually replace the Starlifter fleet. New C–130J models are now being built, with improved propellers and electronic systems.

With modern airplanes, highly trained and motivated crews, efficient command structures, and adequate basing, the nation's airlifters will continue to serve as effective instruments of national policy, both in peace and war, just as they have since World War I. Mobility may not be the most spectacular use of air power, but it is the most common. So, the next time you conjure up an image of the Air Force, you might picture a Hercules, a Galaxy, or a Globemaster III.

Notes

1. Maurer Maurer, *The U.S. Air Service in World War I* (D.C.: Office of Air Force History, 1979), Vol. IV, 175; George W. Sutton, Jr., personal papers at Air Force Historical Research Agency (AFHRA call no. 168.7239–2); David Parmelee Morse, *The History of 50th Aero Squadron* (New York: Blanchard Press, 1920; Nashville, Tenn.: Battery Press,

1990); Robert J. Davis, Air Training Command Study on namesakes of Lackland AFB streets (AFHRA call no. K220.04–53).

2. Maurer Maurer, *Aviation in the U.S. Army, 1919–1939* (D.C.: Office of Air Force History, 1987), 143.

3. Maxwell Field History, 1929 (AFHRA call no. 286.26–1), 53–67.

4. *Air Corps Newsletter*, Jan 25, 1932.

5. Maurer Maurer, *Combat Squadrons of the Air Force, World War II* (D.C.: Office of Air Force History, 1969), 106, 188, 192, 320.

6. History of the I Bomber Command, Vol. 2 (422.01–1 at AFHRA), and 2d Bombardment Wing supporting document (WG–2–SU at AFHRA).

7. Sam McGowan, *The C–130 Hercules: Tactical Airlift Missions, 1956–1975* (Blue Ridge Summit, Pa.: Aero, 1988), 2.

8. *Ibid.*

9. Keith Chapman, *Military Air Transport Operations* (London: Brassey's, 1989), 2.

10. William H. Tunner, *Over the Hump* (D.C.: Office of Air Force History, 1985), 129.

11. Wesley Frank Craven and James Lea Cate, *The Army Air Forces in World War II* (Chicago: University of Chicago Press, 1958), Vol. VII, 19; William M. Leary, "Strategic Airlift: Past, Present, and Future," *Air University Review* 37 (Sep–Oct 1986): 75.

12. Charles A. Ravenstein, *The Organization and Lineage of the United States Air Force* (D.C.: Office of Air Force History, 1986), 17.

13. James L. Stokesbury, *A Short History of Air Power* (New York: William Morrow, 1986), 87–89; Roger D. Launius and Coy F. Cross II, *MAC and the Legacy of the Berlin Airlift* (Scott AFB, Ill.: Military Airlift Command History Office, Apr 1989).

14. *Anything, Anywhere, Anytime: An Illustrated History of the Military Airlift Command* (Scott AFB, Ill.: Military Airlift Command History Office, 1991), 80.

15. McGowan, 5.

16. Robert Frank Futrell, *The United States Air Force in Korea, 1950–1953*, rev. ed. (D.C.: Office of Air Force History, 1983), 255–260.

17. *Anything, Anywhere, Anytime*, 80.

18. Military Air Transport Service History (AFHRA call no. K300.01), Jul-Dec 1953, Vol. I, 233–234; Capt. A.G. Thompson, *The Greatest Airlift: The Story of Combat Cargo* (Tokyo: Dai Nippon, 1954), 455–464; 315th Air Division History (AFHRA call no. K–DIV–315–HI), Jun 1950–Aug 1953, 455–464,; Jan–Jun 1953, Vol. I, 169, and Jul–Dec 1953, Vol. I, 46–51; Futrell, 649–650.

19. Military Air Transport Service History, Jan–Jun 1957, Vol. I, 84–85.

20. Stanley M. Ulanoff, *MATS: The Story of the Military Air Transport Service* (New York: Watts, 1964), 28–30, 116.

21. A. Timothy Warnock, *Air Force Combat Medals, Streamers, and Campaigns* (D.C.: Office of Air Force History, 1990), 288; Ulanoff, 32–33, 117; McGowan, 20–21.

22. Caribbean Air Command History (AFHRA call no. K464.01) Jan–Jun 1960, Vol. I, 154–166; Dick Burkard, *Military Airlift Command Historical Handbook, 1941–1984* (Scott AFB, Ill.: Military Airlift Command, 1984), 5.

23. Leary, 78.

24. McGowan, 33, 34, 136.

25. Ulanoff, 46–51.

26. McGowan, 52–59; Warnock, 296.

27. Warnock, 297.

28. Carl Berger, ed., *The United States Air Force in Southeast Asia, 1961– 1973: An Illustrated Account* (D.C.: Office of Air Force History, 1984), 197.

29. Ray L. Bowers, *Tactical Airlift* (D.C.: Office of Air Force History, 1983), 691, 288-289; McGowan, 134–135, 199, 101–102.

30. McGowan, 177–178.

31. Bowers, 315; McGowan, 156, 175.

32. Leary, 79–80.

33. Berger, ed., 198.
34. Military Airlift Command History, Jul 1972–Jun 1973, Vol. I, 51–71; Vol. VI, supporting document II–3.
35. Richard P. Hallion, *Storm Over Iraq: Air Power and the Gulf War* (D.C.: Smithsonian Institution Press, 1992), 63.
36. Chapman, 1; Department of the Air Force, *45 Years of Global Reach and Power: The United States Air Force and National Security* (D.C.: Pentagon, 1992), 24.
37. Tactical Air Command Histories, FY 1973, Vol. I, 196–197; Jul 1973–Jun 1974, Vol. I, 94–95; and Jul 1974–Jun 1975, Vol. I, 107–108.
38. *Air Force Magazine*, May 1975, 76–77; Tactical Air Command History, Jul 1974–Jun 1975, Vol. I, 99; Eastern Air Force Reserve Region History, Jul–Dec 1974, Vol. I, 21; Frederick J. Shaw, Jr., and Timothy Warnock, *The Cold War and Beyond: Chronology of the United States Air Force, 1947–1997* (Ala.: Air University, 1997), 75.
39. Military Airlift Command History, Jul 1974–Dec 1975, Vol. I, 204–208, 213, 218–221; Twenty-First Air Force History, Jul 1974–Dec 1975, Vol. I, 70–73; Twenty-Second Air Force History, Jul 1974–Dec 1975, Vol. I, 71–86; Maj. George J. Klazynski, "The Airlift Role in Operations Babylift and New Life," Air University Manuscript M–43122–U, K 632a, at Air University Library.
40. Leary, 80; Shaw, 82.
41. Leary, 81–83.
42. Military Airlift Command History, 1988, Vol. I, 231–234.
43. Warnock, 305.
44. Warnock, 308; Shaw, 126–127.
45. USGAO Report to Chairman, U.S. Senate Armed Services Committee, "Desert Shield/Storm: Air Mobility Command's Achievements and Lessons for the Future," Jan 1993 (GAO/NSIAD–93–40).
46. "Desert Shield/Desert Storm: USTRANSCOM's First Great Challenge," 14.
47. *Ibid.,* 16.
48. Tow, 52; Hallion, 227.
49. *Air Force Magazine*, May 1996, 40, 44, 55.
50. David J. Lynch, "When the Mission Is Aid," *Air Force Magazine*, Feb 1993, 63.
51. Military Airlift Command History, Jan 1991–May 1992, Vol. I, 45–47; United States Air Forces in Europe History, 1992, Vol. I, 412.
52. "C–130s Become ACC-Gained," *Citizen Airman*, Jan 1994, 24; Jay Smith, Air Mobility History Office; "Restructuring: Air Rescue Service Realigns," *Airman*, Feb 1993, p. 12.
53. Mat Tulis, "C–130 Transfer Brings about Seamless Mobility," AMC Public Affairs statement in Air Force News Service E-Mail, Feb 7, 1997.
54. Chapman, 5.
55. *45 Years*, 18, 29, 51.
56. Air Mobility Command History, 1992–1994, Vol. XV, supporting document 2–36; Twenty-Second Air Force History, 1992, Vol. I, 71–73; Robert Van Elsberg, "The Force Responds," *Citizen Airman*, Oct 1992, 21–22.
57. Twenty-Second Air Force History, 1992, Vol. I, 80–81; TSgt. Timothy P. Barela, "Air Bridge to Somalia," *Airman*, Mar 1993, 2–11; 435th Airlift Wing History, Jul–Dec 1992, 21.
58. "News Notes," *Air Force Magazine*, Dec 1994, 22.
59. 314th Tactical Airlift Wing History, 1942–1994.
60. "The Air Force in the Balkans," *Air Force Magazine*, Mar 1996, 26–31.
61. Organization record files at AFHRA; *Air Force Magazine*, May 1993, 72, 101, 105.
62. Hoover, 54.
63. "C–17 Testing Continues," *Air Force Magazine*, Oct 1993, 17; *Air Force Magazine*, May 1994, 124.

U.S. Air Force Peacetime Airborne Reconnaissance During the Cold War, 1946-1990

Vance O. Mitchell

During most of its first two hundred years as an independent nation, the United States had no national intelligence establishment and little means of collecting information on other nations, but neither was really needed. Geographically separated from the other world powers on the east and west by two vast oceans, and bordered on the north and south by friendly, or at least weak, neighbors, the nation enjoyed a "cushion of time" that allowed it to mobilize its assets, including intelligence, to meet external threats. In times of peace, intelligence, espionage, and spying, like large standing militaries, were accorded indifference and suspicion rather than support. For most of this period, only the State Department routinely gathered information from abroad, but its efforts were sporadic, poorly coordinated, and bore little resemblance to the vast collection systems we take for granted today.[1]

Military intelligence fared no better, flourishing in wartime only to wither away with the return of peace. As late as 1936, the combined personnel strength of the Army General Staff G–2 and the Office of Naval Intelligence was only eighty-six. A small number of attachés accredited to American embassies overseas constituted the only military collection effort. Few competent officers pursued careers in intelligence because it was a dead-end field marked by low status and poor promotion opportunities. Indeed, other career fields routinely used intelligence as a dumping ground for malcontents, prima donnas, and oddballs whose personality quirks limited their utility elsewhere.[2]

World War II changed all that. The lingering effects of the intelligence failure at Pearl Harbor and the emergence of the United States from isolationism into a world suddenly made smaller by long-range aviation, and more dangerous by nuclear weapons, mandated greater support for peacetime intelligence. No longer could intelligence be what Maj. Gen. George C. McDonald, Director of Intelligence, USAF, during the immediate postwar period, called "an undernourished wretch, misunderstood, and not encouraged."[3] The National Security Act of 1947, one of the most important pieces of legislation of the twentieth century, laid the foundation for a permanent American intelligence establishment. The director of the newly created Central Intelligence Agency (CIA) had a degree of authority over the intelligence community, which at the time consisted only of the CIA, the State Department, and the three military services, for purposes of oversight and coordination. The CIA director also provided pertinent intelligence to the members of the newly created National Security Council, who, in turn, advised the President upon whose shoulders rested the heavy burden of national security.[4]

Although the intelligence community's responsibilities spanned the globe to include every country and political entity, only one foreign power, the Soviet Union, had the technology, industrial base, population density, and, more importantly, the ideological hostility and expansionist impulses to threaten American interests. That reality, soon to harden into the Cold War, gave the intelligence community the focus it would maintain for more than four decades.

Maj. Gen. William Donovan, the head of the Office of Strategic Services, the CIA's predecessor during World War II, once remarked that intelligence was difficult, but no great mystery. It required only three steps—collecting information, arranging that information into patterns, and extracting the desired intelligence. Yet even the first step in General Donovan's simplistic trilogy proved a daunting process when applied to the Soviet Union, owing to that county's sheer size and security measures that sometimes seemed to border on paranoia. How did you compile information on a country where telephone books were controlled items, security forces closely monitored embassy personnel, and even casual contact between its citizens and foreigners was severely restricted?[5]

A partial answer to the problem was to conduct airborne reconnaissance around the Soviet periphery and, later, around the entire Sino-Soviet bloc. Although all the military services and the CIA flew reconnaissance missions during the Cold War, the Air Force was the major player by virtue of having the aircraft with the lifting power to carry the necessary sensors aloft and the range to reach the more remote areas of interest. This paper, which details only the Air Force contribution, focuses on routes, basing, and aircraft rather than on collection objectives and which aircraft carried which sensors, a choice mandated by both the available evidence and security considerations. Moreover, although the United States flew reconnaissance missions against many nations during the Cold War, the following remarks emphasize those operations against the Sino-Soviet bloc.

Reconnaissance against the Soviet Union was a tall order. That country's eleven thousand miles of shorelines and borders encircled an area of over eight million square miles, making it larger than the entire North American continent. Add in the People's Republic of China and the satellite nations of Eastern Europe, and the territory encompassed grew to over thirteen million square miles and the periphery increased to some twelve thousand miles. Thus, the distance around the Sino-Soviet bloc was equivalent to halfway around the world.[6]

Protracted reconnaissance operations against a land mass that size required three things: judicious management, diplomatic initiatives, and advanced aviation technology. Management meant employing a limited number of aircraft to maximum effect, and since all locales did not yield information of equal value, they need not be treated in an equal manner. More sensitive areas, such as the Baltic Sea and the East German–West German border, might merit twice-weekly coverage. Conversely, more remote or less active areas, such as the Laptev Sea along the Soviet Arctic littoral, might receive only monthly or quarterly visits.

The diplomatic initiatives came from the State Department, which for forty years negotiated basing rights for reconnaissance aircraft with a number of foreign nations. Those negotiations allowed aircraft to launch and recover from bases as close to the target areas as geography and international politics would permit. In general, the State Department did its job well, but the shifting political sands sometimes created problems. At least three nations had rescinded basing rights for reconnaissance aircraft by the end of the Cold War.[7]

Enormous technological advances made during World War II resulted in aircraft that could bridge the gap between geographic and diplomatic obstacles and the target areas. The first twenty-five years of the Cold War were marked by the quest for ever-better reconnaissance aircraft, beginning with obsolescent aircraft being phased out of the inventory (such as the RB–17s and RB–29s in the late 1940s and early 1950s), and progressing to more capable vehicles. Not until the 1970s, when its strategic reconnaissance fleet consisted of RC–135s, RC–130s, U–2s, and SR–71s, did the Air Force have the aircraft it needed to conduct the mission satisfactorily.[8]

The Air Force began airborne reconnaissance operations against the Soviet Union in 1946 when RB–29s of the 46th/72d Strategic Reconnaissance Squadron (SRS) began operating from Ladd Air Force Base, Alaska. Some aircraft photomapped the northern extremes of Alaska and the Canadian Arctic Archipelago, searched the Arctic Ocean for hitherto unknown islands, and in general, looked for evidence of clandestine Soviet activity (Project Polaris and Project Five). Other RB–29s collected radar and photographic intelligence along the periphery of the Chukotski Peninsula, the Soviet landmass directly across the Bering Straits from Alaska and a potential launch point for an aerial assault against the United States. In 1947, the 46th/72d SRS and its RB–29 also began monitoring electronic emissions from the Chukotski area (Project Twenty-Three).[9]

Reconnaissance activity intensified over the next few years as relations with the Soviet Union deteriorated and the United States accelerated planning for nuclear war. In 1948, the Strategic Air Command (SAC) modified ten additional B–29s for electronic reconnaissance. Half of the new aircraft stayed at stateside bases from which they periodically deployed to England to fly missions in the Baltic Sea and along the East German and Czechoslovakian borders (Project Biograph). The other five aircraft were stationed permanently with the 91st SRS in Japan where they provided Pacific Air Forces with a theater reconnaissance capability. The 91st SRS's RB–29s would in time conduct systematic operations against the People's Republic of China, North Korea, Sakhalin Island, the Kurile Islands, and the Soviet Pacific littoral as far north as the Khamchatka Peninsula. Further north, the 46th/72d's RB-29s operating out of Alaska and the Aleutian Islands began monitoring the entire Siberian coastline from Wrangel Island in the Arctic Ocean to the southern tip of the Khamchatka Peninsula (Project Rickrack). When combined, the Japan and Alaska-based missions provided complete coverage of the Soviet Union's entire Pacific littoral.[10]

In the late 1940s, the United States Air Forces in Europe, the major American air command on the continent, also acquired a reconnaissance capability. The operative unit was the 7499th Support Group stationed at Wiesbaden Air Base, Germany. Initially, the 7499th had only a few RB–17s jury-rigged with rudimentary electronic intercept equipment, but over the next decade the unit received RC–54s, RC–97s, and variants of the RB–57. These aircraft, like SAC's England-based RB–29s, patrolled the Baltic Sea and the East German–West German and Czech–West German borders. Other 7499th missions flew the length of the Adriatic Sea to sample electronic signals from Yugoslavia and Albania. By the end of the 1950s, the unit used Athens, Greece, as a deployment base for missions in the Mediterranean Sea and Incirlik Air Base, Turkey, for operations in the Black Sea. Most of the aircraft were outfitted with electronic intercept suites, but one of the RC–97s carried aloft the largest optical sensor used in American airborne reconnaissance, the 240-inch focal length Pie Face oblique camera. Pie Face could peer across international borders and gain useful information to a distance of about seventy miles in good weather.[11]

In the early 1950s, SAC modified a number of B–50s into RB–50s with the addition of electronic intercept equipment. With a much greater range than the RB–29 and equipped for inflight refueling, these aircraft pushed reconnaissance coverage still further afield. The 91st SRS's RB–50s patrolled the entire length of the Soviet Far East coastline and recovered in Alaska after fifteen hours in the air. Half a world away, SAC's RB–50s based in England ventured around Norway's North Cape and into the Barents Sea to sample the electronic environment of the Kola Peninsula and the great Soviet naval complex at Murmansk, and further still into the Arctic on missions that lasted as long as thirty hours. Far to the south, SAC RB–29s and RB–50s, temporarily deployed to Dhahran, Saudi Arabia, flew over the Black Sea monitoring the Crimean Peninsula and Soviet Armenia.[12]

In about 1953, RB–47s, ultimately numbering approximately thirty-three aircraft, began joining the inventory, and Air Force reconnaissance truly entered the jet age. The RB–47s were initially divided between SAC's 26th Strategic Reconnaissance Wing (SRW) at Lockbourne Air Force Base, Ohio, and SAC's 55th SRW at Forbes Air Force Base, Kansas. After the 26th SRW deactivated in 1958, the 55th SRW inherited the entire fleet. Powered by six jet engines and equipped for inflight refueling, the RB–47s routinely flew sixteen hour missions that spanned distances in excess of seven thousand miles. From bases in England and Japan, the new aircraft supplemented the Asian and European coverage of the older RB–50s. From bases in Alaska and Greenland, they brought routine coverage to the Kara Sea and the Laptev Sea, the most inaccessible portions of the Soviet Arctic coastline. Thus, by the middle to late 1950s, if not sooner, Air Force reconnaissance aircraft patrolled most of the Sino-Soviet bloc's periphery. Only that portion from eastern Iran to the South China Sea, areas off-limits for political reasons, escaped coverage.[13]

Yet both the RB–50 and the RB–47 had deficiencies that limited their reconnaissance role. The RB–50 was slow, making it vulnerable to hostile fighters and limiting its range despite inflight refueling. The RB–47 had only three intercept positions, and its cramped, almost claustrophobic, interior offered few creature comforts, aggravating crew fatigue in long missions. The search in the late 1950s for a more suitable aircraft quickly focused on the new KC–135 jet tanker, but the SAC commander, Gen. Thomas Power, balked at the idea. Although a strong supporter of reconnaissance and intelligence, he refused to release any of the aircraft from their tanker roles, but he promised to do so as soon as he could. Power's decision led to a renewed search and the selection of the turboprop C–130 transport. RC–130s began entering the inventory in 1958; by 1961 they had replaced the RB–50s in both the Far East and Europe. The RC–130 did not, however, replace the RB–47, owing to deficiencies in altitude, range, and speed. Table 1 shows the basing and operating areas for Air Force reconnaissance aircraft patrolling the Sino-Soviet bloc periphery during the late 1950s.[14]

TABLE 1
Air Force Peripheral Reconnaissance Missions, Late 1950s*

Base	Mission Aircraft	Area of Operation
RAF Brize Norton, England	RB–47	Barents Sea, Baltic Sea, West Germany
Yokota AB, Japan	RB–50, RB–47, RB–57	Yellow Sea, South China Sea, East China Sea, Sea of Japan, Sea of Okhotsk, North Pacific Ocean
Athens, Greece	RC–97, RB–50	Mediterranean Sea

Incirlik AB, Turkey	RC–97, RB–47	Black Sea
Thule AB, Greenland	RB–47	Kara Sea, Laptev Sea
Eielson AFB, Alaska	RB–47	East Siberian Sea, Bering Sea, North Pacific Ocean
Wiesbaden and Rhein Main ABs, Germany	RC–130, RC–97, RC–54, RB–57	Baltic Sea, West Germany, Adriatic Sea
Clark AB, Philippines	RB–47	Unknown

*Compiled from multiple sources.

General Power kept his word, and the first RC–135s entered the inventory in 1961. Afterward, however, problems encountered in sensor development delayed the subsequent delivery until 1965; not until the early 1970s did the Air Force have a full complement of this aircraft. All were assigned to SAC's 55th SRW, now stationed at Offutt Air Force Base, Nebraska. Like the RB–47s, the RC–135s flew peripheral missions from bases in Alaska, England, the Far East, and the Mediterranean. Its spacious interior accommodated relief crews and rest facilities, thereby easing the crew fatigue problem; its 500 mph speed made it less vulnerable to hostile fighters; and an inflight refueling capability allowed missions longer than twenty hours. Sufficient RC–135s were in the inventory to completely phase the RB–47s out in 1967 and the RC–130s out of their peripheral reconnaissance roles in 1974. By then, however, some RC–130s had secured a role in a covert reconnaissance mission that would extend their operational lives until the end of the Cold War.[15]

In addition to patrolling various coastlines and borders, the RC–135s inherited from RB–47s the responsibility for monitoring the Soviet long-range missile program, in particular intercontinental ballistic missile development. Special versions of the RB–47, the ERB–47 Tell Two, collected valuable information on Soviet missile testing during the late 1950s by monitoring electronic emissions from launch complexes located in what is now Kazakhstan. These aircraft operated from Incirlik Air Base, Turkey, and flew routes in Turkish and Iranian air space until Ankara canceled basing rights in 1966. In the early 1960s, two of the ERB–47s moved to Shemya, a tiny, barren island near the western extremity of the Aleutian chain, to record data generated by the reentry of missile warheads into the atmosphere. Unfortunately, the Shemya-based ERB–47s did not prove to be particularly adept at this mission.[16]

The few RC–135s outfitted for missile monitoring also called Shemya home, but the mission was almost nomadic. Depending on the type of missile being tested and the launch site, the warhead could splash down anywhere in the broad ocean area (BOA) along an arc extending from the North Pacific near the Khamchatka Peninsula to the equator southwest of Hawaii.

Fortunately, the Soviets always published the planned splashdown point, along with a warning for ships and planes to avoid the area, several weeks before the launch. This allowed the RC–135s plenty of time to deploy, if necessary, to one of several alternate bases—Hawaii, Guam, Wake Island, or Johnson Island—to await the launch.[17]

When other sources detected an imminent launch, the RC–135s got airborne in time to establish an orbit near the splashdown point. As the warhead neared reentry into the atmosphere, the aircraft began collecting data, using a variety of sensors. The collection continued until splashdown. In any given year, these aircraft successfully collected data regarding more than half of the Soviet missiles fired into the Pacific BOA. Some tests were not monitored because the tasking to do so was not ordered or launch notifications came too late.[18]

The aircraft discussed thus far had large or relatively large crews, ranging from as few as six in the RB–47 to as many as thirty in the RC–135. However, "mini-manned" aircraft outfitted with automatic collection systems allowed them to get by with only a pilot, or at most a pilot and a systems operator. These included the RB–57, the U–2, and the SR–71, the latter two of particular note. In fact, the U–2, whose Air Force service spans the period from 1957 to the present day, is arguably the most successful reconnaissance aircraft in the nation's history.[19]

At one time or another, Air Force U–2s used their 70,000-foot altitude and 10-hour endurance to perform a variety of missions. They ferreted out the Soviet attempt to install offensive missiles in Cuba (1962), confirmed the existence of Soviet military installations in Somalia (1976), assisted another African nation in its war against insurgents, patrolled the tense border between Yemen and Saudi Arabia (1980), monitored North Korea (1976–1990), flew a wide variety of missions during the American military involvement in Southeast Asia (1965–1975), and operated over Western Europe (1976–1990). Since 1974, U–2s have flown photoreconnaissance missions over the Sinai Peninsula and the Golan Heights to police the cease-fire that ended the 1973 Middle East war. The policing required the complete cooperation of the former belligerents—Israel, Egypt, and Syria—all of whom received copies of the imagery. Still other U–2s outfitted with special filters flew the globe through 360 degrees of longitude, virtually pole to pole, collecting radioactive debris hurled aloft by foreign nuclear tests.[20]

The SR-71 Blackbird, the other mini-manned aircraft of note, was the most glamorous aircraft of the time, indeed, probably of all times. Designed to replace the U–2 as a manned penetrator of heavily defended airspace, it relied on its 2,200 mph speed and 80,000-foot operational altitude to escape detection. It was also the first American aircraft designed and built from the ground up specifically to conduct reconnaissance, rather than being an adaptation of an existing airframe. SAC's 9th SRW at Beale Air Force Base, California, began receiving SR–71s in 1965; building up the inventory and crew training occupied the wing for the next two years. Deployed to Kadena Air Base, Okinawa, in 1968, the SR–71 began overflying North Vietnam, a mission that continued regularly until the 1973 American military withdrawal, and less often afterward. During the 1973 Middle East War, SR–71s operating from the continental United States overflew the war zone on photographic missions that exceeded ten hours in length and required six inflight refuelings per sortie. In 1974, SR–71s assumed part of the Cuban reconnaissance mission and continued in this effort until surveillance of the island ended in the late 1980s. In 1987, a single SR–71 surveyed the entire length of the Persian Gulf to gauge the threat that Iran posed to oil tankers plying those waters. The aircraft also conducted operations against North Korea and Central America in the 1980s, but specific information on those missions is lacking.[21]

The overwhelming majority of Air Force reconnaissance missions during the Cold War skirted the Sino-Soviet bloc periphery. But long-range oblique cameras could peer in only a limited distance, and under ideal conditions, the coverage against line-of-sight electronic transmissions was perhaps three hundred miles. Therefore, most territory lay beyond the range of peripheral missions, a severe limitation in the days before reconnaissance satellites. As a result of the intensification of the Cold War following the December 1950 Chinese intervention in Korea, the United States took the extraordinary step of flying a number of reconnaissance missions *over* the Soviet Union, years before the U–2 entered that airspace.

Before discussing those missions, a word of caution. Even though the popular literature in recent years has carried a number of articles about Air Force overflights of the Soviet Union in the early 1950s, they rely mostly on the recollections of those who flew or were associated with the missions. Some accounts ring true, but some do not. With that in mind, the following is the author's best estimate of what took place, based on familiarity with the individuals relating the incidents, the competence of the writers involved, and the few pieces of hard evidence found in various archives and repositories. The paucity of hard evidence, testament to the small circle of people privy to these missions, has led some critics to charge that the overflights were rogue operations authorized by Gen. Curtis LeMay, the SAC commander at the time, possibly in an attempt to trigger World War III. In fact, these missions were ordered by higher authority, and LeMay was merely carrying out orders.[22]

Planning for the first overflight of the Soviet Union, targeting the Chukotski Peninsula, began in early 1951, but the mission never transpired. The aircraft, a B–47 modified to carry cameras in its bomb bay, burned on the ramp at Eielson Air Force Base, Alaska, in September 1951, the day preceding the mission. The first successful overflight, also targeting the Chukotski Peninsula and piloted by Col. Don Hillman, occurred almost exactly one year later. In April 1954, a second mission, flown by an RB–47 piloted by Capt.

Harold Austin, overflew the Kola Peninsula and the extreme northwest portion of the Soviet Union. Both missions flew in the daytime and photographed air bases to determine if they could support a bomber offensive against the United States.[23]

At about the same time, RB–45s based in England penetrated the western portions of the Soviet Union almost to Moscow, collecting radar intelligence against potential targets (Project Ball Park). The collected radar images were used to improve the target folders of SAC bomber crews who, until then, had only sketchy ideas of how their targets would appear on radar. These missions flew at night to minimize the threat posed by Soviet air defense, which at the time had neither radar-equipped interceptors nor surface-to-air missiles.[24]

Other overflights used specially equipped fighter aircraft for shallow penetrations of Soviet air space. One such mission used F–86s based in Japan to penetrate the Soviet maritime provinces. Another used F–100s against the Caucasus region from a base in Turkey (Project Slick Chick). Both missions, flown in the daytime to collect photographic intelligence, relied on surprise, speed, and the minimal amount of time in hostile airspace to escape destruction. Still other missions used RB–47s based at Thule, Greenland, to photomap Novaya Zemlya, a large Soviet island in the Arctic Ocean; the Yenisey River valley; and other areas of the northern Soviet Union in the spring of 1956 (Project Home Run). A final mission took RB–57s over Vladivostok in the Soviet Far East in December 1956, after which all Air Force overflights ceased.[25]

Thereafter, the overflight mission fell entirely to the CIA's U–2 program and continued until May 1960 when a missile downed Francis Gary Powers' aircraft deep inside the Soviet Union. The shootdown and President Dwight Eisenhower's promise that no further overflights would occur ended the penetration of Soviet air space by manned reconnaissance aircraft. The loss of intelligence was short-lived, however. Earth-orbiting reconnaissance satellites became operational in August 1960, obviating the need for a manned penetrator by performing the overflight mission without risking the life of a human pilot and without diplomatic repercussions.[26]

By the 1980s, the Air Force strategic peripheral reconnaissance mission involved three types of aircraft, two main operating bases (MOBs), and a number of operating locations (OLs). The MOBs were Beale, home of the 9th SRW (U–2s and SR–71s), and Offutt, home of the 55th SRW (RC–135s). The OLs were located wherever necessary to provide the optimum coverage of the target nations. With the exception of a small number of missions against Cuba and Central America, conducted from Beale, and a few RC–135 missions in the same area, conducted from Offutt, all operational flying took place from the OLs.[27] Table 2 shows the basing and operating areas in the 1980s.

TABLE 2
Air Force Peripheral Reconnaissance Missions, 1980s

Base	Mission Aircraft	Area of Operation
Primary Location:		
Offutt AFB, Nebr.	RC–135	Caribbean Sea
Beale AFB, Calif.	U–2, SR–71	Caribbean Sea, Central America
Secondary Location:		
RAF Mildenhall, England	RC–135, U–2, SR–71	Baltic Sea, Barents Sea, West Germany
Athens, Greece	RC–135	Mediterranean Sea
Cyprus	U–2	Golan Heights, Sinai Peninsula
Kadena AB, Okinawa	RC–135, SR–71	South China Sea, Yellow Sea, Sea of Japan, Sea of Okhotsk, North Pacific
Osan AB, Korea	U–2	South Korea, Yellow Sea, Sea of Japan
Eielson AFB, Alaska	RC–135	East Siberian Sea, Laptev Sea, Kara Sea, North Pacific Ocean
Shemya Island	RC–135	Pacific BOA
Hickham AFB, Hawaii	RC–135	Pacific BOA
Wake Island	RC–135	Pacific BOA
Andersen AB, Guam	RC–135	Pacific BOA
Johnson Island	RC–135	Pacific BOA
Diego Garcia	SR–71, U–2	Persian Gulf, Arabian Sea
Patrick AFB, Florida	U–2	Caribbean Sea, Central America

All the missions and aircraft discussed heretofore, be they peripheral or overflight, used aircraft that operated overtly with little, if any, attempt to hide the camera ports, antennas, and dielectric domes associated with the various on-board sensors. There was, however, one reconnaissance unit that, while technically not penetrating denied airspace, had to operate more discretely. The unit's aircraft filed flight plans, received the usual clearances from air traffic controlling agencies, and in general, conducted themselves as would any other aircraft. Only the actual mission was concealed by installing sensors in such a way that their presence could not be confirmed without an internal search of the aircraft. This mission was said to be covert.[28]

The 7405th Support Squadron (SUPRON), a part of the 7499th Support Group mentioned earlier, based at Wiesbaden Air Base, Germany, until 1975, and later at Rhein Main Air Base, flew the most successful covert Air Force reconnaissance mission of the Cold War. Beginning in about 1952, the 7405th SUPRON daily patrolled the twenty-mile-wide air corridors leading from West Germany to Berlin and the forty miles in diameter control zone surrounding the city (Project Rain Drop). Technically, there was no need to resort to covertly configured aircraft because the four-power agreement governing the use of the air corridors, drafted jointly by the Soviet Union, the United States, Great Britain, and France, did not prohibit any specific types of aircraft from using that airspace. Moscow's interpretation, however, was that the three western allies enjoyed aerial access to Berlin only to logistically support their military garrisons stationed there. Rather than make an issue of it, the United States elected to use cargo aircraft outfitted with covertly mounted sensors.[29]

Over the years, the 7405th SUPRON's covert aircraft—RB–47s, RB–29s, RC–97s, RC–130s, etc.—collected optical imagery using a variety of cameras with focal lengths ranging from 6 inches for vertical photography to 240 inches for long-range oblique photography, as well as thermal imagery from vertical and forward-looking infrared systems. In addition, one of the RC–97s and one of the later RC–130s had electronic intercept suites. Sliding external panels covered the camera ports and all antennas, and dielectric domes were fully retractable.[30]

Still, for any number of reasons, the Soviets and East Germans knew perfectly well what was going on. Of all the aircraft transiting the air corridors, only those of the 7405th SUPRON requested their own navigation, followed routes different from other aircraft, routinely flew 500 feet off their assigned altitudes, and traced random flight patterns while in the Berlin Control Zone. Berlin Air Traffic Control Center, the American-operated radar facility that monitored and directed air traffic in the corridors and control zone, allowed this freedom of action because it was privy to the mission. Further, the spectacle of transport aircraft landing at Berlin Tempelhof Airfield, and the crew (sometimes numbering upward of fifteen) having lunch and then returning to West Germany, with no effort to either onload or offload passengers or cargo, strained the cover story beyond any credibility. Moreover, ground-based photography taken through telephoto lenses clearly showed open camera doors up to 10,000 feet, the highest altitude allowed in the corridors and control zone.[31]

Why did the Soviets, who had a veto on any aircraft entering the corridors, allow the mission to operate even though it was hidden by only the barest of fig leaves? There is no way of knowing for certain, but several reasons suggest themselves. Supposedly covert flights spared the Soviets the insult of an overt reconnaissance mission operating in airspace over which they had control. East Germany, not the Soviet Union, was under observation, which understandably lessened nationalistic sensitivities. The Kremlin must have known that the United States would not pass up the chance to conduct aerial reconnaissance over the most heavily militarized section of the Warsaw Pact. Having positively identified the mission aircraft, they could, to a degree, control what was and was not seen. There was also tacit reciprocity, an unspoken understanding that by allowing the 7405th SUPRON to operate without interference, the Soviets could carry out similar missions using covertly configured aircraft, mainly civilian airliners, to venture into the West. Finally, there was probably an understanding by Moscow that allowing corridor reconnaissance was a signal that it had nothing to hide, whereas denying that right would alert the West and raise tensions. Whatever the reasoning, the 7405th SUPRON's covert missions flew for almost four decades without a serious incident, giving the corridor missions the advantage of being a low-risk endeavor that returned intelligence of great value.

Although neither the Berlin air corridor missions nor the Air Force overflights of the Soviet Union in the 1950s resulted in any losses to hostile action, other missions and aircraft were not so fortunate. Trouble with Moscow over peripheral reconnaissance began in 1947 when an RB–29 flew perilously close to the shoreline of the Chukotski Peninsula. Fortunately, the incident was resolved via diplomatic exchanges; unfortunately, that civility did not long endure. Beginning in 1950 and continuing on through the 1960s, the Cold War was littered with incidents involving hostile action taken against reconnaissance aircraft.[32]

Those incidents illustrated the delicate balance inherent in peacetime reconnaissance and the potential consequences should either side upset that balance. With the exception of the U–2 missions that policed the cease-fire that ended the 1973 Middle East War, the United States never negotiated with any target nation the ground rules governing peacetime reconnaissance. Instead, the ground rules evolved through a process known as mission assessment, performed at various levels within the military and federal government. The assessment took into account a target nation's sensitivity to intelligence operations in general, the state of its relations with the United States, its shootdown capability, and whether it flew reconnaissance missions of its own (tacit reciprocity). In all cases, whether or not an aircraft flew a particular route on a particular day was a judgment call that balanced the anticipated intelligence gain against the potential threat to the aircraft and its crew. No aircraft ventured into a high-threat area without the potential of gathering intelligence of great importance.

In the vast majority of the cases, mission assessment proved valid, but the capriciousness of the Sino-Soviet bloc reactions, which sometimes seemed to border on the mindless, made it less than foolproof. Peacetime reconnaissance, therefore, despite the precautions, remained one of the more hazardous missions of the Cold War. Fighters intercepted American reconnaissance aircraft on numerous occasions and attacked them at least thirty-three times, resulting in the loss of eleven aircraft. Surface-to-air missiles destroyed two U–2s, and although it cannot be proven, three other aircraft disappeared under circumstances that suggest that they fell victim to hostile action. Three of the downed aircraft—the U–2 of Francis Gary Powers (1960), an RC–130 over Soviet Armenia (1958), and a U–2 over Cuba (1962)—had violated international boundaries, but as far as is known the other lost aircraft were operating in international airspace, well clear of any reasonable claims of sovereignty.[33] Table 3, which includes aircraft operated by the Navy and the CIA as well as by the Air Force, summarizes those losses.

TABLE 3
American Reconnaissance Aircraft Lost on Operational Missions, 1946–1991*

			Number of Men			
Mission Date	Acft. Type	Where Lost	On Board	Recov. Alive	Recov. Dead	Not Recov.
Apr 8, 1950	PB4	Baltic Sea	10			10
Nov 6, 1951	P2V	Sea of Japan	10			10
Jun 13, 1952	RB–29	Sea of Japan	13			13
Oct 7, 1952	RB–29	Kurile Islands	8			8
Jul 29, 1953	RB–50	Sea of Japan	17	1	2	14
Sep 4, 1954	P2V	Siberian Coast	10	9		1
Nov 7, 1954	RB–29	Sea of Japan	11	10	1	
Apr 17, 1955	RB–47	North Pacific	3			3
Aug 22, 1956	P4M	Formosa Straits	20		4	16
Sep 10, 1956	RB–50	Sea of Japan	16			16
Sep 2, 1958	RC–130	Armenia	17		4	13
May 1, 1960	U–2	USSR	1	1		
Jul 2, 1960	RB–47	Barents Sea	6	2	1	3
Oct 26, 1962	U–2	Cuba	1		1	
Dec 14, 1965	RB–57	Black Sea	2			2
Apr 15, 1969	RC–121	East China Sea	31	0	2	29
Total			176	23	15	138

*Sources: FAX, Dir, Log JCS to AF/IN, Sep 19, 1992; MFR, Subj: Incidents Involving United States Reconnaissance Aircraft, 1950–1966, Feb 27, 1967, copy furnished by HQUSAF/INX.

The shootdowns ceased with the arrival of détente between the United States and the Soviet Union in the early 1970s and a greater tolerance by most nations of aerial reconnaissance, although a few unsettling incidents still occurred. Then in the mid-1980s, accelerating economic decline and growing social unrest prompted Soviet Premier Mikhail Gorbachev to begin dismantling the elaborate network of state controls that for two generations had directed and stifled the nation and its citizens. The deepening crisis also forced a dramatic reduction in Soviet military spending and an equally dramatic retraction of Soviet power, thereby realizing the main American objective of the Cold War. Over the next several years, the Soviet Union withdrew its military forces from the satellite nations of Central Europe, ended or drastically reduced assistance to friendly nations and groups, permitted the reunification of Germany, dissolved the Warsaw Pact, and allowed the restive ethic minorities around the Soviet periphery to become fourteen separate and independent nations. Then, in 1991, the Soviet Union dissolved, and its remnant became Russia, thereby placing a finishing touch to some of the most memorable events of this century.

The complete collapse of Soviet power and the end of the Cold War meant that the United States could also trim its defense budget, which had soared during the presidency of Ronald Reagan. Air Force reconnaissance faced particular reductions. Left without a mission after German reunification, the covertly configured RC–130s that had plied the Berlin air corridors stood down permanently, and the 7405th SUPRON disbanded. The RC–135's fleet, already thin, got thinner when some of the aircraft in the active fleet were placed in backup status. Neither move came as a surprise.[34]

Then came the real shock: the retirement of the entire SR–71 fleet. In fact, the SR–71 had operated under a cloud for virtually its entire operational life. The success of reconnaissance satellites robbed the aircraft of its primary mission, that of penetrating the heavily defended airspace of the Sino-Soviet bloc. To be sure, SR–71s flew numerous peripheral missions and occasionally overflew other, less well defended countries. But RC–135s and U–2s could have performed the bulk of these missions, making it increasingly difficult to justify the SR–71's sky-high operating costs estimated in the $70,000 per flying-hour range. It still took the demise of the Soviet Union to end the aircraft's career.[35]

Nonetheless, the aircraft's phenomenal performance, unequaled by any reconnaissance aircraft to this day, prompted the intelligence community to hedge its bet. Six SR–71s were placed in flyable storage, along with six sets of sensors and a six-month supply of spare parts and fuel. The Air Force also tagged the records of all personnel associated with the aircraft so that they could be recalled to those duties quickly if needed. These actions theoretically gave the Air Force the ability to conduct limited SR–71 operations within three months of notification, although skeptics warned that even this modest capability would steadily erode as idle equipment deteriorated and personnel progressively lost proficiency in their former skills, or left the service. The warnings proved correct, and within a few years, the SR–71s were completely out of the inventory with no plans to recall them.[36]

Conversely, the venerable U–2 survived the first wave of post–Cold War cuts in a numerically commanding position, and for good reason. Its operational altitude gave its sensors excellent line-of-sight capability, its endurance allowed it to reach distant targets and loiter once there, and it could overfly less well defended countries. Financial considerations also entered the decision-making process. "It was cheap," observed Brig. Gen. Raymond Haupt, a former commander of the 100th SRW. Another retired officer, Maj. Richard Davies, recalled an expenditure in the 1970s of only $1,500 per flying hour, a bargain even when adjusted for subsequent inflation. In 1991, the Air Force strategic reconnaissance fleet had only RC–135s and U–2s in its inventory, the latter constituting the bulk of the inventory.[37]

What did Air Force reconnaissance accomplish during the Cold War that justified the millions of dollars spent, the international tensions generated, and the lives lost? Admittedly, these missions could claim few intelligence coups, such as the discovery of offensive Soviet missiles in Cuba in October 1962. Their contribution to American security must be judged by the quantity and quality of the data gathered, not by the hours flown, the percentage of on-time takeoffs, on-station reliability, or publicly acclaimed events. Rather, they collected countless shards of information worldwide, much of it unavailable from any other source. When those bits and pieces of evidence were combined with information gained from other sources, the intelligence community could create and continually update databases on any number of locales, weapon systems, command and control structures, deployment patterns, and decision-making networks. In other words, airborne reconnaissance greatly assisted the intelligence community in keeping a finger on the pulse of internal events within potentially hostile nations worldwide.

Although earth-orbiting reconnaissance satellites have reduced the value of airborne reconnaissance, aircraft retain one important advantage. Satellites are remarkable instruments whose prying eyes and ears have made ours a safer world, but they cannot escape Kepler's laws of orbital physics. A satellite's orbit once established remains fixed, making its movement as predictable as the rising and setting of the sun. Conversely, aircraft are responsive vehicles that can arrive at certain locations at certain times and alter their positions and altitudes as needed. That flexibility and the multispectral collection capability both justified their mission during the Cold War and insures that they will continue patrolling the world's trouble spots until technological advances render them obsolete. That day will surely come, but it is probably well in the future.

Notes

1. Thomas F. Troy, *Donovan and the CIA: A History of the Establishment of the Central Intelligence Agency* (New York: Aletheia Books, 1981), pp. 9, 18; Harry Howe Ransom, *The Intelligence Establishment* (Cambridge: Harvard University Press, 1970), p. 56.

2. *Ibid.*; Oral Intvw, Lt. Gen. Robert Breitweiser by James C. Hasdorff and Lt. Col. John N. Dick, Jr., Dec 4–5, 1975, Air Force History Support Office (AFHSO),

K239.0512–877; "USAFSS: Thirty Years of Cryptologic Support, 1948–1978" (unpublished manuscript), Air Intelligence Agency History Office (AIA/HO), n.d., chap. 1, pp. 8, 18.

3. Speech, Maj. Gen. George C. McDonald to the Air War College, "U.S. Air Force Intelligence prior to and during World War II and Today," Nov 12, 1947, pp. 1–2, AFHSO K239.716246–6.

4. Scott D. Breckenridge, *The CIA and the U.S. Intelligence System* (London: Westview Press, 1986), pp. 7–10; Ransom, *Intelligence Establishment*, pp. 85–86. Congress enacted the National Security Act of 1947 as Public Law 253, 80th Congress, Jul 26, 1947.

5. Troy, *Donovan and the CIA*, pp. 78–84.

6. "Lend Lease Aid to Soviet Electronics," *Scientific Intelligence Review*, Apr 1946, AFHSO 170.2224–4; *Webster's New Geographical Dictionary* (Springfield, Mass.: Merriam-Webster Inc., 1984), pp. 210, 257, 755, 1247, 1251.

7. 55th Strategic Reconnaissance Wing (SRW) History, Apr–Jun 1966, p. 6.

8. An aircraft's alphabetic prefix denotes its mission. A B–29 was a bomber, but when converted into a reconnaissance role it became an RB–29. A KC–135 was an aerial tanker until sensors were added when it became an RC–135. The "U" in the U–2 signified a "utility" aircraft, an early attempt to disguise its mission. The "SR" of the SR–71 meant "strategic reconnaissance."

9. Ken White, *World in Peril: The Origin, Mission, and Findings of the 46th/72d Strategic Reconnaissance Squadron* (Elkhart, Ind.: private printing, 1992), pp. 31, 46–47; Memo to the Chief of the Air Intelligence Requirements Division, Subj: Coordinating Photo and Electronic Intelligence Activities, Dec 11, 1947, Folder 2–66 to 2–699, Entry 214 (Top Secret Cable and Controls Division), Record Group (RG) 341 (Records of Headquarters, United States Air Force), National Archives and Records Administration (NARA); Oral Intvw, Col. Maynard White, Nov 16, 1992, the Vance O. Mitchell Collection, AFHSO; Memo for Record, Subj: Photographic Coverage—Chukotskie Peninsula Air Fields, Undated, Folder 2–1500 to 2–1599 (May 1948), Entry 214, RG 341, NARA; *SAC Intelligence Digest*, May 1984, Tab Q, Mitchell Collection, AFHSO.

10. Record and Routing Sheet, DOIN to the Director of Training and Requirements, Subj: A O E R A, May 26, 1948, Decimal 320, Entry 213, RG 341, NARA; H O S O 1-1, p. 47, Strategic Air Command History Office (SAC/HO); Survey of Project Rickrack, n.d., Operations-Rekon K–30 Camera Folder, SAC/HO; Ltr, Alaskan Air Command Commander (Armstrong) to the Air Force Chief of Staff (Vandenberg), Subj: Photographic Coverage of Northeastern Siberia, Nov 4, 1949, Item 2–1097, Entry 214, RG 341, NARA; Record and Routing Sheet, Operations Division of the Air Intelligence Requirements Division, Subj: P C O T F E W K–3, 1–1 C, Mar 7, 1950, Item 1–1879, Entry 214, RG 341, NARA.

11. H O S R O, 1–1, pp. 47–48; Record and Routing Sheet, DOIN Executive to the Directorate of Inspection Services, Subj: Annual Tactical Inspection, 7499th Composite Squadron, APO 633, Jul 11, 1951, Item 2–22109, Entry 214, RG 341, NARA; Memo for Record, Untitled, Oct 28, 1952, Item 2–5686, Entry 214, RG 341, NARA; Ltr, Deputy USAFE/A–2 to DOIN, Subj: P F P, Mar 6, 1953, Item 3–901, Entry 214, RG 341, NARA; Ltr, DOIN to United States Air Force Group, Ankara, Turkey, Sep 8, 1953, Item 3–3353, Entry 214, RG 341, NARA: U S E O M A S I P (L S A C), Section B, Nov 9, 1963, TSC 745–63 Folder, Box 1, Accession (ACC) 66A–3382, RG 341, Washington National Records Center (WNRC).

12. 91st Reconnaissance Squadron History, Oct 1951, Overlay 1 and tabs Q, U, and V, SAC/HO; H O R S O, 1–1, p. 52; Record and Routing Sheet, Assistant for Intelligence Production to the Chief of the Intelligence Division, Subj: R F R O F J L, Jan 9, 1952, Item 2–22137, Entry 214, RG 341, NARA; Memo for the Director of Operations, Subj: F J L E R F O, Apr 23, 1953, Item 3–1740, Entry 214, RG 341, NARA: Record and Routing Sheet, Directorate of Intelligence to the Directorate of Operations, Subj: I R F E R, Dec

10, 1952, Item 3–4244, Entry 214, RG 341, NARA.

13. Oral Intvw, Col. Burton Barrett, Dec 4, 1992, p. 10, Mitchell Collection, AFHSO; 55th SRW History, Apr–Jun 1965, pp. 5, 7, and Jul–Dec 1966, p. 17, AFHSO K–WG–55–HI; Charles A. Ravenstein, *Air Force Combat Wings: Lineage and Honors, 1947–1977* (Washington, D.C: Office of Air Force History, 1984), pp. 47–48, 88–89.

14. Monograph, "H O C C O, FY 1, A H," p. 159–162, AIA/HO; Monograph, "A H O T U A S R P (A), 1–1," pp. 15–16, AIA/HO. General Power's attitude toward reconnaissance and intelligence was related to the author during a casual conversation with Maj. Gen. John Marks (USAF, Ret.).

15. 55th SRW History, Oct–Dec 1967, Chronology Section; S R H, J 1-J 1, Nov 7, 1973, Table 1, AFHRC HO–T–95–010.

16. Robert Hopkins, "The Tell Two Stratojets," *Air Enthusiast*, Vol. 41, pp. 18-21.

17. 6th SRW History, Jan–Jun 1988, pp. 29–30, AFHSO IRIS 1006767.

18. 6th SRW History, Jan–Mar 1975, Vol. I, p. 20, and Jan–Jun 1988, pp. 29–30; Foreign Technology Division History, Jul 1, 1972–Jun 30, 1973, Vol. I, p. 361 and Jul 1–Dec 31, 1976, pp. 23–24, AFHSO K341.01.

19. Thomas J. Doubek, ed., *Strategic Reconnaissance, 1956–1976: A History of the 4080th/100th SRW* (Dallas, Tex.: Taylor Publishing, 1967). p. 24. The U–2 first entered Air Force service with the SAC's 4080th SRW, Laughlin Air Force Base, Texas. In the 1960s, the unit's designation became the 100th SRW and it moved to Davis Monthan Air Force Base, Arizona. In 1976, the 100th deactivated and the U–2s moved to Beale Air Force Base, California to become part of the 9th SRW. The 9th SRW was also the parent unit of the SR–71.

20. 100th SRW History, Jan–Mar 31, 1975, pp 27–28, AFHSO K–WG– 100–HI; Ltr, Director of the Intelligence Community Staff to the Deputy Secretary of Defense, Subj: TR–1 Deployment to the UK, Nov 16, 1982, Folder 930007–930123, Box 1, ACC 85–0016, RG 340 (Office of the Secretary of the Air Force), WNRC; History of the United States Air Force in Europe, Calendar Year 1980, p. 11, AFHSO IRIS 1004339; H O S R O, F 1, p. 32. For an excellent general history of the U–2, see Chris Pocock, *Dragon Lady: The History of the U–2 Spyplane* (Asceola, Wis.: Motorbooks Co., 1989).

21. "S R H," Nov 7, 1973, Table 1; 9th SRW History, Oct–Dec 1974, Vol. I, pp. 81–82 and Jul–Dec 1987, pp. 59–60 and 79–80; Oral Intvw, Brig. Gen. Harold Confer, Feb 8, 1996, Mitchell Collection, AFHSO; "Blackbird Timeline of Events," n.d., 9th SRW History Office.

22. For an example of someone who believes that General LeMay ordered the overflights on his own authority, see Richard Rhoades, *Dark Sun: The Making of the Hydrogen Bomb* (New York: Simon & Schuster, 1995), pp. 564–566. For a glimpse at how tightly President Dwight Eisenhower controlled information on sensitive operations see Karl G. Harr "Eisenhower's Approach to National Security Decision Making," in Kenneth W. Thompson, ed., *The Eisenhower Presidency: Eleven Intimate Perspectives of Dwight D. Eisenhower*, Vol. III of *Portraits of American Presidents* (Lanham, Md.: University Press of America, 1984), p. 97. For compelling evidence that LeMay was ordered to make the overflights, see Memo, Secretary of Defense (Lovett) to Chairman of the Joint Chiefs of Staff (Bradley), Subj: Reconnaissance Requirements, Aug 12, 1952, Package 129, ACC 810-60, RG 342 (Records of the Major Air Commands), NARA.

23. Record and Routing Sheet, Director of Requirements, DCS/D to the Director of Intelligence, DCS/O, Subj: Intelligence Requirements for B–47s for Special Reconnaissance Missions, Jan 4, 1951, Folder 2–17301 to 2–17399, Entry 214, RG 341, NARA; Oral Intvw, Brig. Gen. Richard Neeley, Mar 16, 1996, pp. 4–6, Mitchell Collection, AFHSO; Harold Austin, "A Cold War Overflight of the USSR," *Daedalus Flyer*, Spring 1995, pp. 15–19; Donald E. Hillman and R. Cargill Hall, "Overflight: Strategic Reconnaissance of the USSR," *Air Power History*, Spring 1996, pp. 35–38.

24. Oral Intvw, Maj. Gen. Jim Enney, Jan 10, 1997, pp. 1–2, Mitchell Collection, AFHSO.

25. R. Cargill Hall, "Cold War Overflights: Military Reconnaissance Missions over Russia Before the U–2," *Colloquy*, Apr 1997, pp. 12–30.

26. Two recently released studies have shed considerable light on the agency's U–2 and early satellite programs. See Gregory Pedlow and Donald E. Welzenbach, *The CIA and the U–2 Program*, 1954–1974 (Washington, D.C.: Central Intelligence Agency, 1998), and Kevin C. Ruffner, ed., *Corona: America's First Satellite Program* (Washington, D.C: Central Intelligence Agency, 1995). Both studies have material deleted for security reasons.

27. 9th SRW History, Oct 1980–Mar 1981, p. 66; 55th SRW History, Jan–Jun 1979, Vol. I, p. 58.

28. Memo, AFOIN–1A2 to the Director of Requirements, DCS/D, Subj: R F S R C S, May 5, 1955, Item 5–1207, Entry 214, RG 341, NARA.

29. U R O M A S I P (L S A C), Section B. Other nicknames associated over the years with the 7405th's covert mission included "Bold Bantam," "Ocean Gem," "Flintstone," "Eager Beaver," "Creek Flea," and "Creek Flush." Many of the insights into the Berlin corridor mission are based on the author's experience with the 7405th, which included six years as a crew member (1964–1967 and 1972–1975) and three years as the major air command staff officer responsible for the mission (1975–1978).

30. *Ibid.*; Ltr, Deputy USAF A–2 to DOIN, Subj: P F P, Mar 6, 1953, Item 3–901, Entry 214, RG 341, NARA; Record and Routing Sheet, AFOIN–A to the Directorate of Operations, DCS/O, Subj: R R, Apr 16, 1954, Item 4–935, Entry 214, RG 341, NARA; Detailed Photo Interpretation Report No. 60–5, Subj: N A, E G, Feb 1961, Folder 60–5, Box 5, ACC 69A–6201, WNRC.

31. Soviet–East German knowledge of the mission was confirmed by separate human intelligence sources during the author's tour as the program manager (1975–1978), as was the visibility of the camera ports in telephoto imagery. Enough information on the 7405th leaked out during its operational life for investigative reporters to come up with a fairly accurate assessment of its covert mission. See Dick van der Aart, *Aerial Espionage: Secret Intelligence Flights by East and West* (New York: Arco/Prentice Hall Press, 1985), pp. 13–15.

32. Soviet Note 261, Embassy of the Union of Soviet Socialist Republics, Jan 5, 1948, Folder 2–900 to 2–999, Entry 214, RG 341, NARA; Memo for Record, Problem: Limit on Offshore Distance for Reckon Flights in Pacific Area, n.d., Folder 2–1500 to 2–1599, Entry 214, RG 341, NARA.

33. Tables, "Incidents Reported between United States and Communist Nations," n.d., AFHSO K168.01; Ltr, Aerospace Studies Institute Historical Division to SAC/DIXH, Subj: Air Incidents, May 4, 1964, PE 120.2, SAC/HO.

34. E S C H, Jan 1–Dec 31, 1988, Vol. I, pp. 57–58, AIA/HO; Staff Summary Sheet, Subj: R–1 (R J) F S, May 9, 1986, Folder 86012–86071, Box 1, ACC 87–0013, RG 341, WNRC. Aircraft in backup status are maintained in flyable status but are not funded for fuel or crews. They are, however, rotated into and out of the active inventory to prevent their deterioration and provide a ready source of spare parts.

35. Confer Intvw, p. 10. The SR–71's operating costs were quoted to the author by Dr. Coy Cross, the 9th SRW historian.

36. Staff Summary Sheet, Subj: S–7 A C, Oct 10, 1990, Box 1, ACC 91–07, RG 340, WNRC.

37. Oral Intvw, Brig. Gen. Raymond Haupt, Mar 11, 1996, p. 10, Mitchell Collection, AFHSO; Oral Intvw, Maj. Richard Davies, Mar 21, 1996, pp. 12–13, Mitchell Collection, AFHSO; 9th SRW History, Jul–Dec 1991, Vol. 1, p. 18.

Keynote Address

Turning Points

Gen. John T. Chain, Jr., USAF (Ret.)

I was asked to give you my ideas about the major turning points in the fifty-year history of the United States Air Force. Since I am neither a historian nor have I been associated with the Air Force throughout the period, I decided I could not present a full picture from my viewpoint alone. So I contacted eleven retired general officers from different disciplines who served at different times, and asked them for their opinions. All responded quickly and insightfully, which was no surprise. What did surprise me was that, rather than identifying the same two or three major turning points and perhaps a couple from their personal experiences, most suggested more than four or five, with few duplications. No individual person was singled out, with one exception—Gen. Curtis E. LeMay.

First I would like to share with you some thoughts about my own career, then take up the factors cited by the twelve retired four-star generals, including me. Finally, I would like to make a few comments about what I believe was *the* major turning point in our history—the advent of nuclear weapons and the resulting national strategy.

Personal View

In reflecting on my own experience, I thought about what had caused me to make the Air Force a career in the first place, and why I remained. It was the men I worked for, more than any specific events, who were most influential—bosses who expressed confidence in me and communicated the sense that they cared about me as an individual.

Mr. McCarthy, my first civilian flight instructor, not only convinced me that I could fly, but that I could fly well. Capt. Tom Arnold, the 417th Tactical Fighter Squadron operations officer in my first squadron at Toul Rosiere, France, was tough but showed interest in me as an individual. Lt. Col. Chuck Horton, who was both my and Bob Oaks' squadron commander in Clovis, New Mexico, was a demanding but caring leader. As Gen. Al Schinz' aide when he was head of the Advisory Group in Vietnam, I saw how hard general officers worked and the amount of paperwork they had to process. When I was assigned to the Pentagon as a new major, I was surprised at the responsibility given to action officers, but I came to appreciate the long and diligent hours they put in. Many of those men cared deeply about the mission and the people—Col. George Tormone, Col. Robby Robinson, Gen. John Bray, Gen. Dick Ellis, and Gen. Lou Clay.

Some years afterward I was special assistant to Gen. Bob Dixon. He was an extremely bright person, yet I doubt anybody else could have succeeded using his management style. He taught me a great deal about the qualities to be expected of Air Force leaders, and he remains a good friend to this day. Later I worked for Air Force Secretary John Stetson, Gens. Charles Gabriel and Jerry O'Malley, and Secretary of State George Shultz. From all of them, I learned invaluable lessons.

There were a few misfits along the way, but not many. If they had appeared early in my career, I might have left quickly and gone back to law school. Although I spent two years in combat and had several command positions, those experiences made less of an impact than the strong and concerned leaders I worked for.

Air Force Turning Points

Let me now enumerate the turning points in Air Force history that were singled out by the twelve retired generals. Since the Air Force mission is to organize, train, equip, and fight, I put the responses into those four categories and then listed them in chronological order. It is fortunate that, instead of many catastrophic turning points, a number of events nudged the Air Force toward course corrections rather than dramatic changes in direction.

Organize

Obviously, the first major event of the last fifty years was the creation in 1947 of a separate Air Force. The new Air Force started off with a huge infrastructure, a hodgepodge of leftover war planes, and, I am told, an unprofessional force. However, the late 1940s saw the formation of the Strategic Air Command and an ensuing national strategy of massive retaliation that resulted in SAC's dominance through the 1950s and into the 1960s. In turn, tac air became a "little SAC," with F–100s, F–105s, and F–111s pulling nuclear alert. Since most of the training focused on the nuclear mission, tactical skills were lost. In Vietnam we would pay a price for that loss.

In 1956 a B–52 dropped a hydrogen bomb; subsequently the Air Force was given custody of nuclear weapons. In 1960 a decision paper that addressed the utility of military air transport in peace and war led to a special relationship between the Air Force and the airline industry. This latter development would prove invaluable to the Air Force in times of mobilization and deployment.

Social change was occurring as well. In 1970 the restriction that prohibited women from comprising more than two percent of the Air Force was removed. Legislation followed that required up to twenty percent of the force to be women. In the 1970s and 1980s the Total Force—that included active duty, guard, and reserve units—became a reality. The Air Force accomplished that integration much better than the other services. In the 1980s the Air Force began to adapt what is called modern management techniques, with a focus on quality matrix organizations and downsizing through restructuring.

In 1992 a momentous change came with the abolishment of SAC, TAC, and MAC, to be replaced by STRATCOM, ACC, and AMC. It will be several more years before we can fully assess the gains and losses of that reorganization. Also in 1992, Systems Command and Logistics Command merged. Today many generals are concerned that, while it may have saved dollars, the merger has created a less effective organization than one realized from two separate commands.

Train

Training is the second of our missions. Again, let me move through the major events and developments chronologically. Several generals and I identified the professionalism exemplified by Gen. Curtis LeMay as a significant influence on the direction taken by the Air Force. I was not then in the service but have been told that SAC, like the rest of the Air Force, lacked organization and discipline in the late 1940s and early 1950s. General LeMay upgraded the standards to create in SAC a superbly trained fighting force. LeMay's disciples spread throughout the Air Force, where they perpetuated those high standards of professionalism.

Gen. Cam Sweeny, for example, who came to TAC in the early 1960s, revolutionized our way of doing business. From squadron-level to centralized maintenance, or "communist maintenance" as it was called informally, a stringent stan-eval system was instituted. Predeployment briefings were mandated. I remember going with my squadron commander to TAC headquarters to brief the TAC vice commander on an upcoming deployment to Europe. To say that our casual approach was a disaster would be a gross understatement. The positive changes brought by General Sweeny were felt all the way to the line pilots. That same professionalism successfully reduced the Air Force accident rates that had been astronomically high in the 1940s and 1950s, and would have put the Air Force out of business had they continued.

In the 1960s Vietnam showed that tactics, techniques, and procedures in the fighter world needed a great deal of overhauling. Not until later in that war were the "aggressors" formed and dissimilar air combat maneuvering permitted. Air superiority came to be viewed in a holistic way; the recognition that surface-to-air missiles (SAMs) can limit flying operations meant that their suppression had to become part of achieving air superiority. Those expanded concepts were integrated into the training programs and led to capabilities such as Compass Call, Wild Weasel, and eventually the F–117.

The 1970s saw realistic training come into being, as exemplified by Red Flag and the other Flag series of exercises. A renewed emphasis on readiness during the 1970s and 1980s—spare parts and in-commission rates—allowed the force to train efficiently and maximize its combat capability. In the 1980s SAC shifted toward training for a conventional role, which prepared it for bare-base conventional operations that, during the Gulf War, took place in remote locations like Diego Garcia.

Equip

On the subject of the Air Force mission to equip the forces, as you might surmise, everyone I contacted suggested advances in technology. All mentioned the transition from propellers to jets in the late 1940s and early 1950s. Phil Condent, the current president of Boeing and not a general officer, identified the swept wing as a major technical change in aircraft design that led to airplanes like the B–47, B–52, F–84, F–86, and the Century-series fighters. Airborne radar permitted all-weather navigation and bomb delivery capability. The evolution of the tanker, even though it had been tested back in the 1920s with the *Question Mark*, came into its own with the KB–50, KC–97, KC–135, and KC–10. I know that General LeMay would have put tankers high on his list of significant factors because he told me on many occasions about the importance of the tanker fleet in the projection of air power. Reconnaissance aircraft, U–2s and SR–71s, developed in the 1950s and still going strong, gave reconnaissance much greater utility.

Infrared and laser-guided bombs have changed the lethality of aircraft. Gen. Tom Marsh noted the importance of solar cells in making long-duration satellites practical. The micro chip, which he also cited, played a major part in ballistic missile navigation, in the reliability of avionics, and, of course, in the enormous advances in computer technology. The miniaturization of nuclear weapons permitted increased security, safety, and accuracy, as did integrated avionics and software. Fly-by-wire allowed basically unstable airframes like those in the F–15, the F–16, and the B–2 to become a reality. Computer miniaturization led to the development of internal navigation, weapons control, bombing and missile guidance systems, autopilots, fuel management, and flight controls, to name but a few. Stealth technology, exemplified by F–117s, B–2s, and stealthy cruise missiles, with their resulting impact on enemy capabilities, has been a momentous development. Gen. Russ Dougherty maintains that the Global Positioning System will come to be seen as an advance as significant as electricity, radio, and penicillin.

Fight

The services organize, train, and equip, while the commanders in chief conduct wars. Warfighting has taken various guises since the creation of the independent Air Force fifty years ago. The Berlin Airlift was an early demonstration of what airlift could do. Our successes thereafter in the Cold War would have been less without it. The era had its hot spots too. The Korean conflict in 1950 illustrated the results of poor preparation for war. For instance, it took nine months to get F–86s into the war to replace the F–51s that were fighting the MiGs.

After the Cuban missile crisis, the realization occurred that conventional capabilities were needed to give the national command authority a choice between nuclear confrontation and surrender. Since no Air Force–designed fighter aircraft were then in production, the Air Force was forced to buy Navy-designed F–4s and A–7s, neither of which was designed as an air superiority fighter, and they later proved poor against MiGs. Vietnam also confirmed that the Air Force still was not well trained for conventional operations. There had been little to no air-to-air training in the late 1950s and 1960s, and F–100s, F–104s, F–105s, F–111s, F–4s, and A–7s were not optimal in the environment of Southeast Asia. SAMs and radar-controlled guns took their toll on ground attack missions. Fortunately, the Air Force Systems Command and the manufacturers responded well by producing jamming pods and anti-SAM missiles.

The 1989 fall of the Berlin Wall signaled the end of the Cold War. Major reductions followed in the U.S. defense budget and in force levels. Yet shortly afterwards, in 1991, Desert Storm became the Air Force's final exam for all the changes in structure, tactics, techniques, procedures, and training that had been put into place, and for the equipment that had been developed and fielded. It proved that precision and standoff weapons worked and that stealth was effective. It validated Air Force principles. It demonstrated the importance of information warfare, and that an air component commander was best suited to conduct an air war.

Nuclear Weapons

Finally, let me mention what may be considered the "shaping point" in the history of air power. It came simultaneously with the creation of the independent Air Force and remains relevant today. The advent of nuclear weapons determined our nation's political and military strategies. Without nuclear weapons and the deterrent strategy that they permitted, one can only speculate about whether the Cold War might have exploded into World War III. I believe it can be argued that nuclear deterrence has served our country, and the whole world, very well.

With the Cold War now over, one of our own, Gen. Lee Butler, has proposed as a goal the elimination of all nuclear weapons. He believes that the risk posed by nuclear weapons far outweighs their presumed benefit and that every President of the United States since Eisenhower has endorsed their elimination. I am extremely disturbed by General Butler's contentions, so I asked Gen. Brent Scowcroft, the national security advisor for Presidents Bush and Ford, if they and senior members of their administrations favored eliminating nuclear weapons. Scowcroft informed me that neither Presidents Ford and Bush nor in fact President Nixon had held that view, and he sincerely doubted it had been President Eisenhower's position.

I believe that, like gunpowder, we cannot disinvent nuclear technology. Many countries have nuclear weapons today: the United States, the United Kingdom, France, Russia, India, and China. Israel and South Africa appear to have them, and others—Pakistan, Japan, North Korea, Brazil, Argentina, and Australia, to name a few—have the technology to build them. Iraq, Syria, Libya, and terrorist groups very much want a nuclear capacity. Now that the Cold War is over, according to some people, the world is safe for democracy. Yet I concur with Winston Churchill who once said that anyone who studied history recognizes we are "between wars."

During the Cold War, nuclear weapons provided deterrence. They will continue to provide deterrence to countries that have them and, equally important, to countries that might develop them, in spite of test ban treaties. Nuclear weapons also deter countries that have or might develop chemical and biological weapons, despite the chemical weapons treaty. Effectively, the elimination of nuclear weapons would make the world safe for conventional war.

It seems to me that many of those who support the elimination of all nuclear weapons in the U.S. arsenal, particularly those in the military or retired military, have a self-serving belief that to do so would justify larger standing conventional forces: armies, navies, and air forces. I contend that lower numbers of weapons can be agreed to through negotiation but that their elimination should not be the ultimate goal. As former Secretary of Defense James Schlesinger stated, "It is an unachievable goal and it is a perilous goal."

* * * * *

Many events and technological developments have shaped our Air Force, but fortunately none has led to nuclear conflict. We can be hopeful, even if it is most unlikely, that all future turning points will fit under the categories of organize, train, and equip . . . but not fight.

Remarks

Golden Legacy, Boundless Future

Gen. Ronald R. Fogleman

The subject of this conference, the history of the United States Air Force from 1947 to 1997, fits appropriately with the overall theme of the Air Force's fiftieth anniversary-year celebration, Golden Legacy, Boundless Future. I would like to begin with some reflections on the "golden legacy," without trying to regurgitate the history of the Air Force.

For good or ill, many of us in the room have been labeled, and over the years I have become known as a historian. I think I am more aptly described as somebody who has a keen interest in history. So, when the Air Force History and Museums Program decided to mount a symposium dealing with the history of the United States Air Force, I was eager to participate. However, there are people out there, the unwise and the unbelievers, many in uniform, who actually question the utility of studying history. What is the source of the skepticism about the value of historical investigation, particularly of military history?

One of the first objections that one hears (a rather superficial argument) is that all military events are unique. Each occurs in a specific time and place and is unrepeatable. If one believes that every aspect of the past is unique, then none of what has gone on previously can or will be duplicated or reproduced. Therefore, why would we try to generalize from unique situations?

Another source of skepticism about the value of studying the past comes from the fact that we are living in a world of such rapid and accelerating social, economic, political, and technological change that there are no valid lessons to be garnered from military events that occurred long ago, or even not so long ago. There are those who would say, therefore, that not only is it unproductive to look to history, but to do so may even be harmful. They correctly point out that we may draw the wrong lessons, or that or we may focus so much on a past event that we keep relearning the same thing. That school of thought says we tend to refight the last war.

I appreciate hearing various perspectives on any subject, and I would agree that we should treat history, particularly of the institutions we love, with a certain amount of caution. In fact, the remarks of a senior Air Force leader forced me to reflect on the relevance of my own war stories, my own version of the past. At an air power symposium held at Maxwell AFB many years ago, I was in the audience listening to Gen. Ted Milton, who had just retired. He was waxing eloquent about an event when suddenly he stopped and said, "I have discovered that the older I get, the easier it is for me to recall, with the greatest of clarity, events that never happened." We all must recognize that events, and certainly our own role in them, become colored in our memories, and that people will often assist us in our re-creations.

In spite of the pitfalls of proclaiming lessons learned, the study of history provides needed context and greater understanding of the processes of decision-making. As we consider the forces that came together to establish an independent United States Air Force fifty years ago, it is worth recalling that it was not a benevolent Congress that created the Air Force. The National Security Act of 1947 grew out of air power's demonstrated coming-of-age during World War II. The effectiveness of precision daylight bombing can be debated, but it is a fact that airmen were able to open a second front in the war in Europe that could not have been effected easily in any other fashion. We cannot argue with the fact that the Second World War came upon this nation from the air in a bold, strategic, surprise attack at Pearl Harbor. We cannot argue with the fact that the end of the war came about as a result of strategic attacks from the air when the United States Army Air Forces dropped two nuclear bombs on Japan. Just as the war started for America, it ended for America. I am convinced that the Congress of the United States established an independent Air Force because it recognized that air power had changed, fundamentally and forever, the nature of warfare. Knowing more about the evolution of warfare, in theory and action, gives us greater context and perspective on the decisions we make, the doctrine we espouse, and the missions we perform today.

Let us briefly review some of the earlier developments that changed the conduct of warfare. In 1953, one of my college professors, Dr. I.B. Holley, published a little book called *Ideas and Weapons* that dealt with the interrelationships between theory and technology. Dr. Holley reminded us that one inevitably influences the other. When we look back at the history of warfare and the implements used, we might consider the impact, for example, of the stirrup. Until the stirrup was invented, a man on a horse served as a means of transportation. But when you combine the man, the horse, and the stirrup, for the first time a thrusting weapon of shock and mass is created. Thereafter, we had the invention of the long bow, which effectively permitted a standoff between the man on foot and the man on horseback.

The invention of gunpowder as it was applied to sea warfare and to individual armament was a monumental breakthrough in weaponry. Its use led to advances in rifles and other arms during the nineteenth century. An instrumental change came with the passing from the age of sails to the age of steam for naval forces. Clearly, the most significant event of the twentieth century was the advent of air power. Once again we had a fundamental alteration in the nature of warfare.

Because of the recognition of the role of air power in combat, Congress established the United States Air Force and gave us the responsibility of providing for this nation a full range of capabilities in the areas of science and technology, research and development, testing and evaluation, production, fielding, employment, and sustaining forces in the air and space arena. That is what we do for a living. Historians' documentation and interpretation of those roles and missions provide greater understanding and a means of evaluating the work of military professionals.

I am satisfied that historians have done a good job of describing the period of our history that preceded the independent Air Force, that is, through the interwar years and World War II. We have paid less attention to some of the noncombat and unglamorous administrative and organizational developments that followed the war. Many airmen, including some of the folks in this room, lived through the Cold War era and can probably offer insight into many aspects of that period. When I was engaged in the oral history program as an instructor at the Air Force Academy, I got fascinating little bursts of information that enriched my knowledge about the history of the Air Force. For example, I was interested to hear that at the end of World War II, as we returned to a peacetime air force and downsized, Gen. Hap Arnold removed himself from the process of choosing future Air Force leaders. He turned that decision over to a group of senior officers who were going to be part of the new cadre. Essentially, those officers held their own little selective early-retirement board.

Airmen had been through that process before, but they had not been the decision-makers. At the end of World War I, as troops returned from France, there were only two general officer billets in the Air Service—a two-star and a one-star billet. Undoubtedly, at least a couple of airmen, Billy Mitchell and Benny Foulois, could have competed for those billets. But General Pershing selected Charles T. Menoher to fill the two-star position as Chief of the Air Service. As best I can determine, Menoher's sole qualification was the fact that he had been a division commander during the war. Recognizing that they needed an airman, they selected Billy Mitchell as Menoher's deputy, leaving Benny Foulois out in the cold. As a result, when Foulois stepped aboard ship in France in 1919, he was a brigadier, but when he set foot at the bottom of the gangplank on arriving home, he was a major. The same failure to achieve postwar promotion in the ground army would occur again at the end of World War II. But for the first time, with an independent air force on the horizon, airmen would choose and be led by their own. It would be illuminating to learn more about how such key decisions have been made, and by whom, over the years.

I would also like to see greater historical investigation of noncombat activities and functions during the Cold War. We have made a good beginning in tracing the development of ICBMs, but we would profit, for example, from more information regarding overhead reconnaissance in air and space. There are many critical aspects of ground and air support operations for which the history is incomplete. And, as I indicated, we could benefit by knowing more about decision-making and decision-makers.

These kinds of studies are invaluable as we look to the future. As two years ago we contemplated this fiftieth anniversary year, celebrating both our Golden Legacy and our Boundless Future, the senior leadership of the USAF inaugurated a long-range planning initiative. We reached a major milestone in October 1996 in Colorado Springs when we took up the question of the kind of air force this nation needed in the twenty-first century. That effort was motivated by two things. One was almost organizationally and structurally driven. In the spring of 1995, it appeared that little of significance would come from the Roles and Missions Commission. As often happens, commissions recommend another study or document, so when it became clear that a quadrennial defense review would be recommended, we began a serious discussion about the future of the Air Force.

The second element that fueled the effort to rethink the role of the Air Force in the future was more basic, the result of my own experience right after I became Chief. Previously I had been Commander of Transportation Command at Scott AFB, Illinois. Since I was actively engaged in operational matters, I had given only passing notice to more theoretical or futuristic issues. So, shortly after becoming Chief, I sent word to the Air Staff: "I want the smartest person on the Air Staff to explain information warfare to me." I should have seen that we were in trouble when two people showed up. Obviously we did not have everything in one kit bag. (Moreover, one of the people who showed up was an operator and one was an intelligence officer.) They subjected me to what I could best describe as dueling briefings, but they convinced me that they were, in fact, what I had asked for—the smartest persons on the subject. Not only did they educate me, but eventually we put together a presentation that we took on the road to help educate the commanders in chief.

In the process of informing myself, reading as much as I could, I began to grasp the import of the stunning advances in information technology. Fiber optics were about to be laid around the world; space-based communication was linked to ground-based systems. Those were merging with computer power that was doubling every eighteen months and getting cheaper every day. Also, avionics were becoming miniaturized in a way that would allow us to put together very capable, very complex sensor packages. Those technological advances, combined with the inherent characteristics of air power—range, speed, and flexibility—were adding new elements to the current and ongoing revolution in military affairs.

As we in the Air Force began long-range planning, in attempt to come to terms with new thinking and new technologies, our vision began to form. We came to see that in the first quarter of the twenty-first century it will be possible from space and air-breathing platforms to locate, track, target, and if we choose, engage anything of consequence that is located on or travels across the face of the earth—in near real time. That is the key point, the great leap—in *near real time.* We can do all those things today, but not in near real time. By the end of the first quarter of the twenty-first century, by operating in near real time, we will fundamentally change the size and composition of surface forces and the nature of air power.

To get from here to there, we will be forced to reconsider the way we do business. There is great value in looking back to see how change has been dealt with in the past. It was the flexibility of airmen that contributed to their successes in World War II and throughout the Cold War. As an institution, the Air Force has a culture that willingly accepts change, although some constants must be kept in mind. First of all, we must support the national security strategy. We do not exist as an entity unto ourselves. Also, we must never lose sight of the fact that people are the instruments for action. I and all the Chiefs who follow me are charged by law with organizing, training, and equipping forces. We can gain insight about how those duties might be performed when we turn to past experience, not only of war but also that in peacetime, during the 1920s and 1930s, and through the Cold War. We can benefit from knowing how airmen identified new missions and formed alliances with other services, other nations, and elements of the aerospace industry to produce the kinds of machines, perhaps in relatively small numbers, that would be needed in great numbers later.

Looking back at our Golden Legacy, and looking forward to the Boundless Future, I find it invaluable to be a part of groups like this who come together to think and talk and exchange ideas about where we have been, what successes we have had, and what mistakes we have made. Great good can come from it, but only if we follow through by educating the public and those in uniform about the history of air power. We do that largely by publishing and distributing the work that we have already completed and by continuing our historical investigations into areas where our knowledge remains limited. With that, I will close by admitting that over time I have been called many things. I am honored today to be among friends who call me a historian.

Doctrine for Strategic Air Attack

Technology, Thought, Troops: Gen. Carl A. Spaatz and the Dawn of the Nuclear Age

David R. Mets

> The Military Mind is, of course, a catch phrase. For a good many years it has been used to suggest a pedantic, rather dull, professional soldier who was either monumentally stupid or unbelievably wrong about one thing or another. It was a caricature that was only occasionally accurate. Fortunately, there are not very many of him, not nearly so many, I sometimes suspect, as of his cousins in some of the other professions. This Colonel Blimp does not actually exist in great numbers, and where he does he is seldom important . . .
>
> Rear Admiral J.C. Wylie, USN, 1967

Introduction

This essay is intended to assess the role of Gen. Carl A. Spaatz in the post–World War II evolution of strategic air attack theory and doctrine. Although he was not the primary actor, Spaatz' career provides insights into the larger picture, specifically in terms of the current concept of the Revolution in Military Affairs. I will examine the influence (or lack thereof) of Carl Spaatz on the evolution of technologies, ideas and organization.[1]

Carl Spaatz claimed that his initial interest in military flying in 1910 at West Point came from witnessing Glenn Curtiss' famous flight down the Hudson River. Spaatz joined Army aviation before World War I and deployed in the Army's initial combat flying unit, the 1st Aero Squadron, with Pershing's Punitive Expedition to Mexico. He was a protégé of Billy Mitchell, serving as an expert witness about pursuit aviation at Mitchell's famous 1925 court-martial.

Spaatz was at Langley Field when the GHQ Air Force received its first B–17 and was in command when the Eighth Air Force deployed to England in 1942. After a year-long stint in the Mediterranean (in command of largely tactical operations), he returned with Eisenhower to England in early 1944. There he commanded the largest combat air forces ever employed by the United

States as the head of the U.S. Strategic Air Forces in Europe, which included the Fifteenth and Eighth Air Forces (and for administration, the Ninth as well). Those units conducted the most intense strategic bombing campaign in history. Thereafter, Gen. Henry Arnold sent him to the Pacific to assume control over those strategic air forces. He arrived just as the only two nuclear weapons ever used in combat were dropped.

Immediately after the war, Spaatz returned to Washington to understudy the ailing Arnold. As one of his first duties, he headed an Army Air Forces committee to explore the implications of atomic weapons for the future of air power. He became the last Commanding General of the U.S. Army Air Forces and the first Chief of Staff of the U.S. Air Force. Given his background, Spaatz was highly qualified to set the course for strategic air power at the onset of the nuclear age.[2]

At the helm of the air arm, Spaatz reorganized the Army Air Forces (AAF) along functional lines. To develop policy, he convened the AAF Air Board under the secretaryship of Gen. Hugh Knerr, and later the Aircraft and Weapons Board composed of the seniormost Air Force generals. He represented Air Force interests in testimony before congressional committees regarding the unification struggle, and later to presidential and congressional commissions.[3]

At first the AAF and the USAF paid relatively small attention to the strategic air attack mission. Spaatz, after all, had been the air commander in the North African Campaign where airmen finally won a measure of acceptance for their view of *tactical* air doctrine. It would be codified in Army Field Manual 100–20 in July of 1943,[4] whose main outlines would remain imbedded in USAF tactical air doctrine to the present. But in the immediate postwar years, Spaatz and other airmen pushed for a "balanced" seventy-group air force that that would include strategic attack and defense, ground and sea forces support, and transport.[5] A budget to support seventy groups was never approved. Instead, available funding went to the highest priority, the strategic forces, and too little remained for the tactical and transport forces predicated in constituting a seventy-group air force.[6]

Revolution in Military Affairs

The national security literature of the 1990s strongly suggests that the United States was in the midst of a Revolution in Military Affairs.[7] As described by James FitzSimmonds and Jan van Tol, that revolution is composed of three essential elements: a Military Technical Revolution, a consequent change in doctrine for the employment of the new technologies and, finally, an organizational adjustment needed to capitalize on the new materiel and doctrines. The following remarks will discuss each of those categories and Gen. Carl A. Spaatz' role in them before his retirement near the beginning of the Berlin Airlift in 1948.

Military Technical Revolution

At least since the middle of the nineteenth century, it has commonly been held that military technology is or should be driven by doctrine and strategy. Supposedly, operational commands envision how they will fight future wars, how they will establish the requirements for new technologies to implement those plans, and how the scientific and developmental commands will work to meet those requirements with new equipment, i.e., requirements pull. However, technologies sometimes arise more or less spontaneously and bubble upward toward the users who conceive of a doctrine and an organization to take advantage of the new machinery, i.e., technology push.[8] Consequently, it seems likely that technology and doctrine are interdependent and at varying times drive each other in an interactive way. So it was in Spaatz' time.

The *Question Mark* flight that Spaatz commanded in 1929 was to demonstrate that modern airframes and engines had become reliable and safe. It proved that aircraft could remain aloft for nearly a week through the use of air refueling.[9] Although it was clear during the 1930s that the technique might be a way to extend the combat radius of bombing, there was little development of aerial refueling in support of the strategic bombing mission.

During World War II, the AAF suffered because of the limited ranges of its bombers and especially of its fighters. Some tepid efforts to solve the problem of long-range escort through air-to-air refueling came to little in an aerial war requiring multiple attacks. During Spaatz' tenure as head of the air arm, refueling again received attention.

The B–47 first flew in 1947. It soon became apparent that the combination of jet engines with the sweptwing design yielded a far greater reduction in drag than had been anticipated. This finding resulted in a move away from the turboprop toward a pure jet solution.[10] By then, the enemy had changed. Neither the Navy nor the Army could reach vital interior targets in the USSR, so for a time American national defense requirements came to rely on bombers. One approach to achieving the necessary range was the development of intercontinental aircraft, resulting first in the slow B–36. Another was a conversion to gas-guzzling jet bombers that could be refueled in the air. The latter prospect seemed to be the more practical since any future atomic war was expected to be short; far fewer than twenty-five missions to the vital targets would be needed.[11]

Thus, an intensely felt requirement drove further development of air refueling. Forty years later, aerial refueling stood as one of the chief advantages enjoyed by the United States in the 1991 war against Iraq.[12] In the case of aerial refueling, an old technology lay dormant for two decades until a new requirement emerged to pull it into development and production, an illustration of simultaneous technology push and requirements pull.

Radar was another technological development that both influenced and was influenced by operational and doctrinal considerations. Radar affected the Big Sky notion that the bomber would always get through, although development of long-range fighter escort during World War II provided a solution. Also, radar could guide bombers to the vicinity of the target in inclement weather, and the accuracy of bombing by radar was thought likely to improve as the technology advanced.[13]

"Nukes" were the most radical technological development of the modern age. In 1943 airmen were expected to fly a quota of twenty-five round trips to targets such as Schweinfurt and Berlin, although most crews did not attain that goal. In 1944 the required tour length was raised to thirty-five missions because the training system could not produce enough people for the rapidly growing bomber fleet, replace the losses and fight a two-ocean war. Even when the loss rate dropped to two or three percent, an individual's chance of completing his tour and going home was less than even. After Hiroshima, the power of the atom bomb seemed to prove that any war would be short, as Douhet had hoped. A crew might make a very few trips, sometimes only one, since AAF leaders acknowledged the possibility of one-way trips for atomic bombers.[14]

Like other senior Air Force leaders, Spaatz assumed that the future would bring only total war and that limited war was a phenomenon of the past. He led a postwar panel that tried to predict the impact of the atom bomb on the future air force. The panel concluded that atomic bombs would remain very big, very scarce and very expensive for a long time to come.[15] It was assumed that adversaries, and particularly the USSR, would acquire nuclear weapons and the means of delivery at some point in the future. Carrier aircraft, it was believed, would not be able to handle nuclear weapons because, at 10,000 pounds each, atomic bombs were too heavy for carrier operations.[16]

The Spaatz Board also concluded that a conventional as well as nuclear bombing capability would be needed and, as just indicated, that nuclear deterrence would depend on land-based bombers for some time. Therefore, overseas bases would be needed to accommodate the strategic air force. At the same time, the Air Force began to look for an intercontinental attack capability. Spaatz also envisioned ICBMs with nuclear warheads, supersonic travel, intercontinental jet bombers for transarctic missions and precision guided munitions. During his tenure, the intercontinental B–36 made its first flight, and the request for proposal that led to the B–52 was issued the day after he officially took office as the Commanding General.

Doctrine

I define *air theory* as a coherent body of ideas about the organization and employment of air power. *Doctrine* is a theory given formal written approval from an institution's highest legal authorities. *Strategy* is the application of theory and doctrine to a specific situation, time and place. Theory and doctrine are two inputs to strategy; information about intelligence, weather and terrain are among the others.

Field Manual 100–20 of July 1943, which dealt with tactical or theater air doctrine, was central to airmen's thinking after the establishment of the USAF in 1947. The Air Force did not, however, publish a broader, formal, basic doctrine until the Korean War was nearly over.[17] *Informal* doctrine, i.e., views that are generally believed and taught within an institution, often continue to be espoused even without formal approval by the head of an organization. Such was the case with doctrine put forward at the Air Corps Tactical School (ACTS) during the 1930s, and with the body of ideas shared by most airmen, including Spaatz, in the immediate postwar period.

The degree to which ACTS and airmen ever since have been obsessed with the strategic mission to the exclusion of all others has usually been exaggerated. Tactical air doctrine was never absent from the curriculum of ACTS, nor was it totally ignored in the era of massive retaliation. But strategic air doctrine has been emphasized from the time of Billy Mitchell's pronouncements through the end of the Cold War, even though bombers played a diminishing role.

The theory and doctrine of ACTS argued that a daylight, precision strategic air attack on an enemy's vital centers (mostly industrial, but also agricultural) could be decisive without the need to first conquer his armies and navies. Airmen contended that a long-range escort fighter was technologically unfeasible and that escorts might be unnecessary altogether. The bomber, they thought, would always get through with acceptable losses, relying only on its own defensive armament and formation tactics to hold attrition to within acceptable bounds. The attacker would find its target and hit it with decisive frequency, its bombs powerful enough to fatally retard the enemy's ability to adapt.[18]

British historian Michael Howard has asserted that doctrine is always wrong. Rather, he whose system is most flexible in its adaptability will tend to win.[19] As commander of the Eighth Air Force, Carl Spaatz, and his successor Ira Eaker, learned this painful lesson in the AAF strategic campaign against Germany.[20] Although they enjoyed a preponderance of force, the Mitchell-Douhet promise of quick results was not forthcoming. The small bombs were far less damaging to industrial machinery and installations than the prewar thinkers had believed. Furthermore, the resilience of the enemy was far greater than had been imagined, and the weather was a much more severe inhibition than had been anticipated. The increased use of radar bombing made the precision attacks on vital targets of the USAAF difficult to distinguish from the area bombing of the RAF. In Japan in the spring of 1945, as a matter of deliberate policy, the AAF went to incendiary area raids on cities, using the argument that Japanese industry subcontracted out its work to so many small operators in neighborhoods that it was necessary to attack a whole city to reach it.

The greatest fire raid of all was on Tokyo on the night of March 9/10, 1945.[21]

Although, as noted, an authoritative doctrinal manual was not published until 1943, the basic notion that air power could have decisive effects on an enemy without engaging his army and navy through the use of precision attacks against his vital targets, principally the nodes of his industrial web, remained the main line of thought. The need for escorts came to be acknowledged, although their practicality diminished as bomber range increased.[22] With the employment of the B–29 in 1945, for example, the P–51 escort could not make the 3,000-mile round trip to Tokyo, and 6,000 marines died to capture a base at Iwo Jima halfway to the target.

The postwar Spaatz Board recognized that overseas bases would be needed in the absence of intercontinental strategic bombers. Relying on forward bases located in host countries would induce vulnerabilities and delays, and also play into the hands of the air force's bureaucratic rivals in the Navy who argued that carriers served as mobile bases.[23] A true intercontinental strategic bombing capability would prevent the Navy's advantage and conserve funds for aircraft and weapons development.

Notwithstanding that postwar Air Force leaders planned to hit targets deep in the Eurasian heartland, where the capture of a station halfway to the target was out of the question, they kept escort fighters in the strategic air forces until the mid-1950s.[24] At some level, the problem was recognized in developmental programs for parasite fighters that could ride in the bomb bays of B–36s to be discharged in the target areas to face the enemy interceptor threats. Efforts were also made to develop means of towing F–84s or tanker gliders, but the solution was high-speed B–47s and B–52s that would condemn the interceptors to face guns from the tail position.[25]

Initially it appeared that nuclear energy might come under the control of the United Nations, a solution that some military men thought desirable.[26] Many suspected that no American President would ever again order the dropping of an atomic weapon. Also, some airmen assumed that any atom bomb carrier that was ordered into hostilities would have to be accompanied by a flock of protecting B–29s because escorts would never be capable of flying deep into the interior of the USSR. Too, the Spaatz Board assumed that nuclear bombs would forever be scarce and many vital targets not valuable enough to warrant their expenditure. Finally, Ira Eaker expressed the view that the Air Force's sole nuclear-capable bombardment group, the 509th at Roswell, New Mexico, should not be named "atomic" lest Congress assume that the Air Force only needed one bombardment group. Instead, all heavy bombardment groups should be dual-capable. All these factors were not expected to constrain the use of atomic weaponry to the exclusion of all others, so airmen did not then think that major changes in their force structure were in order.[27]

The AAF's initial proposal for seventy groups was predicated on the assumption that a "balanced" force to include tactical air formations would be maintained in the peace to come. However, a demobilization that was more like an implosion than a drawdown soon drove the AAF far below that figure. The seventy groups were to have been sustained by about 400,000 uniformed personnel, but by the spring of 1947 numbers hovered around 300,000, and few units could be considered combat-ready.

Just as the Air Corps' priorities in austere budgetary times caused it to focus on the heavy bomber, in the postwar period funds were devoted primarily to atomic striking power, with very little for the lesser priorities. For the first five postwar years, the air arm became increasingly specialized in strategic bombing rather than building a force capable of a more general and flexible kind of air power.[28] As early as June 1946, General Spaatz argued in a letter prepared for Bernard Baruch that the "hysterical demobilization" had made us ever more dependent upon atomic weapons for our security. He also doubted that any treaty could prevent their use if a war were to come. Spaatz asserted that the goal, therefore, should be the abolition of war, not increasing the weapons with which it would be fought. Nonetheless, military power remained an essential basis for diplomacy, and the atom bomb had become an essential component of American power. Spaatz closed his letter: "Fear of the terrible consequences of another war may prove to be the major deterrent against war itself; such a full appreciation of the horrors of modern warfare must be instilled in the minds of all peoples and their governments."[29]

Spaatz' affirmation of the deterrent effect of atomic warfare was congruent with Presidents Truman's and Eisenhower's concern to balance the budget and reduce taxes. The public too came to believe that America's security interests lay with atomic bombs and strategic air power, and with cutting the Army, Navy, Marine Corps and tactical air power. While Spaatz was chief, however, his strategic bombing forces were hardly ready to effectively deliver the dozen or so atomic bombs in the stockpile, and compartmentalization of nuclear information prevented training any assembly and loading teams. The prompt launching of an atomic counteroffensive was a daunting prospect.[30]

Spaatz did not offer definitive views about air power doctrine at this time. He had been a fighter pilot in World War I, with three kills in air-to-air combat to his credit.[31] He was the commander of the 1st Pursuit Group in the 1920s when it was the *only* fighter organization in the air arm. He ran the Northwest African Air Force in 1943, whose combat experience resulted in the codification of tactical air doctrine. He was never part of a bomber crew, nor had his principal assistant and successor, Hoyt Vandenberg, ever been on a bomber crew. Nonetheless, at that time airmen tended not to identify strongly with a single command such as the Strategic or the Tactical Air Command, as came to be the case in the 1950s and later.

In the immediate postwar period, airmen narrowed their focus ever more on strategic bombing and its employment doctrine. The viciousness of the unification fight underscored that view because a separate air force could only be justified on the basis of an independent or autonomous mission, not support roles for surface forces. So Spaatz and other senior airmen offered little resistance when technology, finances and the external threat pushed American national security toward strategic nuclear attack.

Organizational Influences

Carl Spaatz was recruited for the AAF commanding general's job, over his reluctance, for the explicit purpose of seeing the AAF to independence.[32] Although airmen got their autonomous Air Force, and although so-called unification was enacted into law, Arnold was correct in that the outcome left intact the power of three separate services, much as the Navy desired. Thus, the defense reorganization that occurred in 1947 did not result in a doctrinal revolution in the air arm or the other services and can best be explained in terms of bureaucratic negotiations and compromises. Within the air arm itself, however, the administrative structure responded to changing technology and long-held doctrinal beliefs.

In his speaking and writing, Spaatz maintained that the United States required a force in-being because America's allies could no longer be counted upon to provide the time needed to mobilize a great army. His perspective prevailed. After World War II, the air arm's strength never dropped below 300,000, and usually it remained much higher. Throughout Spaatz' tenure, the Strategic Air Command, the main striking force, had yet to reach the peak it later achieved, so that Spaatz claimed he had but two combat-ready groups at the end of 1946.[33] Leaders in the Army and the Air Force believed that national security should be based upon air power and nuclear weapons and upon standing forces. In the Navy, the transition was gradual from battleships to carriers as the capital ships, but by 1945 naval aviators were breaking into the upper ranks of the service. Though the battleship came to play a supporting role to the aircraft carrier, the mission of those combined forces in the fleet still was to command the sea. The absence of a foreign naval threat and the powerful political pressures for funding reductions made conflict between the Air Force and the Navy almost inevitable.

In public, Spaatz usually gave at least lip service to the need for a Navy to capture and support the forward bases from which air forces would mount the strategic air offensive.[34] But since the 1920s, airmen had argued that once aircraft of sufficient range were developed, aircraft carriers would follow the battleships to the "mothball fleet" and then to the scrapyard. In the immediate postwar period, Spaatz' staff worked hard to develop that range through the B–36 and B–52 programs, as well as through aerial refueling. Not surprisingly, the B–36 program in particular came in for intense attack by naval officers.

Airmen were convinced that long-range bombing had proved itself over Germany and Japan, and the atom bomb only further enhanced the force of that doctrine. Furthermore, for some time airmen had argued that most combat air power should be under a single operational command. During the combat in Africa, France and even the Far East, air units had not been organized in unified way, or geographically, but rather functionally. Eighth Air Force, for example, had an VIII Bomber Command, VIII Fighter Command and so on, all functioning in strategic bombing. Ninth Air Force in Europe, similarly had its own bomber command, but its function was tactical support. Historian Herman Wolk maintains that airmen agreed to a dedicated tactical air command for the support of the Army in order to win Eisenhower's support in the battle for a separate air force.[35] Spaatz later asserted that the decision arose from discussions between him and Eisenhower and that it was not a payoff.[36]

In any case, after the war, instead of placing all AAF combat power under one command, Spaatz abolished the Continental Air Forces and created three different combat air organizations—the Strategic Air Command, the Air Defense Command, and the Tactical Air Command. After the 1947 reorganization, that structure remained. In the logistical world, it had long been thought that the combination of supply and research and development into the same organization would result in the inhibition of technological advances. Procurement accounts had much higher dollar value than research and development programs. In consequence, it was argued, the supply function would overwhelm efforts at innovation, and research and development would stagnate. Nonetheless, both functions were lodged in the Air Materiel Command beyond the end of Spaatz' tenure.[37]

Not only was the technology of the atom bomb an engine for controversy and ill-will within the Defense Department, the coming of guided missiles set off bureaucratic battles among factions in the AAF and then the USAF, and between the services. The AAF thought of missiles as pilotless aircraft; the Army Ground Forces considered missiles to be an extension of artillery. The Navy too was soon in the act.

In the fall of 1944, Lt. Gen. Joseph T. McNarney, Marshall's deputy but himself an AAF officer, issued the McNarney Directive that put the AAF in charge of all missiles launched from aircraft and all ground-launched weapons dependent upon aerodynamic lift. Ballistic weapons would go to the Army Service Forces Ordnance Department, all assignments being independent of the mode of propulsion.[38]

That arrangement did not last much past the time that Spaatz assumed command. He feared that a continuation of the fragmented approach of the McNarney Directive might play into the hands of the Navy, so that very month he urged centralization of missile development under the AAF. As a result, within the Army, the AAF was assigned the leading role—at least on paper.[39] Yet the Navy had already begun a vigorous missile program, including the development of what is now the Pacific Missile Test Range at Point Mugu, California,[40] that stimulated further anxiety in the AAF.

Airmen themselves tended to be conservative in regard to the implications of missile technology, as indicated by a 1947 HQ USAF working group that advised the First Aircraft and Weapons Board:

> It is not felt that the guided missile will ever replace the airplane. Rather the guided missile will supplement and aid in the air operations of the future. It is felt that the guided missile, proceeding along one line of development and the aircraft proceeding along a second line of development, will ultimately result in very similar high performance supersonic vehicles.[41]

As it happened, the predictions of the working group actually transpired, not only in the United States but also in the USSR.

In sum, the main drivers of organizational change were probably not the new military technology nor any radical doctrinal departures. Doubtless, the appearance of long-range bombers and the impending arrival of an intercontinental-range airplane plus air refueling, among numerous other things, supported the creation of a separate air force and of a dedicated major air command for strategic attack.

Personalities also affected reorganizations of the Defense Department and the USAF. The steady hand and cool mind of George Marshall was vital to that development. An equal competence and the determination of James Forrestal, along with his clever mind, limited the degree to which Marshall and other Army men realized their goal of centralization. Carl Spaatz had a steadying influence in all of this. He also worked well with the first Air Force Secretary, Stuart Symington, which was conducive to internal peace within the Air Force and a unified external front.[42] Spaatz' disposition enabled him to accept the half-loaf of a separate Air Force among at least three other air forces (Army, Navy and Marine Corps), but without the long-range, land-based, overwater reconnaissance and antisubmarine missions that had been main points of contention.

The Influence of Carl Spaatz

In the individualistic American culture, there is a strong tendency to overemphasize the role of the individual in both good and bad events—no statute of limitations exists among our heroes and demons. T. Harry Williams once divided the officer corps into "Macs" and "Ikes." The Macs, usually associated with Douglas MacArthur and the Pacific and Asian wars, are the more conservative. The Ikes, named for Eisenhower, are most often veterans of the European theater in World War II and are more liberal, or at least less conservative, than the Macs. The Macs are described as less comfortable with civilian control and more given to charismatic leadership styles; the Ikes are at home with the political leaders and tend more toward persuasive or consensus styles of leadership.

In the context of the Air Force, the commitment to strategic bombing was stronger among the Ikes than the Macs. Likewise, the postwar Air Force looked more to the lessons learned in Europe than in Asia. Spaatz was clearly one of the "Ikes."[43] He was pragmatic and practical, little given to moralizing, and his mode of leadership little resembled that of Douglas MacArthur. Moreover, he fought almost the entire Second World War alongside Ike himself, in the Mediterranean and in Europe. When he took over from Arnold, he brought in the likes of Hoyt Vandenberg and Lauris Norstad and many others whose principal experience had been in the European theater. Vandenberg, his immediate successor, presided over the increasing specialization of the Air Force in strategic air offensive operations. During Eisenhower's presidency, Norstad became the only airman ever to command NATO. After Vandenberg came Nathan Twining, wartime commander of Fifteenth Air Force under Spaatz and generally considered to be a "Bomber Baron." Twining was succeeded by Thomas White and then Curtis LeMay, who got his baptism of fire under Spaatz against Germany, and who became the great antichrist from the anti–strategic bombing perspective.

The influence of Spaatz (and Arnold) in the selection of field commanders and air staff members lasted for at least twenty years after the dawn of the nuclear age. The rule of this group of Bomber Barons was probably not as complete as some have made it, but it was dominant until the Bay of Pigs, and it remained strong thereafter. Spaatz' decision to split the combat power of the AAF and then the USAF into three different major commands was even more long-lasting. That functional organization remained the basic structure of the Air Force until the 1990s when all combat units were gathered again into the Air Combat Command.

Conclusion

The flaws in the pre–World War II strategic bombing theory were diminished by the increasing range of bomber aircraft; the increased deadliness of atomic weapons; and the increasing irrelevance of bombsight accuracy, a result of the overwhelming effects of nuclear weapons. Spaatz and others anticipated early that escorts would no longer be necessary because the speed of jets made them vulnerable only to stern shots whose effects would be limited. Intercontinental missiles with nuclear warheads removed the difficulty of achieving deep penetrations, even in the presence of radar, by reducing the warning time to near zero. Electronic development was on an increasingly steep curve.

Technology was only one of the factors propelling the evolution of air theory and doctrine. In Spaatz' day, strategic air attack assumed the most prominent role, although other missions were not abandoned. Budgetary concerns increasingly conditioned airmen's thoughts so that, after Spaatz' retirement, the USAF became even more focused on the strategic role.

The debate about the seriousness of the Cold War threat is vigorous now that access to the Soviet archives has increased,[44] but it is certain that the strategic mission fulfilled airmen's bureaucratic interests as well as the logic of international relations and grand strategy.

International relations and military affairs are greatly influenced by personalities. In the short term, at the time of the creation of the National Defense Establishment, Forrestal and the Navy perspective prevailed. In the longer term, the ideas of Truman and the soldiers and airmen who shared them assumed greater importance. Carl Spaatz was effective in representing the airmen's views. His skill at human relations was widely appreciated not only by his fellow service members,[45] but also by some of his most stouthearted adversaries outside the air arm.[46]

It appears that Spaatz was the right man for his time and place. He was better equipped for the task than either his predecessor Arnold or his successor Vandenberg, better also than either of the other Air Force four-star generals, George Kenney and Joseph McNarney. Arnold is famous for his irascibility and impatience. Vandenberg was often viewed as a too rigid air power advocate and, incidentally, too much younger than most of his counterparts. Kenney was a wonderful speaker with a creative imagination, but he was sometimes seen as too quick to shoot from the hip.[47] It is questionable whether senior AAF leaders would have given him widespread support. It is equally doubtful that McNarney would have had the necessary support since he came later to aviation than many others of his rank and had neither the flying nor the combat command experience that Spaatz enjoyed. Spaatz was also the closest to Arnold and Eisenhower, although McNarney was a clear favorite of George Marshall.

In an interview with Secretary Symington, when I commented that Carl Spaatz retired in frustration and disappointment, Symington became irate. He asserted stoutly that I must judge Spaatz' career to be a triumph. Spaatz achieved the main goal after all, the creation of an independent Air Force, the dream of a lifetime. Therefore, according to Symington, Spaatz left the service a happy man.

Whatever sense of achievement or disappointment Spaatz might have felt, the establishment of the USAF was a limited victory, a comprehensive compromise. There was an Air Force, but not a unified air arm. Each of the other military services retained its own air force. The new Department of Defense proved to be a weak reed to lean upon. The powers of its secretary were so constrained that only after the passage of nearly a half century did the Defense Department begin to approach what had been envisioned by Marshall, Eisenhower and Spaatz—and Mitchell long before them.

As to the Revolution in Military Affairs, there is a strong tendency for people to think that their own generation is the most successful. We are giants who walk in the land. Those who preceded us were old-fashioned pygmies; those who follow are naïve pygmies. Our own times are unique, somehow tougher and more modern than all that has passed. But Carl Spaatz' experiences at the dawn of the nuclear age should instill some caution about the notion that America is currently enjoying a unique Revolution in Military Affairs. For the first time in history, the technology of Spaatz' era promised immediate mass destruction across the globe. Military thought since the nineteenth century has held that it might be possible one day to leap over the enemy's armies to destroy the basic sources of his strength, almost instantly and at much lower cost than ever before. In Spaatz' day that prospect came to be taken seriously by politically significant numbers of the American people and their leaders. The technology and doctrinal thought of that time resulted in a new arrangement of military forces that was a major evolution, if not a revolution. The creation of a unified Military Establishment that aspired to become a true Department of Defense and a third autonomous service whose principal function was the conduct of the strategic air offensive and the maintenance of the threat in order to deter a third world war should rightly be seen as momentous events in American military affairs.

Notes

1. I.B. Holley, Jr., *Ideas and Weapons: Exploitation of the Aerial Weapon by the United States during World War* I (New Haven, Conn.:Yale University Press, 1953; Washington, D.C.: Office of Air Force History, 1983, 1997), 19, anticipates current writings on the Revolution in Military Affairs by analyzing the United States' adaptation of doctrine and organization (or failure to adapt) to accommodate the coming of aircraft into the First World War.

2. Two books have been written on Spaatz, my own *Master of Airpower* (Novato, Calif.: Presidio, 1988) and Richard Davis' *Carl A. Spaatz and the Air War in Europe* (Washington, D.C.: Center for Air Force History, 1993).

3. A leading authority on the Finletter and Brewster Boards is Donald Edward Wilson, "The History of President Truman's Air Policy Commission and Its Influence on Air Policy, 1947–1949," unpublished Ph.D. dissertation, University of Denver, 1978.

4. Daniel R. Mortensen, *A Pattern for Joint Operations: World War II Close Air Support North Africa* (Washington, D.C.: Office of Air Force History and U.S. Army Center for Military History, 1987), 47–83.

5. John T. Greenwood, "The Emergence of Postwar Strategic Air Force, 1945–1953," in Alfred F. Hurley and Robert C. Ehrhart, eds. (Washington: Office of Air Force History and the United States Air Force Academy, 1979), 218.

6. "Summary Minutes, First Meeting of the U.S. Air Force Aircraft and Weapons Board, 19–22 August 1947," in Box 181, Record Group (RG) 341, National Archives, College Park, Md. (NA II), gives a rather good summary of the attitudes of the Air Force Establishment at the birth of the USAF, still the ideal being a "balanced air force" with the emphasis on the strategic air attack mission; see also Lt. Gen. Ira C. Eaker, "The Army Air Forces, Its Status, Plans and Policies," draft speech, delivered at the National War

College, Washington, D.C., Jun 5, 1947, for General Spaatz, Box 286, Spaatz Papers, Manuscript Division, Library of Congress (LOC), Washington, D.C., 3–4, which explained at that moment there were in-being elements of eight heavy bomber groups, but there were three light bomber, two tactical reconnaissance and six troop carrier groups—more groups still devoted to tactical than to strategic use.

7. Holley's *Ideas and Weapons* in its original 1953 version expressed the essence of the definition of a Revolution in Military Affairs. Adm. William A. Owens, in his "The American Revolution in Military Affairs," *Joint Forces Quarterly*, Winter 1995–1996, 37–38, provides one sample in a sea of current articles on the subject. Others are James R. FitzSimmonds and Jan M. van Tol, "Revolutions in Military Affairs," *Joint Forces Quarterly*, Spring 1994, 24–31, and Henry C. Bartlett *et al.*, "Force Planning, Military Revolutions, and the Tyranny of Technology, " *Strategic Review* XXIV (Fall 1996): 28. R.L. DiNardo and Daniel J. Hughes, "Some Cautionary Thoughts on Information Warfare," *Airpower Journal* IX (Winter 1995): 69–79, provide a current skeptical view.

8. Donald MacKenzie's "Technology and the Arms Race," *International Security* 14 (Summer 1989) 161–176, is a review article on Matthew Evangelista's *Innovation and the Arms Race: How the United States and the Soviet Union Develop New Military Technologies* which discusses these things using the ex-Soviet system of command (top-down) research and development which can get things done rapidly, and the U.S. system of a more spontaneous (bottom-up) method which develops a greater variety of new options depending on ideas from the field to a large extent; see also Aaron L. Friedberg, "Science, the Cold War, and the American State," *Diplomatic History* 20 (Winter 1996): 107–118.

9. Rprt, Maj. Carl A. Spaatz to Chief, U.S. Army Air Corps, "Report of the Flight of the *Question Mark*," Jan 1–7, 1929, Box 110, Spaatz Papers, LOC. Spaatz speculates not only that the refueling technique permits longer ranges for bomber missions and other combat aircraft as well, but also on the improvement of ranges and speeds for commercial air traffic. For a contemporary analysis, see Charles F. McReynolds, "The Refueling Flight of the *Question Mark*," *Aviation* 26 (Jan 19, 1929): 158–162, in which the meaning for bombing flights and for commercial aviation is mentioned.

10. Mark D. Mandeles, draft paper, "Jean de Bloch and the Future of War," paper prepared for delivery to the Military Classics Seminar, Jan 16, 1990 (rev. 1996), 53, 98.

11. Thomas Julian, draft article, "The Origins of Air Refueling in the United States Air Force," n.d., copy in the possession of the author.

12. Thomas A. Keaney and Eliot A. Cohen, *Revolution in Warfare? Air Power in the Persian Gulf* (Annapolis, Md.: Naval Institute, 1995), 194.

13. Carl A. Spaatz, "Air Power in the Atomic Age: The Fantastic and Appalling Possibilities of Future Warmaking," *Colliers*, Dec 8, 1945, 11–14 *passim*, copy of draft manuscript in Box 269, Spaatz Papers, LOC.

14. Spaatz, "Air Power in the Atomic Age"; Rprt, Secretary General of the Air Board to Assistant Chief of the Air Staff–13, "Army Air Forces Concept of Strategic Bombing," Jun 7, 1946, Box 276, Spaatz Papers, LOC. In this report, Maj. Gen. Hugh Knerr dwells upon the need for force in-being, the lack of time for mobilization, and the deadliness of an atomic armed surprise attack. Among the places Spaatz and the other leaders referred to one-way missions was his "Future Use of Air Power" draft speech, Wings Club Dinner, Waldorf Astoria, New York, Mar 19, 1946, Box 269, Spaatz Papers, LOC. In 1947 LeMay, uncertain of the other measures of reaching the target, was still speaking of one-way trips. Mandeles, "Future of War," 94.

15. Carl A. Spaatz, "Spaatz Board Report," draft, Oct 23, 1945, Box 22, Spaatz Papers, LOC.

16. *Ibid.*; David MacIsaac, Working Paper No. 8, Wilson Center, Smithsonian Institution, Washington, D.C., "The Air Force and Strategic Thought, 1945–1951," Jun 21, 1979. The Joint Strategic Survey Committee shared many of the same assumptions that same Fall. Walton S. Moody, *Building a Strategic Air Force* (Washington, D.C.: Air Force History & Museums Program, 1996), 42.

17. Robert Frank Futrell, *Ideas, Concepts, Doctrine:Basic Thinking in the United States Air Force, 1907–1960*, Vol. I (Maxwell AFB, Ala.: Air University, 1971, 1989), 5, identifies AFM 1–2 dated Apr 1, 1953.

18. Robert T. Finney, *History of the Air Corps Tactical School, 1920–1940* (Maxwell AFB, Ala.: Air University Research Studies Institute, 1955; Washington, D.C.: Center for Air Force History, 1992).

19. Michael Howard, "Military Science in an Age of Peace," Chesney Memorial Gold Medal Lecture, Oct 3, 1973, reprinted in *Journal of the Royal United Services Institute* 119 (Mar 1974): 3–11.

20. A huge and growing literature exists on this subject, a fine recent source being Alan J. Levine, *The Strategic Bombing of Germany, 1940–1945* (Westport, Conn.: Praeger, 1992). Other recent good sources include Conrad C. Crane, *Bombs, Cities and Civilians* (Lawrence: University Press of Kansas, 1993), and Stephen L. McFarland and Wesley Phillips Newton, *To Command the Sky: The Battle for Air Superiority over Germany, 1942–1944* (Washington, D.C.: Smithsonian Institution, 1991).

21. Here again the literature is vast and growing, stimulated especially over the fiftieth anniversary of Hiroshima and the controversy over the commemorative display that had been planned for the Smithsonian Air and Space Museum. Michael Sherry's *The Rise of American Air Power: The Creation of Armageddon* (New Haven, Conn.: Yale, 1987) is so well researched and has attracted so much attention that the scholar cannot ignore it—notwithstanding that I do not at all agree with its approach and style. Another recent book sure to stimulate a similar controversy is Robert A. Pape, *Bombing to Win: Air Power and Coercion in War* (Ithaca, N.Y.: Cornell, 1996), so much so that an upcoming issue of *Security Studies* is scheduled to be almost entirely devoted to various review-essays on that book. It contains chapters on both Germany and Japan.

22. Carl A. Spaatz to Henry H. Arnold, Dec 3, 1944, Box 58, Spaatz Papers, LOC, in which he remarks "When it is possible to build a bomber at terminal speeds, the necessity for the escort fighter may have passed."

23. "Spaatz Board Report"; Mandeles, "Future of War," 87.

24. Gen. Carl Spaatz, "Strategic Air Power: Fulfillment of a Concept," *Foreign Affairs* 24 (Apr 1946): 385–396, suggests by its title that the essence of the preatomic theory and doctrine remained sound. The article gives a concise and readable summary of the attitudes common on the Air Staff and those of Spaatz himself.

25. As it happened, the B–47s and B–52s never really had to fight their way through an aircraft defense. However, one scrap of information that tends to support that theory is that all the kills of B–52s in Linebacker II (15 aircraft brought down) were accomplished by ground-based air defenses. At least two MiGs were indeed shot down by the tail guns of B–52s, and had they been bristling with weapons in other places, as was the B–36, it probably would not have done any good—it would have only reduced the bombload. See Brig. Gen. James R. McCarthy and Lt. Col. George B. Allison, *Linebacker II: A View from the Rock* (Maxwell AFB, Ala.: Airpower Research Institute, 1979; Washington, D.C.: Office of Air Force History, 1985), 116, on the MiG kills.

26. The Joint Strategic Survey Committee report to the Joint Chiefs of Staff, "Guidance as to the Military Implications of a United Nations Commission on Atomic Energy" (Jan12, 1946, Box 178, RG 341, NA II) recommended that the JCS look favorably on international control in the hope of avoiding a nuclear arms race, and because the most vulnerable targets for atomic weapons were advanced industrial countries of which the United States was one.

27. Russell F. Weigley, *The American Way of War: A History of United States Military Strategy and Policy* (Bloomington: Indiana University Press, 1973), 373; "Spaatz Board," 5; Phillip S. Meilinger, *Vandenberg: The Life of a General* (Bloomington: Indiana University Press, 1989), 63–65; Herman S. Wolk, "Men Who Made the Air Force," *Air University Review* XXIII (Sep–Oct 1972): 11.

28. Harry R. Borowski, *A Hollow Threat: Strategic Air Power and Containment Before*

Korea (Westport, Conn.: Greenwood, 1982), 4. This was shown in that by 1947 the technical plans for the B–52 did not include a requirement for the carriage of conventional bombs. Mandeles, "Future of War," 87.

29. Memo, Carl A. Spaatz to Secretary, Joint Chiefs of Staff, "Reply to Mr. Baruch's Letter of 24 May 1946," Jun 10, 1946, Box 18, RG 341, NA II.

30. Borowski, *Hollow Threat*; Spaatz to Lt. Gen. Lewis H. Brereton, Chairman of the Military Liaison Committee to the Atomic Energy Commission, "Information on Military Applications of Atomic Energy," Oct 7, 1947, and "Delivery of Atomic Weapons to the Armed Forces," Oct 31, 1947, both in Box 256, Spaatz Papers, LOC. The Spaatz correspondence provides but two examples among many of efforts to overcome the problem.

31. He himself always remembered it as three, and it is cited that way in many sources although the official Air Force tally gives him but two kills.

32. According to Gen. William McKee, Spaatz did not want to be Chief of Staff of the Air Force either, but Secretary Symington leaned on him, and Spaatz consented with the provision that he would walk out at the end of a year. Intvw, Gen. William McKee with David R. Mets, Washington, D.C., Mar 23, 1983.

33. Borowski, *Hollow Threat*. See especially p. 48 for reference to two combat-ready groups.

34. "Spaatz Board Report," 5, cites need for outlying bases. In his *Colliers* article of December 1945 (p. 84), Spaatz, throws in the notion that the Army and Navy are still needed almost as an afterthought Four months later, in his *Foreign Affairs* article ("Fulfillment of a Concept") he suggests that the air offensive might end the war before the Army and Navy had time to engage the enemy.

35. Wolk, "Men Who Made the Air Force," 14.

36. Intvw, Gen. Carl A. Spaatz with Brig. Gen. Noel Parrish and Dr. Alfred Goldberg, USAF Oral History Program No. K239.0512–754, USAF Historical Research Agency (HRA), Maxwell AFB, Ala., 5.

37. Herman S. Wolk, *Planning and Organizing the Postwar Air Force, 1943–1947* (Washington, D.C.: Office of Air Force History, 1984), 130, cites Spaatz as saying the fragmentation of combat air power was not done under pressure, but this source still offers up Wolk's earlier interpretation as a possible explanation as well.The year after Spaatz retired, a committee of scientists headed by Louis N. Ridenour made the formal recommendation that research and development be separated into its own command specializing in the work. Albert E. Misenko and Philip H. Pollock, *Engineering History, 1917–1978, McCook Field to the Aeronautical Systems Division*, 4th ed. (Wright-Patterson AFB, Ohio: Aeronautical Systems Division History Office, 1979), xvii; Briefing, Maj. Gen. R.C. Coupland to the Scientific Advisory Board, "The Future of Armament Research and Development," Jul 12, 1949, on file at Air Force Development Test Center History Office Eglin AFB, Fla.; Jacob Neufeld, ed., Reflections on *Research and Development in the United States Air Force: An Interview with General Bernard A. Schriever and Generals Samuel C. Phillips, Robert T. Marsh, and James H. Doolittle, and Dr. Ivan A. Getting* (Washington, D.C.: Center for Air Force History, 1993), esp. General Schriever, pp. 37–39.

38. Jacob Neufeld, *The Development of Ballistic Missiles in the United States Air Force, 1945–1960* (Washington, D.C.: Office of Air Force History, 1990), 17–19; Kenneth P. Werrell, *The Evolution of the Cruise Missile* (Maxwell AFB, Ala.: Air University Press, 1985), 79–81.

39. Neufeld, *Ballistic Missiles*, 20–23. For the Air Force establishment's view on missiles at the outset, see U.S. Air Force, Deputy Chief of Staff (DCS) Operations, Guided Missiles Group, "Item 5, Guided Missiles Program," copy in Rprt, First Aircraft and Weapons Board, DCS Development, n.d. [Aug 1947], Box 182, RG 341, NA II, which did not see a possible defense against ballistic missiles, but which anticipated all the types of missiles that have come into use by 1997. At that point, though, the highest developmental priority was for air-to-surface and air-to-air missiles that would enhance the potential

of bomber aircraft.

40. J.D. Gerrard-Gough and Albert B. Christman, *History of the Naval Weapons Center: China Lake, California*, Vol. 2, *The Grand Experiment at Inyokern* (Washington, D.C.: Naval History Division, 1978), 179.

41. DCS Operations, "Guided Missiles Program," 4.

42. McKee intvw, Mar 23, 1983.

43. Spaatz was, in fact, the grand marshal of Eisenhower's first inaugural parade.

44. Mark K. Kauppi, "Strategic Beliefs and Intelligence: Dominoes and Bandwagons in the Early Cold War," *Security Studies* 4 (Autumn 1994): 4–39; Mary N. Hampton, "NATO at the Creation," *Security Studies* 4 (Spring 1995): 610–656; William C. Wohlforth, "New Evidence on Moscow's Cold War: Ambiguity in Search of Theory," *Diplomatic History* 21 (Spring 1997): 229–242; Beisner, "Patterns of Peril," pp. 321–355; Robert C. Tucker, "The Cold War in Stalin's Time: What the New Sources Reveal," *Diplomatic History* 21 (Spring 1997): 273–281.

45. McKee intvw, 23 March 1983; Intvw, W. Stuart Symington with David R. Mets, Aug 4, 1982.

46. Stephen Jurika, Jr., ed., *From Pearl Harbor to Vietnam: The Memoirs of Admiral Arthur W. Radford* (Stanford Calif.: Stanford University, 1980), 82, 115; Intvw, Adm. Arleigh Burke with David R. Mets, Fort Myer, Va., Mar 25, 1983.

47. Borowski, *Hollow Threat*, 140.

The War from above the Clouds: B–52 Operations during the Second Indochina War And the Effects of the Air War on Air Power Doctrine

William P. Head

Introduction

Before discussing air power doctrine, it is important to define the term. In one of the most recent statements on the subject, Col. Dennis M. Drew in his paper "Vietnam, 'Wars of the Third Kind' and Air Force Doctrine," asserts that doctrine is basically a "framework for understanding how to apply military power. It is what history has taught us works in war, as well as what does not."[1] The 1992 Air Force Basic Aerospace Doctrine Manual includes a historical perspective, defining Air Force doctrine as "what we have learned about aerospace power and its application since the dawn of powered flight." In the widest sense, doctrine is "a broad conceptual basis for our understanding of war, human nature, and aerospace power," which is "the starting point for solving contemporary problems."[2] Drew cautions that "although doctrine may not fulfill all of the requirements of a formal academic definition of theory, it fulfills most of the same functions and in that sense forms a 'poor man's' theory of air power."[3]

Students of military history and United States Air Force officers are familiar with Giulio Douhet's theories of strategic bombing attacks on vital centers in the enemy's heartland. Also, Billy Mitchell's vision of vast fleets of bombers and of a separate and equal strategic air arm that could conclude wars with little or no support from land armies is well known. The ideas of these early air power pioneers and the efforts of World War II airmen, such as Hap Arnold and Carl Spaatz, formed the basis of the argument for the creation of a separate U.S. Air Force.[4]

In 1965, when U.S. air power entered the Second Indochina War, these theories underlay Air Force strategy and doctrine. Official doctrine that espoused them appeared in 1953, with modifications made to the manual in 1954, 1955, and 1959. Even though the first manual appeared on the heels of the Korean conflict, and a growing number of brushfire conflicts were unfolding in the developing former colonial nations of Africa, Asia, and Latin America, all of these basic doctrine manuals essentially ignored any direct mention of insurgency conflict or the broader concepts of limited war.[5] As Colonel Drew contends, "In each case it was as if the struggles of Southeast Asia did not exist and, for the most part, as if the Korean War had not happened. It took till 1955 for the official doctrine to even acknowledge the broader concepts of limited war."[6]

Even at the levels below Air Force Manual (AFM) 1–2, there was a similar lack of attention paid to insurgency or counterinsurgency. Caught up in the Cold War, airmen were all but totally focused on nuclear strategic conflicts with the Soviet Union and fulfilling their role as a component of America's nuclear triad. One notable exception appeared in 1953 in the form of AFM 1–3, *Theater Air Operations Doctrine Manual.* It mentioned, for the first time, what it called "special operations." Although using the 1950s catch phrase for insurgency conflict, it defined special operations as "inserting agents behind enemy lines, supplying partisans, and delivering propaganda." The 1954 revision continued in this vein.[7]

Air Power Enters the War in Vietnam

Early in the Cold War the U.S. Air Force (USAF), through its policy, doctrine, and weapons development, focused on its strategic role of delivering a nuclear strike against the Soviet Union (USSR) or People's Republic of China (PRC). During the 1950s and 1960s the Boeing Corporation built the B–52 Stratofortress for this mission. Although it was deployed to serve the national security policy of mutually assured destruction (MAD), mutual nuclear force buildups, and U.S. conventional force reductions, as then USAF Chief of Staff Gen. Ronald R. Fogleman noted, "The harsh realities of Korea and Vietnam showed us the limits of nuclear deterrence and revitalized our interest in, and support for, conventional capabilities."[8]

During the Kennedy years Army and Navy factions in the Joint Chiefs of Staff (JCS) argued that the future would see more limited wars. Therefore U.S. military forces became more conventional, and budgets of the early 1960s did not provide for a new bomber or even the production of more B–52s. They were supplanted instead by Minuteman and Polaris missiles as well as tactical weapons such as the F–4 Phantom. The XB/YB–70 Valkyrie supersonic bomber program, though a pet project of USAF Chief of Staff Curtis LeMay (1961–1965), ended because it could not carry such things as the Skybolt air-to-ground missile. Even the former first Secretary of the Air Force, and by then senator from Missouri, W. Stuart Symington, disapproved of the bomber.[9]

Indeed, the entire tenor of U.S. defense policy changed in the transition from the Eisenhower to the Kennedy administrations. This shift culminated when the new President met with British Prime Minister Harold MacMillan in

Nassau in December of 1962. In what became known as the Nassau Communiqué the two leaders concluded that there was a need to reverse the atomic "sword" and conventional "shield" strategy. In addition to a nuclear shield, they agreed on the importance of a nonnuclear sword.[10]

In short, the U.S. defense policy based on massed manned bomber retaliation against the USSR would be replaced by a buildup of conventional weapons and forces to combat brushfire wars in the former colonial and developing nations of the world. With the Cuban missile crisis fresh in everyone's mind, President Kennedy was determined never again to be left in a situation where he had to commit all or nothing. Starting a nuclear war over Cuba had nearly occurred because the United States had placed all its military eggs in the single basket of manned bombers. Kennedy now moved toward a future in which the United States would be capable of a measured and flexible response to such confrontations.[11]

It was a change that did not sit well with most air power advocates. Gen. Curtis LeMay, USAF Chief of Staff and father of the Strategic Air Command, openly expressed doubt about dependence on ICBMs at the expense of funding for the B–70 program.[12] John Loosbrod, editor of *Air Force/Space Digest*, went so far as to declare that the "doctrine of nuclear deterrence is being replaced by a doctrine of nuclear stalemate. The strategic umbrella, under the shelter of which major Soviet aggression has been deterred or repulsed at many times and in many places since the end of World War II, is being replaced by a strategic ceiling—rigid, immovable, and possibly brittle."[13]

The policy for which the B–52 had been built and deployed, nuclear deterrence, had begun to change as early as the Defense Reorganization Act of 1958, which declared that "the day of the separate ground, sea, and air warfare was gone forever." Indeed, the change in Air Force thinking during the 1960s under the able leadership of Secretary of the Air Force Eugene M. Zuckert eventually led to the creation of radically new basic doctrine. Instead of the 1950s habit of simply changing words and updating catch phrases, the 1964 basic doctrine reflected a new centralized defense structure and a call for flexibility in the Air Force.[14]

Even as the policy debate continued, the U.S. defense establishment was drawn deeper and deeper into the growing war in Southeast Asia. While the Air Force had concentrated on bombers and its strategic mission throughout the late 1950s and wrestled with changes in its roles, missions, and doctrine in the early 1960s, Presidents Dwight D. Eisenhower, John F. Kennedy, and Lyndon Baines Johnson continued the buildup of material support and troop commitments to the U.S.-supported anticommunist regime in South Vietnam, headed at first by Ngo Dien Diem.[15]

On November 1, 1964, southern guerrillas, known as Vietcong (VC), attacked the Bien Hoa Air Base just outside Saigon, destroying six B–57s and killing five U.S. Air Force personnel. President Johnson was outraged and wanted immediate retaliation. Air Force leaders therefore recommended a massive B–52 raid on the Phuc Yen MiG-capable airfield just outside Hanoi. However, the event coming as it did just before the 1964 election, the President decided against a counterattack but asked for a postelection report in order to assess his options.[16]

On November 11, 1964, Assistant Secretary of Defense John T. McNaughton and an advisory team drafted a report entitled "Action for South Vietnam" that presented three options. Option A proposed reprisals to punish the North for actions in the South. Option B, which the JCS supported, called for "a full-court press" and a series of "systematic attacks on the North—bombing rapidly, widely, and intensely." The final option called for a "progressive squeeze and talk" policy which combined covert operations in Laos and bombing of North Vietnam. It proposed to begin at a low level of intensity in the panhandle area and move up in both latitude and in the level of violence toward more lucrative targets in Hanoi and Haiphong.[17]

With the final approach yet to be determined, airmen made plans for full-scale intervention using U.S. air power into Southeast Asia. They focused on North Vietnam and the North Vietnamese Army's (NVA's) resupply of the guerrillas in the South along the Ho Chi Minh Trail rather than on the struggle for the hearts and minds of the South Vietnamese population. As noted above, their preferred plan (Option B) called for a campaign of classic and traditional strategic bombing attacks against the so-called 94 Targets List. Planners designed the campaign to destroy, among other things, North Vietnam's "capacity to continue as an industrially viable state."[18]

President Johnson favored the last option because he believed it allowed him to increase pressure until he could reach a negotiated settlement that left pro–United States South Vietnamese to build a secure and independent non-communist nation. In theory, it meant that the United States could increase the "quotient of pain" at any time using the implied threat of increased military violence to intimidate Hanoi and the southern, communist-dominated National Liberation Front (NLF) into acting as the United States wished. It also avoided a direct confrontation with either the USSR and PRC and provided a consensus within the administration and Congress that President Johnson needed to effect his policies elsewhere. Option C eventually led to Operation Rolling Thunder (1965–1968), the first U.S. air assaults against the North. But Johnson would not allow B–52s to perform these strategic raids. Instead, their execution was left to tactical aircraft flying from land bases in South Vietnam and from U.S. aircraft carriers in the Gulf of Tonkin.[19]

Later, critics of Rolling Thunder and all U.S. strategic bombing efforts would argue that none of the necessary prerequisites for strategic bombing were present. They would contend that the war, at least before March 1972, should have been an effort to pacify the South by defeating a guerrilla insurgency, rather than an attempt to destroy North Vietnam. Besides, North

Vietnam, they would declare, was not a modern industrial state vulnerable to strategic bombing. Thus, none of the plans based on traditional air power operations could have worked. In fact, Rolling Thunder did not work.[20]

As events and competing plans unfolded, President Johnson, almost before he realized it, found himself mired in what he called "a piss ant little war" in Vietnam. U.S. operations soon fell under a policy of a gradual force buildup and limited use of air power. It was a plan that generally ignored the need to stabilize South Vietnam socially, politically, or economically. The approach, coupled with the resilience of the enemy, would be inadequate to secure South Vietnam or defeat the VC or the People's Army of Vietnam.

For Johnson, U.S. air power—traditional air power—became a compromise weapon because it limited the commitment of ground forces, especially reserves, and it racked up spectacular numbers and pictures of destruction. It also satisfied "hawks" like Senators Richard B. Russell and John Stennis, while mollifying moderates and defusing liberals. But the President rightly feared that air attacks too close to China might cause a repeat of the Korean experience which delayed the settlement of that brushfire war for two years. Thus, early U.S. air operations were tightly restricted from fear of a war with the PRC and/or the USSR. Not until the 1970s would President Richard M. Nixon, with friendlier relations with China and the Soviets on the horizon, employ B–52s in a more conventional and effective fashion. But by then the nature of the war had changed; "Vietnamization" was underway and air power was used to cover a U.S. retreat.

Insurgency War and Doctrine in the Early 1960s

As noted earlier, the early 1960s saw a shift in Air Force thinking brought on by the Kennedy administration's new view of international conflict. Moreover, within the inner circles of the Air Force, especially within the newly created Aerospace Doctrine Division of the Office of Deputy Chief of Staff for Plans and Programs, key leaders believed that a new, more clearly stated basic doctrine was needed, as was long-range planning. Instead of the cosmetic changes in doctrine that had been the norm in the 1950s, many, like Maj. Gen. Dale O. Smith and Brig. Gen. Jerry D. Page, who headed doctrinal work within the Air Force, wanted substance and eternal vision incorporated into Air Force doctrine.[21] While this did not mean that insurgency would become a major emphasis, it did mean that airmen needed to define clearly the nature of their job. With the war in Vietnam expanding, any redefinition would have to include a conventional role for air power because the Air Force, albeit reluctantly, would participate in such a war.

The interest in insurgency warfare among airmen was growing in the early 1960s. In 1962, Air Force Chief of Staff General LeMay wrote an article entitled "Air Power in Guerrilla Warfare" that gave recognition to a role for air power in low-intensity conflict. LeMay concluded that "general war poses the primary military threat to the security of the Free World and it is under the umbrella of strategic superiority that the United States has freedom of maneuver in the lesser forms of conflict."[22] That same year, the newly created Special Air Warfare Center held a symposium on limited war as part of the Air Force Association national convention. The interest generated by this meeting and the growing role of the United States in Vietnam culminated in the publication of a new *Air Force Basic Doctrine* manual in August 1964. Within the manual one brief chapter correctly described both insurgency and the goals of counterinsurgency. It delineated air power's role in both combat and noncombat missions and discussed the "difficulties in interdicting guerrilla lines of supply."[23]

This last concern would need to be addressed again during Commando Hunt operations between 1968 and 1972. Ironically, Commando Hunt would prove the efficacy of the part of the new basic doctrine manual that dealt with interdicting guerrilla lines of supply, as well as compare the relative merits and shortcomings of B–52s in attempting long-range interdiction missions over enemy-held territory, especially over imposing mountains and dense jungle terrain.

But while the new basic doctrine manual of August 1964 included a discussion of insurgency and counterinsurgency, like LeMay's earlier article, its doctrinal emphasis remained, according to Colonel Drew, "where it had been since the advent of nuclear weapons and the creation of the independent Air Force," on the strategic mission.[24]

Arc Light, 1965–1968

Despite the internal debates over doctrine, when the first B–52Fs arrived in Vietnam, Air Force leaders soon found, much to their consternation, the flagship of the strategic air fleet employed in a role contrary to the traditional concepts of strategic projection. The assigned missions were known as Arc Light: high-altitude close air support (CAS) or interdiction operations flown from June 18, 1965, to August 15, 1973, mostly south of the 17th parallel.[25]

The first thirty B–52Fs arrived at Andersen AFB in Guam in February 1965. At one point in March the JCS seriously considered incorporating these long-range bombers in the new Rolling Thunder air campaign composed mostly of Air Force, Navy, and Marine Corps tactical fighters and fighter-bombers attacking targets in North Vietnam. Many Air Force leaders, particularly senior officers of the Strategic Air Command, were displeased that the Buffs were in Southeast Asia at all. They feared too few might be left on alert to fulfill their role as part of America's nuclear triad.[26]

In April, Military Assistance Command, Vietnam (MACV) Commander Gen. William C. Westmoreland implored the JCS to allow him to use B–52s against concentrations of Vietcong troops, enemy bunkers, cave complexes, and regional headquarters.[27] In May the JCS approved his request, and on June

18, 1965, the first B–52 raid took place against VC forces ten miles north of Saigon.[28] After the raid, Army of the Republic of Vietnam (ARVN) reconnaissance teams found no enemy bodies and little material damage because the VC had been tipped off.[29] Furthermore, the raid brought additional embarrassments. One news account compared Arc Light to "a housewife swatting flies with a sledge-hammer."[30]

In spite of the mixed reviews, plans soon went forward for more raids with the B–52s flying fifteen more missions by August. At the same time the thirty bomber flights were replaced by fewer planes flying more missions. Raids no longer had to be preapproved; instead, five free-bomb zones were created—two just north of Saigon, two at the southern tip of South Vietnam, and one just southeast of Da Nang. The smaller raids began on August 26, and by October as few as five planes flew in formations, allowing the 30 B–52Fs to carry out multiple missions.[31]

While refined tactics and more careful security measures brought improved bombing results, it was clear from the outset that the B–52s needed to carry larger payloads. In the late summer of 1965 the Air Force approved the Hi-Density or Big Belly modification program. Ironically, one of the immediate effects of increased B–52 bombloads and sorties was a bomb shortage which also affected Rolling Thunder. Some Air Force officers privately suggested that Army leadership in Vietnam was using Arc Light to undermine what they perceived to be the more important air campaign over North Vietnam. True or not, such sentiment indicated the frustration that was building among airmen at the time.[32]

To compound this tension, in the spring of 1966 President Johnson approved a plan by which the Commander in Chief, Pacific Command (CINCPAC), Adm. U.S.G. Sharp, would determine target designation.[33] Airmen already resented Army ground commanders for putting the greatest strategic bomber ever built into a CAS role, but to have a naval officer select targets seemed unbearable. Of course, target restrictions and lack of target flexibility had hampered air operations in Rolling Thunder. Except for Rolling Thunder, restrictions and target approvals came directly from the White House, degenerating target value and expanding response time.

Although General Westmoreland was pleased with the new Arc Light policies, Gen. William Momyer, Seventh Air Force commander, worried openly that the entire process not only violated the basic concept of a separate strategic and tactical air force run by airmen trained in such combat, but that "Westmoreland's employment of the B–52s as long-range artillery to suppress 'what may or may not be suspected concentrations or supply areas' was questionable and relatively ineffective."[34] Momyer wanted to use the B–52s against specific targets, reserving just two squadrons to fly Arc Light. He believed that B–52s would be more effective in an interdiction role against enemy forces infiltrating South Vietnam along the Ho Chi Minh Trail. Indeed, this kind of operation would be eventually undertaken from 1968 to 1972 and designated Commando Hunt.

But the basic disagreement over the use of air resources, especially B–52s, had a more fundamental origin. Both generals had a preconceived notion of how best to use aircraft in combat and, as John Schlight argues in his book *The Years of the Offensive*, "there were no quantifiable assessments, each general adopted a position that fit his preconception of the role of air power." Indeed, the United States and her allies did not often send armed reconnaissance teams into enemy areas after air raids to inspect and quantify results. Instead, they eventually opted for mathematical indices and formulas based on what they hoped were best-guess scenarios and assumptions about enemy tactics and methods of combat.[35]

In the end the JCS agreed upon a compromise whereby Momyer became General Westmoreland's MACV air deputy. Under the plan, Momyer assumed operational control, and most Air Force officers, especially from intelligence, were moved from MACV to Seventh Air Force. But much remained the same, and as Momyer noted, "as long as Westmoreland picked the targets the aircraft would continue to be used for close air support."[36]

By the end of 1966 B–52s had flown a total of 5,000 sorties while U.S. "tactical aircraft" had flown 74,000 fixed-wing bombing sorties. By March 1968 B–52 sortie rates had risen to 1,800 per month, so the normal turnover of trained pilots and crews made it difficult for SAC to fulfill its dual mission with rated personnel. As early as January 3, 1967, pilot shortages required a recall of 2,300 older pilots and a compressed program to train 3,200 new pilots per year.[37]

During early 1968, B–52s supported U.S. Marines during the communist siege of Khe Sanh and, in many ways, proved to be a decisive factor in the outcome.[38] President Johnson enthusiastically described the Khe Sanh air campaign as "the most overwhelming, intelligent, and effective use of air power in the history of warfare."[39] He therefore halted U.S. bombing of the North in an effort to start serious peace negotiations, even though Arc Light raids continued. Commando Hunt achieved only marginal success, owed in part to the fact that it began as Rolling Thunder ended, giving the enemy a head start down to the Ho Chi Minh Trail.[40]

Air Force Theory and Doctrine in the Late 1960s and Early 1970s

During the late 1960s only one significant study examined the effects of B–52 antiguerrilla CAS operations on Air Force doctrine. Written by SAC historian Robert Kipp and published in the *Air University Review*, "Counterinsurgency from 30,000 Feet" was primarily an operational look at the subject in which the author touted the effectiveness of the B–52 bomber in countering guerrilla forces. It was not an in-depth analysis that attempted to define new air power theory or expound upon insurgency or limited war and/or air power's role in such conflicts.[41]

But in March 1967 official doctrine witnessed a dramatic change with the publication of AFM 2–5, *Tactical Air Operations: Special Air Warfare*. This manual offered the first detailed and thoughtful analysis of "special air warfare," defining it as the efforts to "strengthen or create resistance to enemy authority among the people within enemy territory." The authors determined that "military and non-military counterinsurgency actions must be totally intertwined and mutually supporting," and they called for the creation of "country teams" that were to include diplomats, civilian aid personnel, information agents, military assistance advisers, as well as unified military command and military component command personnel. Such teams, they argued, should be used to establish and direct a unified strategy.[42]

In addition, the manual declared that the military component must be able to adjust to each phase of the insurgency conflict, which might range from nation-building to open combat. The manual noted that it was very difficult to obtain totally accurate target identification during combat. Even so, such identification was very important since "military actions by friendly units which kill or injure innocent civilians can lose the loyalty of an otherwise friendly village." According to the authors, "both sides in an insurgency have the same 'center of gravity' [the people] and the objective of both sides is to capture the support of the population."[43]

The study is significant because its tenets ran, and still run, counter to traditional theories of strategic air power. In these Douhetan theories, centers of gravity must include industrial, geographic, and/or military targets. The kind of "special air warfare" described in AFM 2–5 was based on joint operations, not only with military ground forces but with civilian pacification personnel and in-country nationals. To this end therefore, the Air Force would airlift supplies to friendly military forces, bring humanitarian aid to local villages, and provide tactical air and gunship CAS operations. In short, air power would be low and slow, not high and fast. AFM 2–5 would limit the use of strategic weapons like the B–52 and strategic missions. The manual laid out a set of suppositions and air power concepts which, in those days, were at odds with traditional strategic theory and doctrine. Perhaps it was unreasonable to expect airmen to accept them easily.

By September 1971 when the next basic doctrine appeared, the air war in Vietnam was assuming a more traditional posture, and the emphasis had returned slowly and surely to the strategic, if not totally nuclear, focus of 1950s doctrine. To be sure, the Commando Hunt and Menu operations of 1968 through 1972 included numerous strikes by Big Belly B–52s carrying unprecedented bombloads. The big strategic bombers had been one of the main components of these interdiction efforts, especially during Commando Hunts V and VII. The 1971 manual was not a complete reversal of the publications of the mid-1960s, but it was an about-face, a move in a new direction.[44]

Although the 1971 basic doctrine manual did have a final chapter on nonconventional air combat, it did not focus on air power in counterinsurgency. Instead, it focused on the broader subject of Air Force Special Operations. Special Operations, by 1971, had become the latest catch phrase for insurgency conflict and was, in this case, designed to replace the phrase "special air warfare" used in the 1967 AFM 2–5. The 1971 AFM 1–1 introduced yet another term for counterinsurgency, "foreign internal defense." While the examination of "internal defense" covered only one paragraph, it did reiterate the earlier assertion that air operations should be coordinated with civil actions as well as surface force operations in a coordinated military-civilian campaign. The goal was to eliminate the causes of popular discontent and create a sense of national unity. Here again the B–52 was not the optimal weapon. Its primary role, according to AFM 1–1, was to provide a strategic nuclear strike against the Soviet Union.[45]

The War in Vietnam Changes in Nature: Linebacker I

By 1972 President Nixon had withdrawn nearly 500,000 U.S. troops, leaving only 69,000 in Indochina. On March 30, 1972, North Vietnam's senior general, Gen. Vo Nguyen Giap, using the rainy season to avoid air attacks, committed 14 divisions and 26 separate regiments supported by artillery and 200 tanks in a three-pronged invasion of South Vietnam. The Easter Offensive, lasting until September 16, aimed to boost flagging U.S. public support for the war during an election year, counter South Vietnamese successes in rural areas since 1969, and win the war before Nixon's détente policy affected Soviet and Chinese material support of Hanoi. Instead of undercutting Nixon, the offensive gave the President the public support necessary to retaliate.[46]

To counter the invasion Nixon ordered a general buildup of U.S. air power, sending 161 additional B–52s to Vietnam between February 5 and May 23, to create a total force of 210 Buffs, over half of SAC's strategic bomber force. Nixon was ready to "bring the enemy to his knees" by bombing North Vietnam and mining her harbors. Having negotiated closer ties with both Moscow and Peking, he could afford to be bolder with Hanoi.[47]

While most B–52s flew missions in the South to repel the enemy offensive, Nixon decided on a plan of sustained bombing and mining of Haiphong and other Northern harbors. Similar in design to Rolling Thunder, its main force was tactical aircraft using only a few B–52s. Operation Linebacker began on May 10 and officially ended on October 15, 1972. Linebacker I and collateral air operations (April 5–October 23, 1972) dropped 155,548 tons of bombs on North Vietnam—about 25 percent of the tonnage dropped during Operation Rolling Thunder.[48]

B–52s were used most effectively during this period in their Arc Light role. The aircraft flew numerous missions in support of ARVN defenders near cities like Quang Tri. Veteran MACV Army Gen. Bruce Palmer concluded that the North Vietnamese "appear to have had, in South Vietnam and adjacent areas of Laos, supplies sufficient to see them through their defeats, which were the accomplishments of the South Vietnamese infantry, tactical close air support, and the B–52s."[49]

Indeed, the enemy was mauled by South Vietnamese ground forces and U.S. air power, but in spite of their losses the NVA also made important gains, since they held much of the countryside in South Vietnam and still determined the tempo of the war. In fact, Hanoi had not been defeated but delayed. The NVA slowed the offensive to preserve their remaining 150,000 or so troops in the south, which they planned to rebuild during a new series of negotiations with the United States.[50]

Linebacker II

The 100,000 NVA troops that Hanoi argued had entered South Vietnam before March 31 became one of the greatest impediments to ending U.S. involvement in late 1972. In October, with a draft peace agreement on the table that would have left these troops in place, South Vietnamese President Nguyen Van Thieu demanded, among other things, their withdrawal. Nixon, reluctant to act without Thieu's support, did not sign the draft agreement.[51] However, he did suspend air attacks north of the 20th parallel as an act of good will. Impatient Northern leaders, angered by Nixon's hesitation, did not appreciate the bombing pause. Instead Hanoi condemned the United States for "going back on their word" to sign the agreement.[52]

In November Nixon won a decisive reelection victory, but the Republicans fell well short of a majority in Congress. Now Nixon had to complete negotiations quickly or risk having a Democratic Congress bring about a total and unilateral end to the U.S. commitment to South Vietnam. Nixon was willing to risk the loss of public support to guarantee aid to Saigon once U.S. combat troops were gone. He also wanted to be sure that he and not his principal negotiator, White House foreign policy adviser Henry Kissinger, gained history's credit for the peace. Thus, Nixon pressured Thieu to accept the best deal possible while he pressured Hanoi to accept at least a few of Thieu's revisions.[53]

When Hanoi balked, the President ordered air operations against North Vietnam. Some White House advisers wanted a repeat of Linebacker I, but Nixon decided to aim the campaign at enemy morale, using B–52s to send a message to both North and South Vietnam of U.S. resolve to end the war. Airmen would mount a three-day, around-the-clock, all-weather campaign against Hanoi itself.[54] In a revised plan drawn up in three days in November, SAC planners formulated an inflexible scenario that sent all three waves of bombers on the same route and at the same altitude. Staffers at Eighth Air Force were shocked, fearing an attrition rate as high as eighteen percent.[55] The plan aimed the attack at "rail yards, storage areas, power plants, communications centers, and airfields located on Hanoi's periphery." It employed fighters, using "smart bombs," to strike targets in populated areas, to avoid civilian casualties. The B–52s would also make night raids to force the populace to seek shelter during sleeping hours, increasing their psychological discomfort.[56]

Although plans changed and tactics evolved during Linebacker II's eleven days, B–52s flew 729 sorties against 34 targets north of the 20th parallel and dropped 15,237 tons of bombs. Air Force and Navy fighters flew 1,216 sorties and dropped 5,000 tons of bombs. They destroyed 383 rolling stocks, made 500 rail cuts leaving rail traffic in total disarray, totally destroyed 191 warehouses around Hanoi and Haiphong, reduced electric power generation from 115,000 kilowatts to 29,000, and reduced POL capacity by three-quarters. The United States lost 15 B–52s; 33 crew members became prisoners of war, and 33 died.[57]

On January 27, 1973, Secretary of State William P. Rogers signed a peace agreement with Hanoi ending America's active participation in the war. The United States could now disengage, in part because of the bombing in the north and also because Hanoi was concerned about its troops in the south that were still vulnerable to U.S. air power.[58] Moreover, Nixon had made progress toward closer relations with the PRC and USSR. Hanoi also knew that Nixon's aims, unlike his predecessor President Johnson's, were limited by both potential congressional constraints and U.S. public opinion.

During the war, U.S. aircraft dropped eight million tons of bombs and expended about $200 billion on aerial operations. Between June 18, 1965, and August 15, 1973, B–52s flew more than 125,000 combat sorties in all but one of the major air campaigns of the war. A total of 31 B–52s were lost, 18 to enemy fire over the North. In spite of their imposing record, B–52s brought the United States no closer to victory than did any other U.S. weapon or tactic since, as a component of policy. If the policy was flawed, so was the weapon.[59]

Effects of Vietnam on Air Force Doctrine since the War

How did the conflict affect Air Force doctrine after the war? One might expect that such a bitter and protracted experience would have had a long-lasting impact on the Air Force's basic theories of air power. However, there was no self-examination like the Army took with the publication of such books as Harry Summers' *On Strategy*. Instead, U.S. airmen have dealt with Vietnam by all but ignoring it in their official theory and doctrine.[60]

In this regard the 1975, 1979, and 1984 basic doctrine manuals continued the 1971 trend, giving "Wars of the Third Kind" only brief mention.[61] During the 1980s and 1990s important new works on air power in these conflicts were written by civilians such as Larry Cable and officers such as Lt. Col. Mark Clodfelter and Col. Dennis Drew, but the 1992 *Basic Aerospace Doctrine* made no reference to any of the analysis or arguments developed by them.[62]

Other insurgencies such as those in Afghanistan, El Salvador, and Nicaragua rekindled interest in Vietnam, and more analytical and balanced examinations of the war appeared. Authors like Cable and Drew made note of the fact that while the catch phrase had changed to "low-intensity conflict," insurgency was still a topic for analysis. But only a few official conferences and publications in the 1980s and 1990s examined air power's role in insurgency conflicts. In December 1990, the Army and Air Force published a pamphlet focused on low-intensity conflict which introduced a new strategy called Internal Defense and Development (IDAD). Two years later, on November 3, 1992, the Air Force introduced an operational-level manual for "Foreign Internal Defense" that examined counterinsurgency within the framework of the IDAD strategy.[63]

The latter publication opened its discussion of IDAD by declaring: "The aerospace role in development and mobilization focuses on administration and nation building." According to the pamphlet's authors, "where ground lines of communication cannot be established and maintained because of terrain or enemy presence, aerial logistic and communication networks carrying information, supplies, and services to civilian elements establish a critical link between the government and the population."[64]

Ultimately, AFM 2–11 concluded that "Aerospace power contributes most effectively when it functions as an integrated, joint component of the overall internal defense effort. It is least effective when employed unilaterally as a substitute for ground maneuver or long-range artillery." The author goes on to assert: "In many instances, air support can be exploited to its greatest advantage by emphasizing surveillance and logistic mobility over firepower." To be sure, "insurgents generally possess no air capabilities. They have no heartland, no fixed industrial facilities, and few interdictable LOC [lines of communication]." The manual concludes that the enemy's "irregular forces are deployed in small units that usually present poor targets for air attack."[65] Although the author does not refer to the historical antecedents, these doctrinal statements seem to have been, at least indirectly, influenced by the U.S. Air Force's experience in the Vietnam War.

Here again can be found an emphasis on joint operations and nonstrategic, nonbomber air power roles. B–52s are not mentioned in this context. In the earlier AFM 1–1 of 1992, the role of intercontinental aircraft is clearly presented as a strategic strike weapon. Even though by 1992 the Soviet threat was all but moot and B–52s had once again been used in their CAS role in the Gulf War, doctrine still declared them to be primarily a nuclear strike weapon. In spite of AFM 2–11's clear statement of air power insurgency doctrine, the manual was never very important to the overall formulation of Air Force doctrine or theory. The ideas were buried in this operational manual that few even knew existed, and still fewer bothered to read.[66]

The great changes in Air Force doctrine in the early 1990s did not concern insurgency but were rather a new look at the strategic role called parallel warfare. Col. John Warden and Lt. Col. David Deptula, authors of the Gulf War air campaign, developed what some experts called the most important new air power theories since Douhet and Mitchell. Their concept of "parallel warfare" and the profound effect of high technology on modern and future wars has garnered most of the attention of official and nonofficial air power thinkers since the Gulf War.[67]

In many ways the Vietnam experience has had little practical impact on actual operations. Air power has been applied in America's most recent operations according to traditional doctrine, except during the Persian Gulf War when tactical fighters and fighter-bombers carrying precision ordnance executed most of the strategic missions while B–52s performed the same tactical role they had performed in Arc Light. In these cases, circumstances dictated the tactics. But will all future air campaigns be fought under such conditions as the Gulf War? The Bosnian intervention already suggests otherwise. Thus, if the United States once again finds itself in a low-intensity insurgency conflict, fighting in jungle terrain and climate, will Air Force doctrine and theory provide airmen with the foundation necessary to successfully prosecute such a war?

The Vietnam conflict has produced one implicit and subtle effect on the selection of senior Air Force officers and thus, indirectly, on doctrine, theory, and policy. While it is difficult to prove that Vietnam was the primary cause, it is interesting to note that before 1973 the Chiefs of Staff of the Air Force (CSAFs) were almost all strategic bomber navigators, advocates, pilots, and/or experts. Since then all of the CSAFs have had little if any bomber expertise and have been far more familiar with tactical air power and alternate nonstrategic nonbomber air power roles.[68] In 1992 SAC, the backbone of the Air Force, especially in its strategic bombing role, was disbanded as a major command and incorporated into the Air Combat Command. As Colonel Drew declares, these changes seem to be "much more than mere coincidence."[69]

B-52s and Doctrine

The overall impact of the Vietnam War on official Air Force doctrine has been negligible. The employment of B–52s, which failed to influence doctrine and theory, can best be explained by the confusion and disagreement caused by the effectiveness of Linebacker II and the illusion of potential victory it created. Military officers and civilians alike have suggested that a Linebacker-style campaign, begun in 1965, could have brought the war to a successful conclusion. Such an argument is, of course, not historical in nature and one that ignores a myriad of factors at work in Vietnam and internationally, factors which in the eight years of major U.S. involvement mutated and changed totally or by degrees.[70] It is also an argument that ignores the fact that the needed weapon system (B–52 Big Bellies) was not actually available in sufficient quantity until 1967. Even then SAC officials were not willing to commit the numbers Nixon committed in 1972, for fear of being unprepared to meet their strategic responsibilities.

Even more to the point, between 1965 and 1972 détente altered the Cold War, making overt actions against Hanoi easier. Over the same period the nature of the Vietnam War changed from a counterinsurgency campaign, primarily against southern guerrillas, to a lull following the Tet Offensive of 1968, to a conventional war of unification fought mostly by NVA forces beginning with the Easter invasion of March 30, 1972. The changing domestic sociopolitical attitudes of the American public, as well as the fluctuating perspectives of government and military leaders, also affected the way the war unfolded and eventually ended. Of course these factors do not begin to examine the ways in which enemy strategy, tactics, and politico-diplomatic manipulation affected the outcome. Ultimately, the United States was engaged in a limited war whose constraints Lyndon Johnson seemed unable to grasp, but which Richard Nixon clearly perceived as inviolate.

Conclusion

Too few airmen have addressed questions regarding doctrine raised by the war in Vietnam. B–52s did not, and could not, win the Second Indochina War because there were no sound U.S. theories of victory, and the policy derived from this malaise, especially in the 1960s, meant that no weapon, no matter how powerful, could overcome the shortcomings. In 1972 the Air Force thought it could fight a conventional bomber war, but by then it was far too late.

After America's withdrawal, painful memories, bitter legacies, and the misconceptions about the nature and conclusion of the war, as well as disagreements over the nature of the remaining strategic role of the Air Force against the USSR, made it easy for airmen to assign the air war in Vietnam to the trash bin of history. They found it more comfortable to face the familiar issues of nuclear warfare and the European scenario than to wrestle with the 500-hundred-pound Vietnamese "guerrilla."

One must remember that the conflict in Vietnam was viewed as a sidelight to a much larger geopolitical struggle. B–52s were expected to act as a deterrent to a hot war with the USSR and, failing this, to evaporate the enemy in a mushroom cloud. Even if B–52s could not win the bitter sojourn in Vietnam, they ultimately helped the United States win the larger Cold War conflict. But that is another story.

Notes

1. Col. Dennis M. Drew, "Vietnam, 'Wars of the Third Kind' and Air Force Doctrine," unpublished paper presented at Texas Tech University Center for the Study of the Vietnam Conflict, Seminar on the Vietnam War, Apr 18–21, 1996 (hereafter "Vietnam and AF Doctrine"), p. 1n. For details on "Wars of the Third Kind," see Edward E. Rice, *Wars of the Third Kind: Conflict in Underdeveloped Countries* (Berkeley: University of California, 1988).

2. Drew, "Vietnam and AF Doctrine," p. 1n; United States Air Force (USAF), AFM 1–1, *Basic Aerospace Doctrine of the United States Air Force* (Washington, D.C.: Department of the Air Force, 1992), Vol. 1, pp. v, vii.

3. Drew, "Vietnam and AF Doctrine," p. 1n.

4. For more details on these theories, see Giulio Douhet, "Command of the Air," in *Command of the Air* (Washington, D.C.: Air Force History Office [AFHO], 1983), reprint of the 1942 original translation by Dino Ferrari; Brig. Gen. William L. "Billy" Mitchell, *Our Air Force: The Keystone to National Defense* (New York: Dutson Inc., 1921); William Mitchell, *Winged Defense: The Development and Possibilities of Modern Air Power, Economic and Military* (New York: G.P. Putnam, 1925). For a very clear and concise modern explanation of traditional Air Force roles, policies, theories, and doctrine, see Col. Phillip Meilinger, *10 Propositions Regarding Air Power* (Washington, D.C.: AFHO, 1995).

5. Drew, "Vietnam and AF Doctrine," p. 11; USAF, AFM 1–2, *United States Basic Doctrine* (Washington, D.C.: Department of the Air Force, 1953, 1954, Apr 1955, and Dec 1959). Subsequent USAF basic doctrine manuals were marked AFM 1–1 beginning with the subsequent basic doctrine publication in Fall 1964.

6. Drew, "Vietnam and AF Doctrine," p. 11.

7. *Ibid.*; USAF, AFM 1–2, *Theater Air Operations* (Washington, D.C.: Department of the Air Force, Sep 1953 and Apr 1954). The next edition of this publication did not appear until June 1965 and was redesignated AFM 2–1.

8. Gen. Ronald R. Fogleman, "Aerospace Doctrine: More Than Just a Theory," *Air Power Journal*, Vol. X, No. 2 (Summer 1996), p. 41.

9. Earl H. Tilford, Jr., *Crosswinds: The Air Force's Setup in Vietnam* (College Station: Texas A&M University Press, 1993), pp. 33–34, 66. For more on the Skybolt Missile issue, see Robert Frank Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force* (Maxwell AFB, Ala., 1989) [hereafter *Basic Thinking*], Vol. II, pp. 1–63.

10. Futrell, *Basic Thinking*, p. 63; *Public Papers of the Presidents of the United States: John F. Kennedy, 1962* (Washington, D.C.: GPO, 1963), pp. 900–910.

11. Futrell, *Basic Thinking*, pp. 75–91.

12. *Ibid.*, pp. 63–64; Address, Gen. Curtis E. LeMay, CSAF to AFA Convention, Philadelphia, Pa., Sep 21, 1961, text in *Air Force Information Policy Letter for Commanders, Supplement*, Nov 15, 1961, pp. 1–6.

13. Editorial, John F. Loosbrod, *Air Force/Space Digest*, Jan 1963, pp. 28–31.

14. Futrell, *Basic Thinking*, pp. 155–160, 226–230. For more on Zuckert's policy changes, see Eugene Zuckert, "Keeping the Organizational Engine in Tune," *Air Force/Space Digest*, Oct 1964, pp. 37–40.

15. For details on this period, see Stanley Karnow, *Vietnam: A History* (New York: Viking, 1983), specifically pp. 161–348.

16. Tilford, *Crosswinds*, p. 66.

17. *Pentagon Papers: Department of Defense History of United States Decision Making in Vietnam*, Senator Mike Gravel Edition (Boston: Beacon Press, 1971) [hereafter *Pentagon Papers,* Gravel Edition], Vol. III, p. 207.

18. United States Department of State, *United States–Vietnam Relations, 1945–1967* (Washington, D.C.: GPO, 1971), Vol. 4, C. 3:35, 3:4. This is, in fact, the official version

of what later became known as the Pentagon Papers when two unofficial versions were published in the same year.

19. *Pentagon Papers*, Gravel Edition.

20. Drew, "Vietnam and AF Doctrine," pp. 15–16; Department of State, *U.S.–Vietnam Relations*, Vol. 4, C. 3:35–38, 3:4.

21. Futrell, *Basic Thinking*, pp. 171–173, 242, 251–252.

22. Curtis E. LeMay, "Air Power in Guerrilla Warfare," *Air Force Information Policy Letter for Commanders*, Vol. XVI, No. 80 (Washington, D.C.: Office of the Secretary of the Air Force, Apr 15, 1962); Drew, "Vietnam and AF Doctrine," pp. 12–13.

23. USAF, AFM 1-1, *United States Air Force Basic Doctrine* (Washington, D.C.: Department of Air Force, Aug 14, 1964), chap. 6.

24. Drew, "Vietnam and AF Doctrine," pp. 13–15.

25. For general information on Arc Light, see John F. Guilmartin, Jr., "Arc Light," in Stanley I. Kutler, ed., *Encyclopedia of the Vietnam War* (New York: Charles Scribner's Sons, 1996), p. 48. For details on Arc Light operations, see J.C. Hopkins and Sheldon A. Goldberg, *The Development of the Strategic Air Command, 1946–1986* (Offutt AFB, Nebr., SAC/HO, 1986) [hereafter *SAC, 46-86*]; USAF Special Study, HQ SAC, "Activity Input to Project Corona Harvest–Arc Light Operations, 1 Jan 65–31 Mar 68," 3 Vols.; Carl Berger, ed., *The United States Air Force in Southeast Asia, 1961–1973: An Illustrated Account* (Washington, D.C.: AFHO, 1984) [hereafter *USAF in SEA*]; John Schlight, *The Air War in South Vietnam: The Years of the Offensive, 1965–1968* (Washington, D.C.: AFHO, 1988) [hereafter *Years of the Offensive*].

26. *The Joint Chiefs of Staff and the War in Vietnam, 1960–1968*, pt. II, pp. 24-1, 2; Hist, "Strategic Air Command (SAC), Jan-Jun, 1965," Study 101, Vol. I, p. 198; Schlight, *Years of the Offensive*, p. 49.

27. SAC, "Activity Input to Project Corona Harvest, Arc Light" (Offutt AFB, Nebr.: SAC/HO, 1970), Vol. II, p. 2 [hereafter SAC Arc Light Input]; SAC Hist, Jan–Jun 1964, Study 95 Narrative Volume, HA-1093; Msg, COMUSMACV to CINCPAC, "Use of SAC in RVN (Arc Light)," 140805Z May 1965; Schlight, *Years of the Offensive*, p. 50; Larry Cable, *Unholy Grail: The U.S. and the Wars in Vietnam, 1965–1968* (London: Routledge Inc., 1991), pp. 98–100, 109.

28. Msg, COMUSMACV to JCS, "Utilization of Arc Light B-52s," 190330Z Mar 1965; Msg, JCS to CINCPAC, 292147Z Apr 1965; Schlight, *Years of the Offensive*, p. 50; SAC Hist, Jul-Dec 1965, Vol. II, p. 267.

29. Msg, JCS to DIRNSA, "NMCC Opsum, 141-165," 181004Z Jun 1965.

30. Hopkins and Goldberg, *SAC, 46-86*, p. 131 (quote). John Schlight has the same incident in his book, but he has the quote reading "using a sledgehammer to kill gnats." Schlight, *Years of the Offensive*, p. 53. Schlight's source is Hist, "Military Assistance Command, Vietnam (MACV), 1965," pp. 191–192.

31. *A Chronology of Significant Airpower Events in Southeast Asia, 1950– 1968*, Corona Harvest Report, May 1969 [hereafter *Chronology SEA, 50–68*], p. 114; Schlight, *Years of the Offensive*, pp. 54–55, 82–83; SAC Hist, Jul–Dec 1965, Vol. II, pp. 270–271; Msg, Zippo 08–225, 7BS to AIG 673, "Commander's Progress Report/Birch Bark," 02/1255Z Aug 1965; MACV Hist, 1965, pp. 166–167. For precise details on every major ground operation from 1965 to 1968 and their Arc Light and air support components, see Cable, *Unholy Grail*, pp. 41–47, 98–99, 109, 191–192.

32. *Chronology SEA, 50-68*, p. 167; SAC Arc Light Input, Vol. II, pp. 16–17; Msg, SAC to JCS, Zippo 0731, "High Reach Charlie Report," 15/1445Z Mar 1966. For more on Rolling Thunder and interservice rivalries, see Tilford, *Crosswinds*; Larry Cable, "The Operation Was a Success, but the Patient Died: The Air War in Vietnam, 1964–1969," in Dennis Showalter and John G. Albert, eds., *An American Dilemma: Vietnam, 1964–1973* (Chicago: Imprint Publications, Inc., 1993), pp. 109–158.

33. Schlight, *Years of the Offensive*, pp. 148–149.

34. *Ibid.*, p. 149 (quote); Memo, 7AF to PACAF, "B-52 Operations," 061234Z Oct

1966; William W. Momyer, *Air Power in Three Wars* (Washington, D.C.: GPO, 1978), pp. 97–102 [hereafter *Three Wars*]; Gen. William W. Momyer, "End of Tour Report, Seventh Air Force," p. 9 [hereafter Momyer, EOTR].

35. Schlight, *Years of the Offensive*, p. 149 (quote); Momyer, *Three Wars*, pp. 99–102. Momyer laid out these issues in Memo, Momyer to Maj. Oakah L. Jones, PACAF, "B–52 Concept,"Aug 7, 1966.

36. Momyer, *Three Wars*, pp. 101–103 (quote); Momyer, EOTR, p. 9; Memo, Momyer to McConnell, Nov 11, 1966; Msg, 7AF to PACAF, "Arc Light Forces," Sep 22, 1966; Corona Harvest (CH), *In-Country Air Strikes Operations, Southeast Asia, 1 Jan 65–31 Mar 68* (Washington, D.C.: AFHO, 1971); Schlight, *Years of the Offensive*, pp. 149–150.

37. Schlight, *Years of the Offensive*, pp. 153, 213; SAC Hist, Jan–Jun 1966, pp. 106, 138; Charles K. Hopkins, *SAC Bomber Operations in the Southeast Asia War*, Study 204, Vol. I (Offutt AFB, Nebr.: SAC/HO, 1985), p. 168; Memo, Deputy SECDEF to CJCA, Sep 1, 1966; SAC Arc Light Input, Vol. III, pp. 1, 15, 49; Ltr, CINCSAC to CSAF [no subject], Aug 26, 1967; *Chronology SEA 50–68*, p. 221 (quote).

38. *Chronology SEA 50–68*, pp. 261–263, 268, 273–274; 7AF Hist, Jan 1– Jun 30, 1968, p. xxii; Rprt, HQ 7AF, No. 6819, "Weekly Air Intelligence Summary," May 11, 1968; Berger, ed., *USAF in SEA*, pp. 156–157; PACAF, CH, *Command & Control*, Book 1, Vol. II, pp. 2–25; SAC Hist, Jul–Dec 1967, pp. 152–153; Msg, SAC/VC to CINCPAC, "Continuous Arc Light Emergency Capability for Operation Niagara," 10/1830Z Feb 1968. *N.B.*: The Tet Offensive also began in January.

39. Schlight, *Years of the Offensive*, p. 292 (quote); Berger., ed., *USAF in SEA*, p. 157.

40. Eduard Mark, *Aerial Interdiction: Air Power and the Land Battle in Three American Wars* (Washington, D.C.: Center for Air Force History, 1994), pp. 358–360; Berger, ed., *USAF in SEA*, p. 119; Tilford, *Crosswinds*, pp. 138–140; 7AF Hist, 1972, p. 80; Bernard C. Nalty, "Interdiction in Southern Laos," unpublished manuscript, Air Force History Office, pp. 250-251. For details on Commando Hunt V, see Hist, "7AF Commando Hunt V," May 1971, pp. 56–57; Tilford, "Bombing Our Way Back Home," pp. 127–128; Jack S. Ballard, *The United States in Southeast Asia: Development and Employment of Fixed-Wing Gunships, 1962–1972* (Washington, D.C.: Air Force History Office, 1982), p. 173; Col. D.L. Evans, Dir Intel, Task Force Alpha, End-of-Tour Report, Jul 6, 1972, p. 30, File 10015110, AFHRA.

41. See Robert Kipp, "Counterinsurgency from 30,000 Feet," *Air University Review*, Jan–Feb 1968, pp. 10–18.

42. Drew, "Vietnam and AF Doctrine," p. 22; USAF, AFM 2–5, *Tactical Air Operations Special Air Warfare* (Washington, D.C.: GPO, Mar 10, 1967), pp. 13, 18.

43. Drew, "Vietnam and AF Doctrine," pp. 22–23; AFM 2–5, pp. 14–16.

44. USAF, AFM 1–1, *United States Air Force Basic Doctrine* (Washington, D.C.: GPO, Sep 28, 1971), p. 6-1.

45. Drew, "Vietnam and AF Doctrine," pp. 23-24; AFM 1–1, 1971, p. 6-1.

46. Richard M. Nixon, *RN: The Memoirs of Richard Nixon*, 2 Vols. (New York: Warner Books, 1978), Vol. 2, pp., 79, 259; Richard M. Nixon, *In the Arena: A Memoir of Victory, Defeat, and Renewal* (New York: Simon & Schuster, 1990), pp. 335–337; Tilford, *Crosswinds*, p. 143; Mark Clodfelter, *The Limits of Air Power: The American Bombing of North Vietnam* (New York: The Free Press, 1989), pp. 152–153; Mark, *Aerial Interdiction*, pp. 365–366; Troung Nhu Tang, *A Vietcong Memoir: An Inside Account of the Vietnam War and Its Aftermath* (New York: Harcourt, Brace, & Jovanovich, 1985), pp. 200–202, 210–213, [hereafter *VC Memoir*]; Henry Kissinger, *The White House Years* (Boston, Little, Brown, 1979), p. 1109.

47. Capt. Charles A. Nicholson, *The USAF Response to the Spring 1972 NVN Offensive: Situation and Redeployment* (Project CHECO, 7AF/DOAC, 1972), pp. 67, 123–124; Tilford, *Crosswinds*, pp. 143-145; Mark, *Aerial Interdiction*, p. 373; Hist, "PACAF, 1 Jul 71–30 Jun 72," Vol. I, pp. 121–122; Hist, "7AF History of Linebacker Operations, 10 May–23 October 1972," 1973, pp. 3–5, File K740.04-24, AFHRA; Nixon,

RN, p. 606; Mark Clodfelter, "Nixon and the Air Weapon," in Showalter and Albert, eds., *American Dilemma*, pp. 169–172 [hereafter "Air Weapon"]; Seymour M. Hersh, *The Price of Power: Kissinger in the Nixon White House* (New York: Summit Books, 1983), p. 506; Melvin F. Porter, *Linebacker: Overview of the First 120 Days* (Project CHECO, 7AF/DOA, 1973), pp. 14–15.

48. PACAF, CH, *USAF Air Operations against NVN, 1 Jul 71–30 Jun 72* (1973), pp. 90–91; Porter, *Linebacker: Overview*, pp. 16–17; Clodfelter, "Air Weapon," p. 171; Momyer, *Three Wars*, p. 33; Tilford, *Crosswinds*, pp. 149–150; PACAF, CH, *Command & Control*, Book I, pp. 1–24. Specifically the report determined that Linebacker I's goal was to "1) restrict resupply of North Vietnam from external sources; 2) destroy internal stockpiles of military supplies and equipment; and 3) restrict flow of forces and supplies to the battlefield."

49. Clodfelter, *Limits of Air Power*, p. 173 (quote p. 166); Bruce Palmer, "U.S. Intelligence and Vietnam," *Studies in Intelligence*, Special Spring Issue 1984, pp. 98–99 (quote).

50. MACV Hist, Jan 72–Mar 73, pp. 53, 74, 79; Mark, *Aerial Interdiction*, pp. 399, 408.

51. Nixon, *RN*, Vol. 2, pp. 188–193; Ted Szulc, *The Illusion of Peace: Foreign Policy in the Nixon Years* (New York: Viking Press, 1978), p. 629.

52. Kissinger, *White House Years*, pp. 1397, 1409–1410; Hersh, *Price of Power*, p. 604.

53. Clodfelter, "Air Weapon," pp. 173–174; Nixon, *RN*, Vol. 2, pp. 222–227, 230; Kissinger, *White House Years*, p. 1411–1412, 1416; Clodfelter, *Limits of Air Power*, pp. 177–179.

54. Clodfelter, *Limits of Air Power*, pp. 179–183; Clodfelter, "Air Weapon," pp. 174–177; Nixon, *RN*, Vol. 2, pp. 224–231, 234–242; Kissinger, *White House Years*, pp. 1420–1447; Hersh, *Price of Power*, p. 619.

55. Clodfelter, "Air Weapon," p. 178. Most of this information was obtained by Col. Clodfelter in his interview with Col. Clyde E. Bodenheimer, Jan 7, 1983, his interview with members of General Meyer's staff, and a USAF interview of Lt. Gen. Gerald W. Johnson by Charles K. Hopkins, Apr 3, 1973, AFHRA, File K239.0512-813, pp. 6–7.

56. Clodfelter, *Limits of Air Power*, pp. 184–185; Brig. Gen. James R. McCarthy and Lt. Col. George B. Allison, *Linebacker II: A View from the Rock*, USAF Southeast Asia Monograph Series, Monogr. 8, Vol. VI (Maxwell AFB, Ala.: Airpower Research Institute, 1979; Washington, D.C.: Office of Air Force History, 1985), p. 41.

57. Clodfelter, *Limits of Air Power*, pp. 191–195; McCarthy and Allison, *View from the Rock*, pp. 171–175; HQ PACAF, *Linebacker II Air Force Bombing Survey*, p. 37; Berger, ed., *USAF in SEA*, p. 167.

58. Clodfelter, "Air Weapon," p. 180; Troung, *VC Memoir*, p. 226; Phillip B. Davidson, *Vietnam at War: The History, 1946–1975* (Novato, Calif.: Presidio Press, 1988), p. 728.

59. William Head and Lawrence E. Grinter, *Looking Back on the Vietnam War: A 1990s Perspective on the Decisions, Combat, and Legacies* (Westport, Conn.: Greenwood, 1993), p. 119; Berger, ed., *USAF in SEA*, p. 167; Tilford, *Crosswinds*, pp. 178–180; Thomas C. Thayer, *War without Fronts: The American Experience in Vietnam* (Boulder, Colo.: Westview, 1985), pp. 26, 37.

60. For more on the Summers book, see Harry G. Summers, Jr., *On Strategy: The Vietnam War in Context* (Carlisle Barracks, Pa.: Army War College, 1981), and his *On Strategy: A Critical Analysis of the Vietnam War* (Novato, Calif.: Presidio Press, 1982; New York: Dell, 1984).

61. USAF, AFM 1-1, *United States Air Force Basic Doctrine* (Washington, D.C.: GPO, Jan 15, 1975); USAF, AFM 1-1, *Functions and Basic Doctrine of the United States Air Force* (Washington, D.C.: GPO, Feb 14, 1979); USAF, AFM 1-1, *United States Air Force Basic Doctrine* (Washington, D.C.: GPO, 1984).

62. AFM 1-1, 1992. Also see Clodfelter, *Limits of Air Power*; Col. Dennis M. Drew, "Insurgency and Counterinsurgency, American Military Dilemmas and Doctrine," CADRE Paper No. 88-1 (Maxwell AFB, Ala.: Air University, Mar 1988); Cable, *Unholy*

Grail; Larry Cable, *Conflicts of Myths: The Development of American Counterinsurgency Doctrine and the Vietnam War* (New York: New York University Press, 1986).

63. U.S. Army and USAF, FM 100–2, AFP 3–20, *Military Operations in Low Intensity Conflict* (Washington, D.C.: Departments of the Army and Air Force, Dec 5, 1990); USAF, AFM 2–11 *Foreign Internal Defense Operations* (Washington, D.C.: Department of the Air Force, Nov 3, 1992); Drew, "Vietnam and AF Doctrine," pp. 32–33.

64. AFM 2–11, 1992, p. 9.

65. *Ibid.*, pp. 9–10.

66. Drew, "Vietnam and AF Doctrine," pp. 35–36.

67. For more on parallel warfare and the future of high-tech air power as a result of the Gulf War, see John A. Warden, *The Air Campaign: Planning for Combat* (Washington, D.C.: National Defense University Press, 1988; New York: Pergamon-Brassey, 1989); John A. Warden, "Air Power in the Twenty-First Century," in Richard H. Shultz, Jr., and Robert L. Pfaltzgraff, Jr., eds., *The Future of Air Power in the Aftermath of the Gulf War* (Maxwell AFB, Ala.: Air University Press, 1992); David A. Deptula, "Parallel Warfare: What Is It? Where Did It Come From? Why Is It Important?" in William Head and Earl H. Tilford, Jr., eds., *Eagle in the Desert: A Look Back at U.S. Involvement in the Persian Gulf War* (Westport, Conn.: Greenwood Press, 1996).

68. Drew, "Vietnam and AF Doctrine," pp. 39–40.

69. *Ibid.*

70. The best proponent of this theory is Adm. U.S.G. Sharp, *Strategy for Defeat: Vietnam in Retrospect* (San Rafael, Calif.: Presidio Press, 1978; 1986).

Should Deterrence Fail: Strategic Attack Theory in the Nuclear Era

Mark J. Conversino

Just days before the start of Operation Desert Storm, United States Secretary of State James A. Baker III sought to deter Iraqi dictator Saddam Hussein from ordering his forces to employ weapons of mass destruction during the impending conflict. "God forbid," Baker told his Iraqi counterpart Tariq Aziz, that "chemical or biological weapons are used against our forces—the American people would demand revenge."[1] The Secretary of State did not explain how the Americans would exact their vengeance, but he clearly implied, and the Iraqis perceived, a threat to employ nuclear weapons. Fortunately, as they had since 1945, America's nuclear weapons remained holstered, and the United Nations coalition dismembered Iraq's war machine in a swift and relatively bloodless campaign. The thinly veiled nuclear threat, however, was not unique to the war in the Gulf. When Baker issued his warning to Aziz, he was merely the latest in a long line of American statesmen who had conducted business in the ominous shadow of nuclear weapons.

Few nonevents have generated as much writing and debate as the issue of nuclear war. The enormous destructive force residing in the world's nuclear arsenals made their use "unthinkable." Lawrence Freedman thus noted that "historical experience provides minimal guidance" to nuclear strategists and that the study of nuclear strategy is "therefore the study of the nonuse of these weapons."[2] A nuclear holocaust, though remote, remained a distinct possibility during the major hot wars and crises from 1947 to 1991. However horrific the results of an all-out clash between the West and the USSR, the United States Air Force faced up to the necessity not only to think about nuclear war but to plan, train, and equip to fight it as well.

Nuclear weapons and their potential use have been a fact of life for more than five decades. This paper seeks to provide a broad overview and synthesis of the literature on the evolution of nuclear strategy through the various presidential administrations from 1947 to the present. In particular, the present essay will address as well Air Force strategic attack doctrine and thought in the nuclear era. Time and space, however, do not allow a full discussion of the many issues related to nuclear strategy. This paper, for example, does not deal in detail with technological progress or changes in force structure.[3]

Witnessing the destruction wrought by their own air forces during World War II, American airmen considered their faith in strategic bombardment vindicated. Furthermore, the utter collapse of Germany and Japan, brought about in no small measure through air power, led them to conclude that the interwar theorists were correct in their assessment of the air weapon's revolutionary effects on warfare. Obviously, populations did not rise up in agony and despair to overthrow their governments, nor did air power win the war by itself. Yet, as the men of the Air Corps Tactical School predicted, the destruction of select vital elements of the enemy's economic and social structure did have wide-ranging effects that sped both Berlin's and Tokyo's collapse. The arrival of the atom bomb simply reinforced the perception, articulated by Army Air Forces Chief of Staff Gen. Henry H. "Hap" Arnold, that air power was now "all-important."[4]

Still, the airmen recognized not only the possibilities that the employment of atomic air power offered to the nation's defense, but the threat that it posed as well. As a result of this realization, deterrence became an important tenet of postwar air strategy. Deterrence is but one element of nuclear strategy, albeit an important one. As Robert Jervis noted, deterrence, in its most elemental sense, "depends on perceptions."[5] Stated simply, one state deters another by convincing it that accepting the status quo outweighs the costs and benefits associated with starting a war. Acknowledging the difficulties of air defense in the dawning atomic era, the authors of the *United States Strategic Bombing Survey* noted that the country would require a powerful air force for deterrence. "The threat of immediate retaliation," the report stated, "with a striking force of our own should deter any aggressor from attacking."[6] Arnold was even more specific:

> . . . it must be recognized that real security against atomic weapons in the visible future will rest on our ability to take immediate offensive action with overwhelming force. It must be apparent to a potential aggressor that an attack on the United States would be immediately followed by an immensely devastating air-atomic attack on him. . . . The atomic weapon thus makes offensive and defensive Air Power in a state of constant readiness the primary requisite of national survival.[7]

As John Greenwood pointed out, Arnold's remarks contain all the different elements of what eventually became strategic nuclear deterrence: "strategic air power, the atom bomb, constant readiness, an air force in-being, and swift, devastating retaliation for aggression."[8]

If airmen recognized the importance of "the bomb" to strategic air power, they remained uncertain as to the extent of the role it would play in the future of an independent air force. In the immediate aftermath of the war, the Army Air Forces' leadership faced the challenges of demobilization and restructuring, as well as the issue of independence itself. Moreover, airmen would not, on their own, determine if, and when, the new weapons would be used. Apart from the Silverplate project to modify B–29s to carry atomic weapons, the Army Air Forces did not exactly "leap forward" into the nuclear era. A lack of data on atomic weapons and access restrictions that curtailed training prevented any realistic planning for strategic attack in the early nuclear era. For several years, only a single group, the 509th at Roswell Army Air Field, formed the country's atomic strike force. Nevertheless, with the inception of the Strategic Air Command (SAC) in March 1946, the nation's air arm possessed at least the nucleus of what would become arguably the most powerful military force in history.[9]

Events outside the Air Force soon dictated the role of atomic air power in the nation's defense. Even before the end of the fighting in Europe, planning and intelligence officers singled out the Soviet Union as the sole future opponent of the United States. As relations between the two erstwhile allies deteriorated and slipped into a state of cold war, a budget-conscious and war-weary nation looked to strategic air power and atomic weapons as a means to offset the perceived might of the Red Army. In light of failing attempts to outlaw this new weapon type, or at least place it under international control, the nation's air leaders hoped to deter the Soviets through threats of atomic annihilation. At the same time, airmen recognized, as did numerous civilian experts, that deterrence strategies had often failed in the past. Thus, the emerging US Air Force had to prepare and plan for the use of a force of credible size and strength to both deter war as well as prevail in one should deterrence ultimately fail.[10]

In the immediate aftermath of the Second World War, atomic war planning received little attention in the Air Force as theories of the prewar Air Corps Tactical School remained frozen in time. Certainly, atomic weapons reinforced airmen's long-held belief in the principles of surprise and the initiative. Atomic air power would fulfill the vision of Italian air theorist Giulio Douhet by producing a war-ending first blow from the air. Limited resources further constrained any air plan that contained atomic strikes. The nuclear arsenal was extremely small. In 1946, the stockpile of weapons numbered nine. It rose to thirteen in 1947, fifty in 1948, and 250 in 1949.[11] The weapons themselves required assembling, a process that required as much as two days for each. In 1947, the year of Air Force independence, only six weapons assembly specialists and twenty crews were available to load and fly fewer than three dozen B–29s modified for atomic operations.[12] Most Air Force plans produced before the Korean War thus continued to emphasize conventional attacks against the "vital centers" of the Soviet Union.[13]

Early postwar joint planning nonetheless relied heavily on a strategic air offensive to destroy Soviet war-making capacity, while surface forces adopted a strategic defensive posture in Europe. Based on a lack of resources and guidance on the employment of atomic weapons from higher levels, the first major strategic air attack plan, Makefast, was a scaled-down World War II conventional bombing offensive aimed at the Soviet petroleum industry. Relying on the perceived lessons of the war as well as drawing on prewar theories, air planners sought the most efficient means to employ the limited nuclear stockpile. Attacks against major industries such as steel, aircraft, and electric power would require too much time to be effective in the event of a Soviet advance westward. Planners deemed the Soviet transportation net as the "most vital cog" in the USSR's military machine but one too vast for air attacks to affect. Since two-thirds of the Soviet petroleum industry was concentrated in seventeen cities, planners subsequently identified these as suitable—perhaps the only—targets for nuclear attack.[14] Thus, the Red Army, like the German Wehrmacht before it, would grind to a halt for lack of fuel.

Still, none of this planning mattered if President Harry S Truman refused to consider the use of nuclear weapons. Some members of the government and the armed forces downplayed the revolutionary significance of the atom bomb and considered these devices just another weapon. Truman took a different view. "You have got to understand," he told a group of his advisers in 1948, "that this isn't a military weapon. It is used to wipe out women and children and unarmed people, and not for military uses. So we have got to treat this differently from rifles and cannons and ordinary things like that." He ensured civilian control over the small but slowly growing stockpile through the Atomic Energy Act of 1946. The act made atomic weapons a separate component of the nation's arsenal. It also granted to the office of the President sole authority for ordering the use of atomic weapons. The newly formed Atomic Energy Commission (AEC) gained control over both the stockpile of weapons and the production facilities.[15]

Despite Truman's misgivings, planning for an air-atomic offensive moved slowly forward. The Joint Outline Emergency War Plan Broiler, and the subsequent plans Frolic and Halfmoon, all placed heavy emphasis on an air-atomic campaign. In the spring of 1948, however, Truman, still clinging to hopes of international control of the weapon, ordered an alternate conventional plan prepared. He remained convinced that the American people would not tolerate the use of atomic weapons for "aggressive purposes," though the above plans were predicated on containing and defeating *Soviet* aggression.[16]

Halfmoon reflected the limitations of SAC, constraints generated by the limited number of weapons available and the questionable ability of the crews to find their targets. The result, not only for Halfmoon but for the five-year period 1945–1950, was a plan designed for "city-busting." Air strategists expected the plan to "exploit the destructive and psychological power of atomic weapons against the vital elements of the Soviet war-making capacity."

Halfmoon called for dropping fifty atomic bombs on the twenty major cities of the USSR containing the largest share of war industries while conventionally armed bombers struck oil targets.[17] Halfmoon's planners aimed to create "immediate paralysis of at least 50 per cent of Soviet industry."[18] In its essential form and goals, however, the plan was actually a nuclear extension of World War II strategic bombing.

Events in Europe would alter Truman's vision of atomic weaponry. By 1948, it was clear that international control of atomic weapons was a dead issue. At the same time, relations with the USSR had frayed almost to the point of open, armed confrontation. In June of that year, the Soviets sealed off all ground access to the Allied sectors of Berlin. The following month, as the crisis deepened, Secretary of Defense James Forrestal ordered the Joint Chiefs to resume serious planning for an atomic offensive. The Air Force in particular pointed to the need for advanced planning and preparation for the employment of atomic weapons. In September 1948, Truman approved NSC–30 in which the prerogative to initiate atomic operations remained with the President. At the same time, Truman officially recognized that the military required the freedom to use "all appropriate means available" in the event of war, "including atomic weapons."[19] A subsequent document, NSC–20/4, issued in November, laid out broad objectives in an all-out war with the Soviets: reduce or eliminate Soviet (communist) control inside and outside the Soviet Union. Interestingly, the administration's guidance did not call for unconditional surrender or occupation of the USSR.

The green light for nuclear war planning also placed the burden for such work on SAC and its recently appointed commander, Curtis LeMay. The critical question for the Air Force remained what to attack and, after answering that, how to build the forces necessary to do so. As the Berlin crisis subsided, two separate events soon propelled LeMay, SAC, and nuclear weapons to the forefront of American defense planning: Truman's fiscal policy and the march of Soviet technical developments.[20]

Truman considered runaway government expenditures, particularly in defense, as a threat to the nation's security. Maintaining the large, conventional forces experts deemed necessary to deter—and fight—the Soviets in Europe would be prohibitively expensive. Air theorists had often argued that air power provided "more bang for the buck" than did surface forces. The advent of atomic weapons appeared to reinforce that claim. While the Air Force did not receive all that it requested, it nevertheless expanded at the expense of the other services. As one historian of the period noted, Truman's "continuing refusal to budget adequate conventional alternatives thus made the United States virtually dependent on the atomic bomb."[21]

While Moscow had retained large conventional forces, the Kremlin also pursued its own atomic program. On September 23, 1949, Truman informed the American people that the Soviets had detonated an atomic device. The implications of this were clear: a Soviet "bomb" coupled with an aircraft of sufficient range would pose a direct threat to American security for the first time in more than a century. Together with the crises and confrontations in Central and Eastern Europe of the previous years, the "fall" of China to Mao Zedong's communist forces, and revelations of widespread Soviet espionage in America's atomic research program, the reality in 1949 of a Soviet bomb threw official Washington into a panic.[22]

The Soviet acquisition of atomic weapons, while not unexpected, was still a nasty surprise to American policymakers, who considered such an event to be several years down the road. The prospect of Soviet atomic weapons led many in government and defense circles, particularly within the Air Force, to openly discuss the notion of preventive strikes against the USSR. Truman stood firmly against such a move, though it surfaced as one of four recommendations in the landmark document NSC–68. That important national security study, completed in April 1950, just months after the explosion of Moscow's own atom bomb, concluded that within the coming four or five years the Soviets would have the power to cripple the United States. The study's recommendation called for a sufficiently large and diverse defense establishment that would deter the Soviets and prevail in a general war. Ominously, however, the study concluded that the United States faced an implacable foe, "animated by a peculiarly virulent blend of hatred and fear." NSC–68's authors therefore called for a continued atomic buildup together with an increase in conventional forces. Truman had already decided to expand the atomic stockpile and pursue development of infinitely more powerful hydrogen, or thermonuclear, weapons.[23]

Subsequent plans for an air offensive remained consistent with Air Force thinking on strategic attack. For example, Offtackle, in October 1949, increased the size of the atomic offensive to 104 urban targets and 220 atom bombs with an additional 72 weapons held as a "re-attack" reserve. The objective remained breaking or "disrupting" the Soviets' ability and will to continue the war. The Air Force leadership, including LeMay and Vandenberg, was convinced that the strategic air-atomic offensive would likely decide the outcome of a general war at the outset.[24]

Indeed, as they did during the interwar period, airmen viewed the strategic air offensive as the most effective means of defeating an enemy quickly and avoiding a bloody war to liberate Europe. "The atomic bomb cannot be employed with maximum effect if used to further the land and sea missions," one officer wrote in the summer of 1949. "The atomic bomb," he continued, "has changed the nature of war by making the long-range bomber *the decisive weapon* . . . " (emphasis added).[25] Harking back to the perceived lessons of the Second World War, another officer noted that "industrial vulnerability to atomic attack is a major problem confronting the United States today. . . . And World War II," he concluded, "made it obvious . . . that the basis of military operations in modern war is industry." He called for dispersal, hardening, and other passive means to protect America's industrial base. Striking a Douhetian note for the atomic age, the writer declared that no defense was "impregnable." "Today, if only ten percent of a sizable atomic attacking force penetrates our boundaries we may be defeated."[26] Maj. Gen. Orvil Anderson, writing before the preventive war controversy, saw the exploitation of a strategic air offensive as a "moral" imperative. American military leaders would be "derelict" if they did not reduce the Soviets' ability to strike at the West, and "so minimize the casualties which would be suffered by us and our friends."[27]

Despite the Air Force's confidence in strategic air power, many in the administration and Department of Defense questioned the ability of the Air Force to carry out a successful air-atomic offensive, whether it be preventive, preemptive, or retaliatory. Under LeMay, SAC's state of readiness increased dramatically. Still, an ad hoc committee under Air Force Lt. Gen. Hubert Harmon, analyzing the possible effects of an atomic offensive, concluded that SAC was incapable of executing existing war plans. The committee's unanimous report expressed doubts that the Soviets would collapse as a result of the planned attack. They also did not believe an atomic offensive would slow a Soviet advance into Western Europe, the Middle East, and the Far East. Furthermore, the Harmon Committee noted that the air offensive, by causing unprecedented levels of destruction, might produce "reactions detrimental to the achievement of Allied war objectives." Nevertheless, in the committee's opinion, an air-atomic offensive remained "the only means of inflicting shock and serious damage to vital elements of the Soviet war-making capacity . . . the advantages of its early use would be transcending."[28] Thus, the Harmon report, and a subsequent study conducted by the Weapons Systems Evaluation Group (WSEG–1), cast doubt on the wisdom of maintaining an air-atomic offensive as the mainstay of American strategic planning. Nonetheless, the strategic air plan remained viable as the only alternative to Soviet conventional power.

By the late summer of 1950, the Harmon Committee's report, and concern over the rapidly deteriorating situation in Korea, led the JCS to mandate three broad missions for SAC beyond simply attacking Soviet cities and industry. The first required the *blunting* (Bravo) of Soviet capabilities to deliver atomic weapons against the United States and her allies. The second called for attacks to *retard* (Romeo) Soviet advances in western Eurasia. The third, one SAC and the Air Force already embraced, was the *disruption* (Delta) of the vital elements of the Soviet war economy.[29] The new, broader guidance implied joint military operations but also left open for consideration ideas that many airmen found appealing. If mounted quickly, and on a large scale, the air-atomic offensive, in conjunction with conventional operations, could prove to be *the* decisive factor in a general war with the Soviets.

Time and space do not allow a full discussion of the Korean War and its impact on defense policy and spending. What is important, however, are the perceived "lessons" airmen and their political leaders derived from the war. The Chinese entry into the war convinced many Americans, among them NATO Supreme Commander Gen. Dwight D. Eisenhower, that World War III was imminent. Reacting to the crisis, the Truman administration embarked on a major arms buildup, nearly tripling defense spending between 1950 and 1952. Many of the new resources went into conventional forces, prompting some historians to consider Truman's actions a realization of the country's overreliance on atomic weapons. Samuel F. Wells, however, noted that the administration also "poured money at a furious rate into the improvement of American strategic nuclear forces and into the program for the creation of tactical atomic weapons." Secretary of Defense Robert Lovett granted clear priority within the rearmament drive to the Air Force and SAC. The JCS concurred in Truman's policies.[30]

In light of Truman's improvised policy of "limited war" in Korea, SAC planners were skeptical that their forces, armed with either conventional or nuclear weapons, could have a strategic impact striking targets in the north. While SAC heavy bombers did destroy North Korea's limited industrial base, the "real" strategic targets lay in Soviet or Chinese territory, inviolate under Truman's guidance. LeMay, irritated over what he perceived as the wastage of his strategic force, nevertheless told Vandenberg that "the employment of atomic weapons in the Far East would probably not be advisable at this time unless this action is undertaken as part of an overall atomic campaign against Red China." Such sentiments reflected Air Force ideas about what constituted a true "strategic attack." Many years after the war, LeMay told an interviewer that, in Korea, "We never did hit a strategic target." One of his subordinates, Lt. Gen. Jack J. Catton, a veteran of the Pacific War and long-serving member of SAC, agreed. "It was interdiction," he quipped. "The strategic targets—the resources—were located north of the Yalu. . . ."[31]

Elected in part by the nation's disgust over the progress of the war in Korea, Eisenhower entered office under a self-proclaimed mandate for change. He actually continued moving in a direction set by the Truman administration. The likelihood of the use of nuclear weapons remained one issue of critical importance to SAC and the Air Force. On this, however, Eisenhower wrought a major change in policy that influenced Air Force planning and thinking about general (and to some degree, limited) war for the next decade.

As President, Eisenhower retained the option of preempting a Soviet attack and, unlike Truman, believed that any major war with the Soviets would be nuclear. Driven by the same fiscal pressures as his predecessor, Eisenhower likewise sought to use nuclear weapons to offset the Soviet Union's conventional strength as well as the Kremlin's burgeoning nuclear arsenal. The result was his New Look posture. Much has been written elsewhere about the twists and turns in the formulation of the policies and priorities behind the New

Look. In a nutshell, however, Eisenhower's defense doctrine, like Truman's, placed a heavy reliance on strategic nuclear air power. Anxious "not to go broke" in what he saw as a lengthy cold war with the Soviets, Eisenhower believed that threats of atomic attacks during the Berlin crisis of 1948 and in Korea in 1953 proved both the deterrent and coercive value of nuclear weapons. Thus, in his state of the Union address on January 7, 1954, Eisenhower declared American policy was to deter aggression by maintaining a "massive capability to strike back." Secretary of State John Foster Dulles, in a speech made just a few days later, echoed his boss' sentiments. Nuclear weapons, Dulles stated, provided "more security at less cost." The best way to deter the Soviets was "to depend primarily upon a great capacity to retaliate instantly by means and at places of our choosing." Massive retaliation was born.[32]

Air Force doctrine, together with the widely held belief within the service that the USSR was the only enemy that mattered, dovetailed nicely with Eisenhower's stated policies. The development of the New Look and massive retaliation coincided with the release of the first post-independence Air Force doctrinal manuals. Air Force Manual (AFM) 1–2, *Basic Doctrine* of April 1, 1953, reiterated what airmen had come to accept as the "conventional" wisdom on air power, a train of thought consistent with the interwar theorists. "Air forces," the manual stated, "find their greatest opportunities for decisive actions in dealing immediately and directly with the enemy's warmaking capacity—both in being and potential." Air attacks sought to destroy or neutralize the "enemy's industrial capacity" as well as "forces presenting unacceptable threats." In a section entitled "Control of the Air," the manual's authors declared that "no nation can long survive unlimited exploitation by enemy air forces utilizing weapons of mass destruction." AFM 1–2 extolled the virtues of seizing the initiative, including the ability to destroy or cripple an opponent's air forces, thereby limiting damage to the United States. Acknowledging the probable decisiveness of "weapons of mass destruction," the manual stressed that these same weapons "in no way lessen the need for careful selection of objectives and targets."[33]

Taking up a Douhetian theme, AFM 1–8, *Strategic Air Operations,* informed its readers that "in modern warfare, the physical security of a nation is dependent upon the decisive effects of its air forces upon the warmaking will and capacity of an enemy nation." A strategic air offensive was essentially unstoppable; despite losses, "successful penetration is inevitable and devastating in effect." The theories of the interwar years and the experience gained from operations in war were manifested throughout the manual. "The fabric of modern nations is such a complete interweaving of major single elements that the elimination of one element can create widespread influence upon the whole." Properly executed, concentrating enormous destructive power in both time and space, strategic air operations would "disrupt an enemy nation to the extent that its will and capability to resist are broken."[34] Manual 1–8 remained operational doctrine until the Air Force issued AFM 2–11 in December 1965.

In many respects, Curtis LeMay's views of nuclear strategy are of great importance in understanding Air Force thinking on the matter during the decade following the conclusion of hostilities in Korea. Despite the feverish hallucinations of some historians and writers, LeMay preferred preemption, but he realized the choice was not his to make. Once ordered to attack, however, LeMay wanted SAC to throw one massive "Sunday punch" designed to disarm and destroy the Soviet Union in as short a period as possible. Still, he recognized the deterrent mission of his command. "First and foremost," LeMay told a House Armed Services Subcommittee in 1956, "[SAC] must possess sufficient strength and readiness to deter open aggression against the United States." LeMay built SAC into a "striking force so efficient and powerful that no enemy could, in justice to his own present and future, attack us—through a sneak assault or any other way."[35]

Should deterrence fail, LeMay and SAC were ready to execute their plans. With a focus on the blunting and disruption elements of the JCS's nuclear strategy, SAC would seek to defend the United States by attacking the Soviet Union's strategic forces. SAC would win the air battle first through a coordinated strike intended to destroy the Red Air Force on its airfields. The command's 1954 war plan, for example, contained 1,700 designated ground zeroes, or aiming points, of which 409 were airfields. Such actions also protected (limiting the damage to) the United States. Airmen long believed in the necessity to establish the first blow in an air war; considering the decisiveness of a nuclear air attack, failure to do so would be irresponsible. Discounting the possibility of an impervious defense against air attack, LeMay stated that the Air Force, in light of growing Soviet strength, would have to "go back to the rulebook and principles of war and fight the air battle first, which means that we must as quickly as possible destroy their capability of doing damage to us."[36]

SAC's optimum strike plan for 1954 illustrates LeMay's and the Air Force's approach to fighting—and winning—a war with the USSR. Within hours of receiving orders from the President, SAC would unleash 735 bombers and 700 atomic weapons against the Bravo and Delta target lists. In the words of a U.S. Navy captain attending a then-classified SAC briefing on the plan, when SAC was finished, "virtually all of Russia would be nothing but a smoking, radiating ruin at the end of two hours." In theory, such a strike would indeed be decisive within days, if not hours, of the start of hostilities.[37]

Of course, the growing Soviet arsenal meant that nuclear war was a two-way street. Indeed, operational and technical limitations prevented the Air Force from adopting a purely counterforce plan. As one historian noted, "Massive, accurate and virtually simultaneous raids on all elements of the budding Soviet nuclear forces would have been required to guarantee the success of a pure counterforce strategy."[38] While counterforce targets remained in SAC's plans, the resources, plus adequate and timely intelligence and target data, all were simply unavailable.

Surprisingly, the enormous growth in American nuclear power did not bring the administration peace of mind. As the end of Eisenhower's second term neared, the President grew uncomfortable with the status quo. Doubts about the feasibility (and morality) of a reliance on industrial targeting grew both inside and outside the Air Force. In the face of Soviet power, even Dulles questioned the viability of massive retaliation as declaratory policy. The President kept open the option of a preemptive strike but tended to cling to the notion that the "biggest thing today is to provide a deterrent to war."[39]

At the same time, Eisenhower and the JCS recognized the need to better coordinate nuclear targeting. Each U.S. commander of a unified or specified command (including SAC, a specified command) oversaw his command's preparation of its own nuclear plans, causing a great deal of duplication and confusion. On August 11, 1960, Eisenhower approved the creation of the Joint Strategic Target Planning Staff (JSTPS) under SAC domination. The CINC-SAC, now Gen. Thomas Power, assumed the title Director of Strategic Target Planning and was charged with developing, on behalf of the JCS, the *national* nuclear war plan, the Single Integrated Operational Plan (SIOP). Though officers from the other services worked on the JSTPS, the Air Force concept of strategic nuclear warfare continued to pervade the planning for a potential war with the Soviet Union.[40] The development of the SIOP marked a watershed in the evolution of strategic attack thought and planning. The new national nuclear war plan was, in the words of one historian of the period, the "institutionalization of overkill."[41]

The new SIOP did, however, reflect current Air Force doctrine. AFM 1–2, dated December 1, 1959, stated that air forces were the "means of carrying out operations immediately against an enemy at any desired point in time or space." This required that they be "employed on the offense at the very outset of hostilities." In the section on employment of "aerospace forces," the manual noted that "as a matter of national survival," the Air Force "prepares aerospace forces for fast reaction, high rates of operation, and dependability in closely coordinated attacks." The concept behind the new nuclear plan, SIOP–62, envisioned the strategic force attacking at once the entire target list, which included the whole of the "Sino-Soviet bloc." If the SIOP appeared to those outside the Air Force to be "overkill," the manual offered a partial explanation.

> A general war may involve one conflict or more than one conflict fought simultaneously or in series. It follows, therefore, that the best preparation for limited war is proper preparation for general war. The latter is more important since there can be no guar-

antee that a limited war would not spread into a general conflict.[42]

With the buildup of strategic forces during the decade of the 1950s, the Air Force was certainly prepared to fight a general, nuclear war.

Indeed, the nation seemed to suffer from an embarrassment of nuclear riches. In the final years of the Eisenhower administration, from 1958 to 1960, the nuclear stockpile tripled in size, from 6,000 to 18,000 weapons. In addition to the huge bomber fleet under SAC, twelve Atlas intercontinental ballistic missiles (ICBMs) were operational in the United States, and ninety Thor and Jupiter IRBMs were deployed in Europe. The Eisenhower administration had also authorized another 650 Atlas, Titan, and Minuteman ICBMs and 14 Polaris submarines, each equipped with 16 missiles.[43]

Thus, when elected to the presidency in 1960, John F. Kennedy inherited from Eisenhower a strategic air force of unprecedented striking power. Within a year of Kennedy's inauguration, his secretary of defense, Robert McNamara, surprised at the scope of the SIOP–62, directed a review of the plan. Writing more than two decades after his first SIOP briefing, McNamara declared that *"nuclear weapons serve no military purpose whatsoever. They are totally useless—except only to deter one's opponent from using them.* This is my view today. It was my view in the early 1960s" (emphasis in original).[44] If true, McNamara's statement may explain, in part, his extremely negative reaction to the SIOP.

McNamara was most concerned with the rigidity of the plan. The briefing he received on September 13, 1961, actually stressed the SIOP's supposed flexibility, citing "withhold" options against targets in the satellite nations of the Soviet bloc. After extolling the SIOP's flexibility, the briefer—Chairman of the JCS (CJCS) Gen. Lyman L. Lemnitzer—declared that "it must be clearly understood that any decision to execute only a portion of the entire plan would involve acceptance of certain grave risks." A partial SIOP would leave Soviet military targets "uncovered," providing Moscow with a potentially powerful retaliatory strike force. Thus, the CJCS concluded, "the ability to defeat the enemy must not be lost by the introduction into the SIOP of an excessive number of options which would contribute to confusion and lower our assurance of success under the most adverse circumstances."[45]

Adding options to the SIOP, and therefore some measure of "flexibility," is exactly what McNamara set out to do. Lemnitzer's briefing coincided with the height of yet another crisis over Berlin, highlighting the impracticality of an "all-or-nothing" assault on the Soviet bloc regardless of the provocation. McNamara's approach to nuclear strategy embodied two concepts: counterforce/"no cities" and limited "major attack options." Echoing the tone of the new administration's overall defense policy, McNamara called for the application of "flexible response" in nuclear planning. Part of that posture included an option to withhold from attack Soviet population centers, a notion he floated publicly during a speech in Ann Arbor, Michigan, in 1962.

McNamara's reasoning was relatively clear: if war broke out, the United States would destroy Soviet military power while retaining a "second-strike" force capable of destroying Soviet urban-industrial centers if the Kremlin persisted. Kennedy and McNamara also sought "controlled responses and negotiating pauses" in fighting a nuclear war. McNamara directed the JSTPS to build a new nuclear war plan that broke the "optimum mix" into three theoretically distinct target sets: (1) nuclear-threat targets; (2) other military targets; (3) urban-industrial targets. McNamara retained the option to execute the full SIOP at once if the situation called for it.[46] While counterforce options remained in the SIOP, McNamara placed greater emphasis on the second-strike option that came to be known as "Assured Destruction."

Assured Destruction was in essence a deterrent and not a war-fighting, strategy. McNamara wanted the Soviets to understand that the United States would be able to devastate the USSR even after a Soviet first strike. Likewise, with both sides possessing the ability to ride out a first strike and destroy the other's society in response, "victory," in Aaron Friedberg's words, "had become impossible, mutual destruction was assured." Thus, Assured Destruction in time gave way to *Mutually* Assured Destruction. The deliciously appropriate acronym for this strategy, MAD, would cloud the public's, and the military's, perceptions of nuclear policy for many years.[47]

While the SIOP did not change significantly, the shift in nuclear strategy from massive retaliation to flexible response and assured destruction affected Air Force doctrine. For example, the August 1964 version of AFM 1–1, *United States Air Force Basic Doctrine*, stated that "thermonuclear weapons and assured delivery capability in the hands of potential enemies have altered the use of total military power." In an all-out war with another major nuclear power, the manual explained, even the "victor" might suffer "unacceptable damage." The Air Force accepted the concept of holding the enemy's population hostage: "our threat to enemy cities would be useful mainly as a coercive force, to restrain an enemy from introducing his total capabilities." AFM 1–1 now recognized the concept of "intrawar deterrence" as well as "second strike options." In a major departure from previous doctrine, however, the August 1964 edition explicitly discussed counterforce and countervalue operations. The purpose of counterforce operations, according to the manual, was to coerce an opponent into ending a conflict before it escalated to attacks against his cities. "We intend to leave intact the vital economic and political framework of his society," the manual's authors declared, "provided he exercises similar restraint."[48] This was a far cry from the massive retaliation–era doctrine that stressed the need for the "compression of firepower in time and space" intended to deny the enemy time to recuperate from the shock of disruption.[49]

Air Force Manual 2–11, *Strategic Aerospace Operations*, dated December 1, 1965, also reflected the new thinking about strategic nuclear war. It echoed longstanding theory and doctrine by claiming that strategic air warfare "makes the total structure of an enemy's war-making capacity an exploitable target area." While previous doctrine extolled the virtues of taking the initiative, this edition noted that strategic forces could either attack at the outset or "ride out and survive an attack. Thus, they provide a secure retaliatory capability." Under the section "Employment Planning," the manual emphasized the ability of strategic forces to "apply appropriate force at any level of conflict." AFM 2–11 also discussed counterforce and countervalue targets, noting that "selective attack options in conjunction with target selection, . . . on counterforce targets can be varied to provide a *graduated response*" (emphasis added).[50]

If McNamara, serving under both Kennedy and Lyndon B. Johnson, managed to "loosen" nuclear strategy, the SIOP remained cumbersome. Accordingly, like his predecessors, Richard M. Nixon ordered a review of U.S.strategic plans and force structure and found them wanting. The growth in the Soviet strategic arsenal coincided with a leveling off of the American part of McNamara's plan to avoid an unlimited arms race. Waning American confidence in successful counterforce operations consequently slumped further. In his February 1970 Foreign Policy Message to Congress, Nixon sounded a note of despair over existing strategic policy. He asked, "Should a President, in the event of a nuclear attack, be left with the single option of ordering the mass destruction of enemy civilians, in the face of the certainty that it would be followed by the mass slaughter of Americans? Should the concept of assured destruction be narrowly defined and should it be the only measure of our ability to deter the variety of threats we may face?"[51]

Clearly, both Nixon and his advisers realized that the choices available to the President were not quite that stark. On the other hand, the President's options, despite changes in emphasis and strategy, were not that great, either. Massive—and effective—counterforce strikes were no longer possible, considering the Soviet Union's strength. Still, the President might face three choices in a crisis: (1) authorize strikes against Soviet strategic forces that might actually leave the US weaker than the USSR; (2) initiate the assured destruction option against both military and urban-industrial targets; or (3) do nothing. Nixon's advisers also considered the possibility of uncontrolled escalation following the outbreak of hostilities and the impossibility of a successful, full-scale counterforce strike. Following a Department of Defense (DOD) review between 1972 and 1974, the administration recognized the need to build additional flexibility into strategic war plans.[52]

The result of the DOD's review was National Security Decision Memorandum (NSDM) 242, signed by President Nixon on January 17, 1974, and the Nuclear Weapons Employment Policy (NUWEP) signed by Secretary of Defense James Schlesinger on April 4, 1974. The new policy embodied in these documents, soon known as the Schlesinger Doctrine, had two major components. The first was the creation of limited nuclear options (LNOs) to enhance the credibility of deterrence and provide escalation control following the outbreak of war with the Soviets. NSDM–242 expanded the range of options open to the President, with plans calling for the employment of anywhere from a few to several hundred nuclear weapons. Many of these options remained counterforce in nature and would ostensibly allow the United States to respond to Soviet aggression at an appropriate level. In the past, Schlesinger noted, even the "limited" options crafted in SIOP–63 would be "virtually indistinguishable from an attack on cities. . . . So what the change in targeting (NSDM–242) does is give the President of the United States, whoever he may be, the option of limiting strikes down to a few weapons."[53]

The Schlesinger Doctrine continued to emphasize the destruction of Soviet economic and industrial targets. In the past, Air Force planners and administration policymakers sought to cripple Soviet war-making or supporting industry in order to prevail *during* a conflict. Now, in the first concrete declaration of posthostility objectives, NSDM–242 called for the crippling of the Soviet economy to impede postwar recovery. Turning back to the statistical "metrics" of assured destruction, the new doctrine called for the United States to retain the capability—following a Soviet first strike—sufficient to kill 30 percent of the enemy's population and lay waste to three-quarters of his industry. NSDM–242 directed the development of plans that resulted in the "destruction of the political, economic, and military resources critical to an enemy's post-war power, influence and ability to recover . . . as a major power." Thus, rather than launch a massive assault intended to simply produce the greatest numbers of casualties and the largest amount of physical destruction, NSDM–242, according to Scott Sagan, sought to provide a political rationale to the concept of assured destruction. "Victory" in a nuclear war with the USSR now depended on which side recovered some semblance of late twentieth-century civilization first.[54]

Air Force doctrine continued to evolve with the changes in national policy. AFM 1–1, January 15, 1975, stated that "the deterrence of strategic nuclear war is the highest defense priority of the United States." The manual referred, for the first time, to the strategic triad of manned bombers, ICBMs, and SLBMs. The January 1975 version of Air Force basic doctrine continued to stress, as did past manuals, the importance of seizing the initiative and the decisiveness of offensive actions. The manual also provided evidence of the continuity of strategic thought in the nuclear era. "Strategic attack is directed against selected vital targets of an enemy nation so as to destroy that nation's war-making capacity or its will be [*sic*] continue the conflict." Air Force doctrine now considered conflict at four levels, defined by the types of weapons employed and the scope of operations: strategic nuclear war, theater nuclear war, theater conventional war, and subtheater or localized conflict.[55]

In terms of employing nuclear weapons, Air Force doctrine had changed significantly since the mid-1950s. Gone were references to using the entire force at the outset to achieve maximum shock and "disruption." AFM 1–1 now referred explicitly to escalation control, the varied levels of strategic nuclear operations, and the goal of impeding postwar recovery. Strategic nuclear operations "may range from selective, limited employment at a low-intensity level to large-scale, high-intensity employment against forces and resources essential to the enemy's continued viability as a functioning postwar power." The manual's treatment of theater nuclear warfare reflected the incorporation of selective and limited nuclear options into nuclear strategy: "Theater nuclear capabilities which lessen the potential for increased collateral damage help diminish the probability of escalation." "As a result," the section concluded, "theater nuclear operations can be made more credible."[56]

As with previous administrations, however, upon taking office in January 1977, President Jimmy Carter and his advisers were not entirely happy with strategic policy. Despite the numerous changes that had occurred under both McNamara and Schlesinger, Carter faced an ever more powerful Soviet Union. The growth of the USSR's offensive and defensive forces led American strategists and policymakers to doubt that even America's highly capable triad posed a sufficient deterrent as a basis for national security. Carter directed an interagency review of policy and strategy, eventually signing Presidential Directive (PD) 18. PD–18 directed modernization studies of the ICBM force, a strategic reserve force study, and a comprehensive Nuclear Targeting Policy Review (NTPR).[57]

The NTPR provided the foundation for the Carter administration's policy and altered the philosophy behind strategic nuclear targeting. An extensive survey of Soviet doctrine and force structure resulted in a "countervailing strategy." According to Leon Sloss, the director of the NTPR, the principal focus of the new strategy was the denial of Soviet objectives, as the Soviets themselves saw them.[58] Formalized as PD–59 in 1980, the countervailing strategy, in the words of Secretary of Defense Harold Brown, focused on the specific values of the Soviet leadership. According to Brown, PD–59 was a "specific recognition that our strategy has to be aimed at what the Soviets think is important to them, not just what we might think would be important to us in their view."[59]

Under the countervailing strategy, the *effects* sought through targeting changed. The strategy assumed that the Soviet leadership valued its own survival more than that of its people. Thus SIOP–5F, reflecting PD–59 guidance, contained some 5,000 leadership targets. To further exploit the leadership's fear of losing their grip on power, planners targeted elements of the Soviet food supply as well as Red Army units stationed in the Far East, thereby making the Soviets vulnerable to a Chinese attack.[60] Although PD–59 did not change the essence of targeting guidance under NSDM–242, it backed away from the counterrecovery mission, seeking instead to deny Soviet war aims.

PD–59 was not a major departure in existing strategic doctrine; Secretary Brown characterized it instead as "a refinement, a codification of previous statements of our strategic policy." One White House official identified what was probably the most important aspect of the policy and its relationship to nuclear war planning: "In the past nuclear targeting has been done by military planners who have basically emphasized the efficient destruction of targets. But targeting should not be done in a political vacuum."[61] McNamara and Schlesinger might have argued with that observation. Military planners responded to political guidance throughout the nuclear era. The lack of political postwar "goals" led to the military's emphasis on the "efficient destruction of targets."

Nevertheless, the incoming administration of Ronald Reagan accepted and refined Carter's countervailing strategy. In October 1981, President Reagan signed National Security Decision Directive (NSDD) 13, setting the goal of "prevailing" in a protracted nuclear war lasting as long as six months. The sharp edge of Reagan's Cold War rhetoric may have led some to believe that his administration was actually placing a much greater emphasis on nuclear warfighting than his predecessor. In fact, nuclear strategy under Reagan continued to emphasize deterrence and the conclusion of a nuclear exchange as quickly as possible on terms favorable to the United States. To lessen a perceived dependence on nuclear weapons, President Reagan placed a high priority on enhancing America's conventional forces.[62]

During previous transitions from one administration to another, the new leadership generally expressed dissatisfaction with the status quo. Strategic doctrine under Reagan retained many features of the Carter years. For example, planning continued to deemphasize counterrecovery targeting. SIOP–6, effective October 1, 1983, retained the targeting classifications of previous plans. The new plan embodied the concept of "protracted nuclear war" as envisioned by the Carter administration. It also increased the Carter-era focus on targeting leadership. Certainly, this was nothing new. American nuclear war plans had, from the very first, contained provisions for attacking the Soviet leadership.[63]

In the meantime, the JSTPS undertook to cull the targeting list. that contained more than 50,000 targets in 1982, double the number in 1974, and twelve times that in the data base of the first SIOP. The elimination of the counterrecovery mission allowed the removal of many of the 15,000 targets in the economic-industrial category. Planners also deleted many of the minor military installations among the 25,000 other military targets listed in 1982. By the end of Reagan's second term, the list contained a "mere" 14,000 targets.[64]

Less than a year after Reagan left office, however, the Soviet empire began to unravel in Eastern Europe. Soviet dictator Mikhail Gorbachev, in an attempt to revive the moribund East Bloc, unleashed latent forces that quickly exceeded his ability to control them. As the decade of the nineties dawned, the strategic landscape was changing at a dramatic pace. The impending collapse of the USSR itself and a perceived end of the Cold War forced the administration of George Bush to reassess, once again, strategic nuclear doctrine and strategic attack in general.

By the latter part of the 1980s, it was clear to many observers that political changes within the crumbling Soviet bloc might also herald a new era in nuclear strategy. Indeed, Edward Luttwak, writing in 1988, declared the emergence of a "postnuclear" era.[65] Likewise, Air Force thinking on strategic attack began to shift away from an emphasis on nuclear weapons. Col. Phil Meilinger noted that the threat of the Warsaw Pact, "so comfortable, so stable, and so predictable," had led SAC, in part, to see "strategic nuclear operations and little else." If the Soviet threat, and its nuclear arsenal, was indeed fading from the scene, nuclear strategic attack theories would be irrelevant. "The concept of conventional strategic air power," Meilinger lamented, "together with its ability to be decisive at the operational and strategic levels of war—has been forgotten."[66] The successful conventional air campaign against Iraq in 1991 drove home the point that air power could achieve strategic effects through conventional operations.

As the public debate turned on the perceived obsolescence of nuclear weapons and Cold War deterrence theories, the Air Force adjusted to the "lessons" of the Gulf War. AFM 1–1, effective in March 1992, continued to stress the central importance of strategic attack to the successful exploitation and employment of air power. Nevertheless, the role of nuclear weapons in air operations is noticeably reduced in this doctrinal manual. The Air Force continued to note the presence of identifiable and targetable "centers of gravity" in any enemy "with the capacity to be a threat." Now, however, precision weaponry, not nuclear warheads, gave strategic attack its "punch." Accompanying essays on strategic attack and deterrence in the manual's second volume sounded many long-standing Cold War themes on nuclear deterrence: escalation control, assured destruction (or retaliation), and intrawar-war deterrence. "Most recently, however," the manual noted, "renewed emphasis has been placed on conventional deterrence of general war as the most meaningful means for regulating the aggressive behavior of potential adversaries."[67]

More recently, the post–Cold War period—perhaps the "late nuclear era"—has brought old arguments back to center stage. William J. Perry, former Secretary of Defense under the first administration of President Bill Clinton, sounded a call for "preventive defense." The current concept of deterring states from seeking access to weapons of mass destruction, including nuclear weapons, is rather more complex than the preventive war impulses of the early Cold War period. It is nonetheless critical to the pursuit of the nation's desire for a stable, global order. Perry reinforced the need to retain a nuclear force of sufficient size and sophistication to deter "any nuclear state"—including the Russian and other successor states to the USSR—in his annual reports to Congress for both 1995 and 1996. At the same time, he kept open the "counterforce" option for preventive strikes against lesser states, seeking "capabilities to seize, disable, or destroy WMD [weapons of mass destruction] arsenals and their delivery means prior to their use without unacceptable collateral effects."[68]

The most recent Air Force document on strategic attack, Air Force Doctrine Document (AFDD) 2–1.2 reflects, as previous doctrine did, current national policy and strategy as well as the changed nature of the post–Cold War world. AFDD 2–1.2 retains the Air Force's traditional faith in the efficacy of strategic attacks: "Strategic attack is often viewed as the preeminent mission of air power." In keeping with the traditional line of Air Force reasoning, developed through the Air Corps Tactical School, World War II, and the long Cold War, this document claims that "strategic attack can cripple industrialized, technological, or information-based opponents. . . ." As for nuclear weapons, once the centerpiece of Air Force strategic attack thought and doctrine, the draft manual sounds the end of the "strategic equals nuclear" concept. "The advent of precision non-nuclear weapons . . . [has] in many cases supplanted what many considered to be an unusable and horribly destructive nuclear strategy with one that can attain many of the same objectives with minimum collateral damage." Gone is the talk of earlier manuals like AFM 1–8 and its emphasis on *employing* nuclear weapons; only deterrence remains.[69]

Many observers have come to view the Cold War theories of nuclear deterrence and warfighting as some aberrant form of strategic thought. Nevertheless, airmen took the new weapons handed them in 1945 and integrated them with existing doctrine. The Air Force continued to favor seizing the initiative and destroying the enemy's air, and later, missile, forces as a way both to gain "command of the air" and to limit the damage an enemy could inflict on the United States in much the same fashion that Douhet suggested during the interwar years. Nuclear planners sought "vital targets," the destruction of which could decide the war. The fact that the difference between the victor and the vanquished in a nuclear war was determined by the percentages of industries and population that managed to ride out the conflict might boggle the imaginations of academics and policymakers alike. Air Force planners, however, had no choice but to plan to fight and win a nuclear war with the Soviet Union—whatever the political definition of victory might have been.

The current edition of AFM 1–1 defines doctrine as "what we hold true about aerospace power and the best way to do the job in the Air Force."[70] That perspective differs from definitions of strategic attack doctrine during the heyday of nuclear weapons. In the early years of the atomic era, a lack of direction from the highest levels of government allowed the Air Force a certain degree of latitude in planning and equipping for a nuclear war. As the Cold

War progressed, successive presidents and their civilian advisers became more deeply involved in developing nuclear strategy. National policy directly affected the evolution of Air Force doctrine on strategic attack. In many ways, then, doctrine reflected the strategies and priorities developed by civilian leaders. By the late 1960s, the institutionalization of nuclear planning within the SIOP took strategic thought within the Air Force down to the level of evaluating target sets. Thus, during the last two decades of the confrontation between the United States and the USSR, Air Force nuclear strategic attack doctrine reflected presidential policies more than any purely military theory. This, of course, is understandable given the destructive power of nuclear weapons. Fortunately, we will probably never know if strategic attack doctrine, as it applied to "nukes" from 1947 to 1991, laid out the "best way to do the job in the Air Force." Nuclear deterrence between the superpowers "worked," and the awesome weapons of the two nations' strategic arsenals remained on the airfields and in their silos.

Nevertheless, the theoretical nature of the topic of strategic attack in the nuclear era does not mean that the issues involved in the nuclear debates and planning of the last fifty years are moot. A seemingly recent notion, "parallel warfare," stresses the rapid and simultaneous attack against the entire structure of an enemy state. Nuclear planners from 1959 to the present would find the theory quite familiar. As the SIOP evolved, nuclear plans included "leadership" options, a "decapitation" strategy favored in a conventional sense by some contemporary air theorists.[71] As Karl Mueller writes "contemporary arguments about the coercive impact of targeting leaders, command and control systems, economic infrastructure, military forces, or civilian populations essentially recapitulate debates about nuclear targeting from the 1980s and before. . . ."[72] At the same time, the idea of escalation control still applies in conventional operations. Secretary Baker clearly intended to restrain Iraq with his thinly veiled threat that the United States might unleash a portion of its nuclear arsenal in response to the introduction of other weapons of mass destruction.

America's reliance on nuclear deterrence and strategic air power to backstop its position during the Cold War drew on existing air doctrine and theory. Likewise, the passing of nuclear weapons from center stage in the post–Cold War world does not mean that theories and ideas developed during the five decades following Hiroshima no longer apply. Airmen today seek many of the same effects with advanced conventional munitions that SAC's planners hoped to achieve with nuclear weapons. In one sense, the Air Force has come full circle since 1945. Early Cold War–era air plans sought to integrate widely accepted theory with a new form of highly destructive weaponry. Likewise today, modern precision weapons can produce "nuclear" effects, without, of course, the radiation and widespread collateral damage. Targeting what a state values, striking it in a "parallel" fashion, and holding out the threat that escalation can lead to annihilation is an effective strategy, whether the means of destruction is a muffled explosion or a blinding flash of light.

Notes

1. Secretary of State James A. Baker III, quoted in William M. Arkin, "Calculated Ambiguity: Nuclear Weapons and the Gulf War," *Washington Quarterly Vol.* 19, No.4, pp. 3–18. Arkin doubts that the United States would have used nuclear weapons during Operation Desert Storm, even if Saddam had employed weapons of mass destruction. He notes, however, that the administration not only left Iraq unsure of American intentions vis-à-vis the employment of nuclear weapons, but the Pentagon as well.

2. Lawrence Freedman, "The First Two Generations of Nuclear Strategists," in Peter Paret, ed., *Makers of Modern Strategy from Machiavelli to the Nuclear Age* (Princeton, N.J.: Princeton University Press, 1986), p. 735.

3. The reader seeking a comprehensive review of the major literary works on nuclear policy and strategy should look elsewhere. The largely theoretical nature of the field of nuclear war has allowed legions of think-tank analysts, college professors, and assorted pundits to produce literally thousands of books and publications on the various aspects of a war as yet unfought. As Karl Mueller has written, the theoretical soil of nuclear strategy "has been cultivated nearly to the point of exhaustion, and in many places it has been virtually paved over by fifty years of intense study." Despite this condition, since the mid-1960s most work on the subject has generally built upon the work of Bernard Brodie, Thomas Schelling, and a handful of other writers from the "golden age" of nuclear theory. Karl Mueller, "Strategic Airpower and Nuclear Strategy: New Theory for a Not-Quite-So-New Apocalypse," a chapter in "Paths of Heaven," an unpublished collection of essays from the faculty of the USAF School of Advanced Airpower Studies, Maxwell AFB, Ala., pp. 278–279. Mueller's footnotes provide the reader with a comprehensive bibliography of the significant works on nuclear strategy. To be sure, the ideas expressed by many civilian experts significantly affected and molded national strategic policy. See, for example, Fred Kaplan, *Wizards of Armageddon* (New York: Simon & Schuster, 1983), p. 45.

4. John T. Greenwood, "The Emergence of the Postwar Strategic Air Force, 1945–1953," in Alfred F. Hurley and Robert C. Ehrhart, eds., *Air Power and Warfare,* Proceedings of the Eighth Military History Symposium, October 18–20, 1978, USAF Academy (Washington: GPO, 1979), p. 220. For a complete examination of the postwar Air Force's struggle to come to grips with its new independence as well as its role as the nation's atomic striking force, see Walton S. Moody, *Building a Strategic Air Force* (Washington: Air Force History & Museums Program, 1996). Brodie is cited on pp. 40–41. For full discussions of the "classical" air power theorists and their beliefs, see David MacIsaac, "Voices from the Central Blue: The Air Power Theorists," in Peter Paret, ed., *Makers of Modern Strategy from Machiavelli to the Nuclear Age* (Princeton, N.J.: Princeton University Press, 1986); Alan Stephens, "The True Believers: Air Power between the Wars," in Alan Stephens, ed., *The War in the Air, 1914–1994* (Fairbairn, Australia: Air Power Studies Center, 1994); and Barry Watts, *The Foundations of U.S. Air Doctrine: The Problem of Friction in War* (Maxwell AFB, Ala.: Air University Press, 1984). Watts argues that the postwar nuclear era deterrence theorists are "basically indistinguishable in their logic from those of Douhet, Mitchell, and Hansell based on the long-range bomber." For a review of the major theorists' own writings, see, for example, William Mitchell, *Winged Defense: The Development and Possibilities of Modern Air Power, Economic and Military* (New York: Dover Publications, 1988), and Giulio Douhet, *The Command of the Air,* trans. Dino Ferrari (Maxwell AFB, Ala.: Air University Press, 1983).

5. Robert Jervis, "Deterrence and Perception," *International Security,* Winter

1982/1983, pp. 3–30.

6. *The United States Strategic Bombing Survey, European War/Pacific War,* Summary Report (Maxwell AFB, Ala.: Air University Press, 1987), p. 114.

7. Gen. Henry H. Arnold, quoted in Greenwood, p. 220.

8. *Ibid.*

9. Moody, chaps. 2, 3; Greenwood, p. 221. See also Harry R. Borowski, *A Hollow Threat: Strategic Air Power and Containment Before Korea* (Westport, Conn.: Greenwood Press, 1982).

10. A public relations release explaining the new Strategic Air Command's purpose summed up Air Force thought on nuclear deterrence at the dawn of the Cold War: "Destruction is just around the corner for any future aggressor against the United States. Quick retaliation will be our answer in the form of an aerial knock-out delivered by the Strategic Air Command." Some years would pass, however, before SAC's knockout blow made it off paper and into the air. Greenwood, p. 224; Robert Frank Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force, 1907–1960* (Maxwell AFB, Ala.: Air University Press, 1989), Vol. I, p. 216.

11. Mark Clodfelter, *The Limits of Air Power: The American Bombing of North Vietnam* (New York: The Free Press, 1989), p. 12.

12. David Alan Rosenberg "The Origins of Overkill: Nuclear Weapons and American Strategy, 1945–1960," *International Security*, Spring 1983, pp. 3–71, 14; Aaron L. Friedberg, "A History of the U.S. Strategic 'Doctrine'—1945 to 1980," *The Journal of Strategic Studies,* Dec 1980, p. 40.

13. Wartime air commander, future Commander in Chief of SAC, and future Air Force Chief of Staff Gen. Curtis E. LeMay considered the war in the Pacific essentially won, largely through the strategic attack of Japanese cities, before the atomic attacks on Hiroshima and Nagasaki. See, for example, Richard H. Kohn and Joseph P. Harahan, eds., *Strategic Air Warfare: An Interview with Generals Curtis E. LeMay, Leon W. Johnson, David A. Burchinal, and Jack J. Catton* (Washington: Office of Air Force History, 1988); Curtis E. LeMay and MacKinlay Kantor, *Mission with LeMay: My Story* (New York: Doubleday & Co., 1965); Friedberg, pp. 37–71; Clodfelter, chap. 1.

14. David Alan Rosenberg, "American Atomic Strategy and the Hydrogen Bomb Decision," *The Journal of American History*, Jun 1979, pp. 62–87, 64.

15. Scott D. Sagan, *Moving Targets: Nuclear Strategy and National Security* (Princeton, N.J.: Princeton University Press, 1989), pp. 14–15; Rosenberg, "American Atomic Strategy," p. 66. Sagan notes that air power icon Alexander de Seversky quipped in *Readers' Digest* that the effects of the atom bomb "had been wildly exaggerated." See also Alexander de Seversky, *Air Power: Key to Survival* (New York: Simon & Schuster, 1950).

16. Sagan, *Moving Targets*, pp. 14–15; Rosenberg, "Origins of Overkill, pp. 12–13.

17. Moody, pp. 198–199.

18. Friedberg, p. 40.

19. Sagan, *Moving Targets,* p. 17; Rosenberg, "Origins of Overkill," p. 13.

20. Sagan, *Moving Targets,* p. 16; Rosenberg, "Origins of Overkill," p. 14; Rosenberg, "American Atomic Strategy," p. 69.

21. Samuel F. Wells, "Sounding the Tocsin: NSC-68 and the Soviet Threat," *International Security*, Fall 1979, pp. 116–158; Borowski, p. 210; Rosenberg, "American Atomic Strategy," p. 69. For a discussion of atomic targeting in support of NATO operations, see Peter J. Roman, "Curtis LeMay and the Origins of NATO Atomic Targeting," *The Journal of Strategic Studies,* Mar 1993, pp. 46–74. Numerous scholars have questioned the nature of the Soviet threat to the West in the late 1940s and early 1950s. At issue are both the size and preparedness of the Red Army and its air forces, especially in Europe. See, for example, Matthew A. Evangelista, "Stalin's Postwar Army Reappraised," *International Security,* Winter 1982/1983, pp. 110–138; John S. Duffield, "The Soviet Military Threat to Western Europe: U.S. Estimates in the 1950s and 1960s," *The Journal*

of Strategic Studies, Jun 1992, pp. 208–227.

22. The text of the Soviet announcement is in Message 2406, "The Ambassador in the Soviet Union (Kirk) to the Secretary of State," Moscow, Sep 25, 1949, in *Foreign Relations of the United States, 1949* (hereafter *FRUS, 1949*), Vol. V, *Eastern Europe: The Soviet Union* (Washington: GPO, 1976), pp. 656–657. See also Wells, "Sounding the Tocsin," p. 117.

23. "A Report to the National Security Council by the Executive Secretary (NSC–68)," Apr 14,1950, in *FRUS 1949*, Vol. I, *National Security Affairs, Foreign Economic Policy*, pp. 234-292. See also Wells, p. 133, and Rosenberg, "American Atomic Strategy." Marc Trachtenberg, "A 'Wasting Asset': American Strategy and the Shifting Nuclear Balance, 1949–1954," *International Security*, Winter 1988/1989, pp. 5–49.

24. Rosenberg, "American Atomic Strategy," p. 71; Rosenberg, "Origins of Overkill," p. 16; Moody, pp. 311–312; Roman, p. 51.

25. Col. Dale O. Smith, USAF, "Air Power as Peace Power," *Air University Quarterly Review*, Summer 1949, pp. 3–14, 9.

26. Lt. Col. George R. Charlton, USAF, "Industrial Vulnerability in the Atomic Age," *Air University Quarterly Review*, Fall 1949, pp. 13–23.

27. Maj. Gen. Orvil A. Anderson, "Air Warfare and Morality," *Air University Quarterly Review*, Winter 1949, pp. 5–14. For an interesting glimpse of strategic thought in the USAF in the early nuclear era, see "A Collection of Theses on Atomic Warfare," Air Command and Staff School, Air Force Historical Research Agency File 239.04349A–477. See, for example, Lt. Col. Ivan W. Hawes, "Selection of Targets for Retaliatory Atomic Weapon Attacks," Oct 1948.

28. Borowski, pp. 182–183, n 12; Rosenberg, "Origins of Overkill," p. 16.

29. Sagan, *Moving Targets*, p. 20; Rosenberg, "Origins of Overkill," p. 16. The code-names actually date from 1952. See David Alan Rosenberg, "A Smoking, Radiating Ruin at the End of Two Hours: Documents on American Plans for Nuclear War with the Soviet Union, 1954–1955," *International Security*, Winter 1981/1982, pp. 3–38, 9.

30. Samuel F. Wells, "The Origins of Massive Retaliation," *Political Science Quarterly*, Spring 1981, pp. 31–52. Wells concludes that Eisenhower's "New Look" policy thus continued rather than altered the defense priorities of the Truman administration.

31. Roman, p. 55; Kohn and Harahan, p. 87.

32. Wells, "Origins of Massive Retaliation," p. 33; Sagan, *Moving Targets*, p. 23. Dulles provided a rather comprehensive look at the Eisenhower administration's doctrine some months later. See John Foster Dulles, "Policy for Security and Peace," *Foreign Affairs* 32 (Apr 1954): 353–364. Eisenhower's basic defense policy was outlined in NSC–162, signed in October 1953. See documents relating to NSC–162 in "Report to the National Security Council by the National Security Council Planning Board," Washington, Sep 30, 1953, in *FRUS, 1952–1954*, Vol. II, *National Security Affairs*, pt. I, pp. 489–597.

33. Air Force Manual (AFM) 1–2, *Basic Doctrine*, Apr 1, 1953, pp. 4, 13. A revision of 1–2, issued the following year, reiterated these points.

34. AFM 1–8, *Strategic Air Operations*, May 1, 1954, pp. 1, 4, 7.

35. "U.S. Air Power Today: Its Capability and Its Needs," *Air University Quarterly Review*, Fall 1956, pp. 61–78.

36. *Ibid.*, p. 62–63; Friedberg, p. 41."Disruption," LeMay declared, meant far more than selective attacks: "Destroying that [industrial] base means blasting it down, plant by plant," or in this case, city by city. See also Rosenberg, "Smoking, Radiating Ruin," pp. 3–38.

37. Rosenberg, "Smoking, Radiating Ruin," pp. 7, 25.

38. Friedberg, p. 41.

39. Rosenberg, "Origins of Overkill" p. 65; Sagan, *Moving Targets*, p. 24.

40. *Ibid.*

41. Rosenberg, "Origins of Overkill," p. 64.

42. Department of the Air Force, AFM 1–2, *United States Air Force Basic Doctrine*,

Dec 1, 1959, pp. 4, 8–9.

43. Desmond Ball, *Politics and Force Levels: The Strategic Missile Program of the Kennedy Administration* (Berkeley: University of California Press, 1980), chap. 2; Scott Sagan, "SIOP–62: The Nuclear War Plan Briefing to President Kennedy," *International Security,* Summer 1987, pp. 22–51.

44. Robert S. McNamara, "The Military Role of Nuclear Weapons: Perceptions and Misperceptions," *Foreign Affairs,* Fall 1983, pp. 59–80.

45. "SIOP–62 Briefing JCS 2056/281 Enclosure, 13 September 1961," in Sagan, "SIOP–62," pp. 50–51.

46. Sagan, *Moving Targets,* p. 30; Friedberg, pp. 50–51; Desmond Ball and Robert C. Toth, "Revising the SIOP: Taking War-Fighting to Dangerous Extremes," *International Security,* Spring 1990, pp. 65–92; Leon Sloss and Marc Dean Millot, "U.S. Nuclear Strategy in Evolution," *Strategic Review,* Winter 1984, pp. 19–28. The new target categories were similar to the blunting, retardation, and disruption missions of the early 1950s.

47. Friedberg, pp. 52–53; Sagan, *Moving Targets,* p. 32–34. McNamara's shift, particularly in declaratory policy, gave rise to the impression that U.S. "strategy" for nuclear war consisted of simply obliterating Soviet cities, while the Soviets responded in kind. Yet McNamara's shift in emphasis to assured destruction did not force a revision of the counterforce and other major attack options in the SIOP. U.S. war plans changed little from 1962 to 1974. Thomas A. Fabyanic, *Strategic Air Attack in the United States Air Force: A Case Study,* Professional Study No. 5899 (Maxwell AFB, Ala.: Air War College, Apr 1976, pp. 130–132.

48. Department of the Air Force, AFM 1–1, *United States Air Force Basic Doctrine,* Aug 14, 1964, pp. 3-1–3-2.

49. AFM 1–8, May 1, 1954, p. 8. Ironically, though later editions of Air Force basic doctrine reflected the Kennedy administration's "flexibility," they provided an extremely narrow definition of general war. "General war," they stated "is armed conflict between the major powers of the communist and free worlds in which the total resources of the belligerents are employed, and the national survival of a major belligerent is in jeopardy." See AFM 1-1, Aug 14, 1964, p. 3-1.

50. AFM 2–11, *Strategic Aerospace Operations,* Dec 1, 1965, pp. 1, 3.

51. Friedberg, p. 54; Fabyanic, p. 137; Sagan, *Moving Targets,* p. 40.

52. Friedberg, pp. 55–57.

53. Sagan, *Moving Targets,* p. 43; Sloss and Millot, p. 23.

54. Sagan, *Moving Targets,* p. 45. For a full discussion of LNOs, see Lynn Etheridge Davis, *Limited Nuclear Options: Deterrence and the New American Doctrine,* Adelphi Paper No. 121 (London: The International Institute for Strategic Studies, 1976).

55. AFM 1–1. *United States Air Force Basic Doctrine,* Jan 15, 1975, pp. 1-2, 3-4–3-5.

56. *Ibid.,* p. 3-5.

57. *Ibid.,* p. 76.

58. Sloss and Millot, p. 25. Leon Sloss directed the study of nuclear targeting policy for the Secretary of Defense that led to PD–59 in 1980.

59. Sagan, *Moving Targets,* p. 49.

60. Ball and Toth, p. 77. For a full discussion of the Carter administration's strategy, see Walter Slocombe, "The Countervailing Strategy," *International Security,* Spring 1981, pp. 13–27. Slocombe served as Deputy Under Secretary of Defense for Policy Planning in the Carter administration. On the issue of ethnic targeting, see David T. Cattell and George H. Quester, "Ethnic Targeting: Some Bad Ideas," in Desmond Ball and Jeffrey Richelson, eds., *Strategic Nuclear Targeting* (Ithaca, N.Y.: Cornell University Press, 1986), pp. 267–284. The potential target base still numbered some 15,000 economic-industrial objectives. Desmond Ball, *Targeting for Strategic Deterrence,* Adelphi Paper No. 185 (London: The International Institute for Strategic Studies, 1983), pp. 32–34.

61. Ball and Toth, p. 77.

62. Fred Charles Ikle, "Strategic Principles of the Reagan Administration," *Strategic Review,* Fall 1983, p. 17. Ikle served as Under Secretary of Defense for Policy in the Reagan administration.

63. Ball and Toth, p. 67.

64. *Ibid.*, pp. 71–72. A comprehensive, look at Reagan administration policy, including strategic defense, can be found in William P. Snyder and James Brown, eds., *Defense Policy in the Reagan Administration* (Washington: National Defense University Press, 1988). Jerome Slater and David Goldfischer discuss strategic defenses in part three of this book. (See their chapter, "Population Defense through SDI: An Impossible Dream," pp. 333–363.) For a small sampling of the enormous literature that appeared during the debate over SDI, see Fred S. Hoffman, "The SDI in U.S. Nuclear Strategy: Senate Testimony," and Charles L. Glaser, "Do We Want the Missile Defenses We Can Build?" both in *International Security,* Summer 1985, and Stephen J. Cimbala, "The Strategic Defense Initiative: Political Risks," *Air University Review*, Nov–Dec 1985, pp. 24–37.

65. See Edward N. Luttwak, "An Emerging Postnuclear Era?" *Washington Quarterly,* Winter 1988, pp. 5–15.

66. Lt. Col. Phillip S. Meilinger, USAF, "The Problem with Our Air Power Doctrine," *Airpower Journal,* Spring 1992, pp. 24–31. The fact that "strategic" and "nuclear" had become almost identical was reflected in an the title of an article written by CINCSAC Gen. John T. Chain, Jr. See Chain, "Strategic Bombers in Conventional Warfare," *Strategic Review,* Spring 1988, pp. 23–32.

67. AFM 1–1, *Basic Aerospace Doctrine of the United States Air Force*, 2 vols, Mar 1992. See pp. 11–12 in Vol. 1, and Essay P, "Strategic Attack," and Essay R, "Deterrence," both in Vol. 2.

68. See William J. Perry, *Report of the Secretary of Defense to the President and the Congress* (Washington: GPO, Mar 1996), p. 10. Gen. Eugene E. Habiger, Commander in Chief of the U.S. Strategic Command (SAC stood down in 1992), also wrote recently of the continuing need for a large-scale nuclear deterrent. See Eugene E. Habiger, "Strategic Forces for Deterrence," *Joint Forces Quarterly,* Winter 1996/1997, pp. 64–69.

69. Air Force Doctrine Document 2–1.2, *Strategic Attack,* second draft, Oct 10, 1996, p. 16.

70. AFM 1–1,Vol. 1, p. vii.

71. First and foremost among those favoring strikes against leadership elements to produce "strategic paralysis" is John Warden, a retired Air Force colonel and former commander of the USAF Air Command and Staff College. See, for example, two short pieces by John Warden, "The Enemy As a System," *Airpower Journal,* Spring 1995, pp. 40–55, and "Employing Airpower in the 21st Century," in Richard H. Shultz, Jr., and Robert L. Pfaltzgraff, Jr., eds., *The Future of Air Power in the Aftermath of the Gulf War* (Maxwell AFB, Ala.: Air University Press, 1992).

72. Mueller, p. 319.

The Air Force at War

New Perspectives on the Combined Bomber Offensive: Results of a Statistical Analysis

Richard G. Davis

The Combined Bomber Offensive was a unique historical event. From September 1939 through May 1945 the four-engined bombers of the U.S. Army Air Forces, in 410,000 effective sorties, and the strategic bombers of the British Royal Air Force, in 300,000 effective sorties, each dropped over 1,000,000 tons of bombs on enemy targets in Europe, the Mediterranean, and North Africa.[1] Never again will fleets of massed heavy bombers using iron bombs make strategic or tactical attacks on enemy targets. So complex have modern aircraft become that, in constant procurement dollars, one B–2 bomber costs as much as 600 B–17s,[2] although the B–2 may make up that difference in personnel and support costs: three trained aircrew versus 6,000, and one hangar and ground staff versus 600. Not only cost, but the advent of nuclear weapons and precision guided munitions have lessened the requirement for large numbers of aircraft to deliver destructive force to the precise target. The air war in Europe has further generated several bomber loads of written material. The U.S. Eighth Air Force and its related interests alone inspired approximately 3,000 books and articles as of 1981,[3] with many hundreds, if not thousands of works occasioned by the fiftieth anniversary of World War II. Nonetheless, a reexamination of the original wartime records of both the RAF and the AAF, and their compilation into a homogeneous whole, has removed the detritus of over fifty years of revisionism and denial to reveal new perspectives concerning one of the most intriguing aspects of the Second World War.

The methodology of the research and compilation of the statistics of the Anglo-American strategic air war against the European Axis discussed here requires explanation. In the course of two decades of research the author encountered often annoying and sometimes major inconsistencies within and between the records of the two allied air services. Not only did the AAF and the RAF use different measurements, e.g., long versus short tons, but their methods of reporting operations, targets struck, and losses reflected greatly different service perspectives. The necessity to evaluate both the overall allied strategic effort and the individual service contribution as consistently as possible required the compilation and reconciliation of each service's effective sorties (individual aircraft that actually attacked the target), losses, target nomenclature, method of bomb sighting, and the type of bombs employed. The task of compilation involved returning to the original daily, weekly, and monthly records prepared at the time of the operation by the bomber commands: RAF Bomber Command and 205 Group and the AAF Eighth, Ninth, Twelfth, and Fifteenth Air Forces. Only those immediate documents contained the targets and aiming points which the units were ordered or authorized to strike.

Revision of the records began as soon as the war ended, if not before. For instance, on May 31, 1945, less than four weeks after the German surrender, the U.S. Eighth Air Force headquarters completed a document entitled "Eighth Air Force Target Summary: Statistical Summary of All Bomber Attacks."[4] This work accounts for 268,000 effective heavy bomber sorties and lists not one of them as having been directed at a "city," or "town," or "village." Yet the mission records of the Eighth's three bombardment divisions, which directed the day-to-day bomber operations, list 259 attacks of nine or more aircraft on German and French city areas. The process of reconciliation of the records took place during and after their compilation when the compiler applied standardized tonnage figures and sighting and target terminology to the data. With that process complete, analysis of operations could be accomplished on the basis of comparing same to same rather than apples to oranges as had heretofore been the case.

During the course of research, compilation, and reconciliation, new insights into the nature of the Allied bomber offensive emerged. These fresh perspectives fell into three broad and sometimes overlapping categories: the possible effects of strategic bombing on Axis decisions and decision-makers; the actual conduct of bomber operations as opposed to wartime and postwar disputes and agendas; and the relationship of targets bombed to both strategic and target priorities and to technological limitations.

Before the outbreak of the Second World War both British and American strategic bombing doctrine stressed that the effect of bombing could go beyond physical destruction of enemy targets to affect the morale and the "will to resist" of the enemy's state and people[5] As French Marshal Ferdinand Foch, the supreme Allied military commander in 1918, suggested, the bombing of civilians might "impress the public opinion to a point of disarming the Government and thus becoming decisive."[6] It would logically follow that the more fragile the state and the less committed it and its people were to a war effort, the more susceptible it would be to the application of strategic bombing. Italy and the Balkan states formed the weakest links the Axis. Yet, Allied strategic air power as an instrument of military force acting alone failed to reduce a single member of the Axis to the state of surrender.

The expectations of the prewar theorists were, of course, altogether too simplistic. Just as the attack on key enemy capabilities, such as oil and ball bearings, proved immensely difficult to mount and follow through on, so too did the attack on the enemy's will to resist. Authoritarian regimes, backed by internal security services of varying efficiency, held power in each of the Axis nations. These regimes, whether based on monarchy, dictatorship, oligarchy, class, party, or some combination of governance, sailed a course between Scylla and Charybdis. To continue the fight meant eventual destruction of their regimes by the Anglo-Americans or the Soviets. Of the two, the Anglo-Americans were preferable, being less prone to the ruthless physical elimination of their opponents and wholesale expropriation of private property. Even a new popularly based state would make significant decisions not in the interests of the current rulers, but abandoning the fight would bring immediate German overthrow of the regime and subject the nation (and its untrustworthy rulers) to the merciless rigors of a Nazi occupation. Given these circumstances, bombing, even to destruction, presented an alternative no worse than those already in the offing.

This is not to imply that bombing did not lower morale and productivity or that the Allies did not engage in strategic bombing for direct political and diplomatic objectives. In fact, more than has generally been realized, the record suggests that many individual raids, and even particular bombing campaigns, had both military and political objectives. Because of air power's inherent flexibility, which included an immediate response to critical situations and the unique capability to strike targets and populations not otherwise involved in combat, the Anglo-Americans seemed to have used strategic bombing as an exclamation point to emphasize or further political demands or expectations. The Allies directed the bulk of these raids against weaker Axis powers.

The strategic bombing of Italy illustrates the intertwining of military, psychological, and political aspects of Allied war-making. Many of Bomber Command's raids and the missions of the U.S. Ninth and Twelfth Air Forces against the marshaling yards of Rome on July 19 and August 13, 1943, may have had an impact on that nation's will to resist that went beyond the physical damage inflicted by the raids. After a break of thirteen months, Bomber Command resumed large raids over northern Italy on October 22, 1942. The raids were timed to distract Italian attention and lower morale before the beginning of Montgomery's counteroffensive at El Alamein and the Allied invasion of French North Africa. The raids continued until mid-December. Two days after the beginning of the Sicilian campaign, on the night of July 12, Bomber Command hit the city area of Turin with 900 tons of bombs. A military coup removed the Mussolini government on July 25, six days after the air raid on Rome, which killed 700 and wounded 1,600.[7] Italian King Victor

Emmanuel had approved the plotter's plans in part because of his reaction to the bombing of the capital. The new government of Pietro Badoglio began surrender negotiations with the Allies.[8] Two months earlier the senior American airman in the Mediterranean, Lt. Gen. Carl Spaatz, had stated, "We have ample evidence to clearly indicate that they [B–17 bombers] can blast their way through any defenses and destroy the will to fight in any nation which may oppose us."[9] On June 15, the day before the Allied Combined Chiefs of Staff authorized the raid on Rome, Spaatz further suggested bombing the marshaling yards of Naples and dropping surrender leaflets.[10]

On July 31 Eisenhower warned the Italians to surrender or face more bombing. Air Chief Marshal Sir Charles A. Portal, Chief of the RAF Staff, directed Air Chief Marshal Sir Arthur T. Harris, Commander of RAF Bomber Command, "to heat up the fire."[11] Between August 7/8 and August 16/17 Harris sent five large raids against Genoa, Turin, and Milan. On the night of August 12 Harris struck the city area of Milan with 1,400 tons. In Turin bombs damaged the Fiat factory, and the city suffered heavily. It had 40 percent of its fully built-up area destroyed or damaged and injury inflicted to the firms of Alfa Romeo, Isotto-Fraschini, Breda, and Pirelli.[12] Cultural objects had no immunity in these attacks. The La Scala opera house burnt and the refectory of the Church of Santa Maria delle Grazie was left with only one wall standing—the wall on which Leonardo da Vinci had painted the last supper.[13] But Badoglio continued to delay. For another tap on the shoulder the Allies sent the heavy bombers of the Twelfth Air Force to hit the Lorenzo marshaling yard at Rome on August 13. The next day the Italians declared Rome an open city, and on August 16 a representative of the Italian government arrived in Portugal to begin serious peace negotiations. He had departed with his instruction a day before the bombing. The sincerity of the offers convinced the Allies to cancel further attacks on northern Italy. The August 13 mission took the bombers away from another important target: the Axis forces evacuating Sicily. If the Italian surrender had gone as the Allies anticipated, the German forces and their heavy equipment that escaped from Sicily might have made little difference, but with the unexpectedly easy German occupation of Italy after the surrender, the failure to stop the evacuation would continue to plague the Allies for months to come.

Likewise, in the winter and spring of 1944 the nations of Bulgaria, Rumania, and Hungary began to waver. On January 10, 1944, 142 B–17s executed, under orders, a city area attack of 420 tons of high explosives on Sofia, the capital of Bulgaria. This raid, and three earlier ones by the Fifteenth in November and December 1943, caused the mass flight of the capital's population and the movement of the seat of the Bulgarian government to a safer location.[14] These attacks, which the Allies repeated in subsequent months, apparently aimed to force the Bulgarian Council of Regents[15] to the peace table. On February 16 the British Joint Intelligence Committee advised the

Mediterranean theater commander, Gen. Maitland Wilson, that the Allies had received "a number of Bulgarian offers of surrender" and "approaches from Roumania," and that "there are abundant signs that the Hungarian Government is seriously concerned at the bombing of Sofia and Helsinki." Although uncertain as to the genuineness of these initiatives, the committee recommended to Wilson that the Mediterranean Allied Air Forces (MAAF) bomb the Bulgarian towns of Plovdiv (a communications center), Burgas (transit port for German imports of Turkish chrome), and Varna (a German navy and sea transport base) for both political and economic reasons until the Bulgarians made "an authoritative approach." The committee further advised the bombing of Bucharest and Budapest in order to produce "panic and administrative confusion." The committee added, "It is important that the first bombing [of Budapest] should be effective and perhaps for that reason Anglo-American bombing should precede Russian."[16] On March 22, Wilson, taking cognizance of this information and of the results of the Soviet winter offensive, which had heavily weakened the German southern front, asked the Fifteenth to move in the greatest possible strength against marshaling yards in Bucharest, Ploesti, Sofia, and other suitable Bulgarian and Rumanian targets. However, Wilson placed Budapest on the restricted list. Although Spaatz appealed to both Eisenhower and Arnold, he failed to get these decisions reversed. The Hungarian decision particularly baffled him, until he found that His Majesty's government had contacted pro-Allied elements in the country and hoped to take it out of the war. Instead, a German-sponsored coup put Hungary firmly under Nazi control; the Allies then removed any bombing restrictions on Hungary.[17] Four hundred and fifty of the Fifteenth's heavy bombers hit a Budapest marshaling yard and an armaments work in a built-up area of the city on April 3.

Within the context of these events, 205 Group and the Fifteenth Air Force attacked Bulgarian targets during March. On the night of March 15/16, 205 Group attacked the Sofia marshaling yard. The next night 205 Group returned to the same aiming point. Two nights later 205 Group struck the marshaling yards at Plovdiv. On the night of March 29/30, the British attacked Sofia once more, dropping 149 tons. The next day it was the Americans' turn to hit Sofia. A total of 246 bombers attacked the marshaling yards; 88 bombers, under orders, attacked the center of the city, and 32 bombers hit the city's industrial area. In all they dropped 1,070 tons of bombs (including 278 tons of incendiaries, the second highest total of this type of bomb ever dropped by the Fifteenth in a single raid). In terms of the Fifteenth's total wartime operational pattern, this late March bombing was clearly a city area raid. One source reported that it caused a fire storm.[18] Given the inaccuracy of the Allied bombing and the fact that neither 205 Group nor the Fifteenth had yet received electronic aids, the residents and bureaucrats of Sofia had again been touched by the war.

As for Rumania, both the Antonescu government and the opposition made peace overtures, especially after the Red Army fought its way into Rumanian territory on April 1, 1944. The Anglo-Americans emphasized the Rumanian's predicament on April 4, when 313 of the Fifteenth's heavy bombers dropped 866 tons of high explosives (no incendiaries) on Bucharest marshaling yards; on April 15, when 257 heavies using radar and dead reckoning dropped 598 tons of high explosives on the Bucharest city area; and on April 24, when 209 bombers hit Bucharest with 477 tons. By late April the western Allies and the opposition had agreed to terms (also approved by the Soviets in June), but the opposition leader, a man known for his indecisiveness, procrastinated. On April 29, 1944, an exasperated Churchill received a report from Foreign Minister Anthony Eden that described the Rumanian delays and excuses. The Prime Minister's reply, written at a time when he was delaying pre-Normandy air operations out of concern for French civilian casualties, revealed an all too human capacity to hold two contradictory thoughts at the same time. He noted, "It is surely a case of more bombing."[19] 205 Group sent night raids to Bucharest on May 3, 6, and 7. But the Fifteenth dealt the heaviest blows. On May 5, 550 bombers hit Ploesti. On May 6, over 667 bombers assailed rail yards and aircraft plants in 5 different Rumanian cities. And on May 7, 481 heavy bombers dropped 1,168 tons (including 164 tons of incendiaries) on rail yards in Bucharest. These attacks had the military purposes of denying the Germans oil, snarling communication with the Eastern Front, and adding to the burden on the rails imposed by the Danubian mining campaign. Given Churchill's pique, the Allies also intended the bombing as a reminder of the consequences of continued delay. Unfortunately the Bucharest raid of May 7 partially missed its intended target and struck a crowded industrial slum. According to Lt. Gen. Ira C. Eaker, Commander, MAAF, this attack killed 12,000 civilians.[20] The Rumanians continued with the Axis until late August. Ultimately, as with the Bulgarians, they delayed until too late to make an agreement with the western Allies. They also ended up in the belly of the Soviet wolf.

The bombings of Bucharest and other Balkan capitals do not seem to have produced significant political results. Given the weak morale of the Balkan nations' leadership and populations, they would appear to have been excellent candidates for the prewar air theories that advanced the principle that strategic bombing could panic a state's leadership into surrender. Evidence from wartime operations indicates that air theorists tended to emphasize the potency and potential of air power without adequate consideration of the entire spectrum of diplomatic and military factors involved in warfare. On the other hand, the psychological effects of strategic bombing defy exact measurement. The Balkan bombings may well have contributed to defeatism and a desire for limited commitments with their German partners.

New perspectives on strategic bomber operations derive from comparison of data generated by the electronic spreadsheet. This tremendous analytical tool enabled the author to take a fresh look at one of the enduring controversies of the era—the contribution of Harris and Bomber Command to the Anglo-American campaign against German oil, a system whose destruction meant the end of effective German military operations. In the following discussion, only the efforts of the U.S. Eighth Air Force and Bomber Command are compared. Both had access to the same targets, encountered the same weather conditions, and responded to the needs of the same ground forces. The U.S. Fifteenth Air Force is not included because it attacked different targets under much different circumstances. Lt. Gen. Nathan F. Twining, commander of the Fifteenth, based his decisions on whether to attack oil targets during a specific period on very different criteria than those used by Harris and Spaatz. There is no question that Spaatz and Lt. Gen. James H. Doolittle, Commander, Eighth Air Force, treated oil as the primary strategic target from May 12, 1944, the date of the first systematic American attack on German synthetic oil, to the end of the war. But Harris' commitment to oil bombing, especially when it competed with his city area campaign, was questioned during the war by his service chief, Portal, and afterward by numerous critics, all of whom contend he could have done far more against the oil target system. One of Harris' most severe critics, historian Max Hastings, stated the charge most clearly:

> But having made allowances for all these elements, there were still many mornings when Harris sat at his desk confronted with a long list of targets of every kind, together with a weather forecast that—as usual throughout the war—made the C-in-C's decision a matter of the most open judgment. And again and again, Harris came down in favor of attacking a city rather than an oil plant.[21]

Although the statistical record cannot address Harris' reasoning for the selection of targets bombed, it does show what he actually bombed. From June 1, 1944, to May 8, 1945, Bomber Command devoted 15 percent of its total sorties, 22,000 of 155,000, against oil targets, dropping 99,500 tons. Both these figures exceeded those of the Eighth Air Force, which devoted 13 percent of its effective sorties, 28,000 of 220,000, and dropped 73,000 tons of bombs on oil targets from May 12, 1944, to May 8, 1945. Obversely, Harris devoted 36 percent of his efforts over the same period to area bombing, while Doolittle employed his forces on area or area-like raids only 16 percent of the time throughout the last year of the war. In spite of the fact that Bomber Command actually devoted more energy to oil bombing than the Eighth did, could it have done more, and as critics imply, was Harris deliberately disobeying his directives?

In June and July 1944 the German night fighters were still a force to be reckoned with. In June Harris sent only four main force raids into Germany, all against oil targets in the Ruhr, and suffered a loss of 10 percent. In July he sent ten main force raids into Germany, including five oil raids against the Ruhr. City area heavy bomber sorties doubled those against oil. The Eighth surpassed these efforts by only 150 tons in June and by 1,750 tons in July. By that time German synthetic oil production had fallen precipitously. The Eighth's initial bombing in May dropped production from 380,000 tons per month to 200,000 tons. In the next two months production dropped to approximately 70,000. In August Harris dispatched ten heavy bomber raids against oil, five of them to French storage facilities, and ten area raids into Germany. He sent the first major RAF daylight heavy bomber raid of the war, 220 aircraft against oil targets in Homberg. At this stage of the war Bomber Command was more accurate by day than the Americans were. In September Bomber Command made nine more 300-ton or larger daylight raids on oil targets in Germany, but it devoted three times that effort, including three day raids, to area bombing. In August Bomber Command dropped 1,400 more tons of bombs on oil targets than the Eighth did; it fell behind the Eighth by 3,100 tons in September. In October Harris sent six major daylight raids against oil, but he devoted twelve times that effort, including eight major day raids, to area bombing. Of the eleven daylight area raids of September and October, at least five, comprising 1,650 sorties, employed visual sighting. One of those, on Kleve, was at the request of the Allied ground forces. The other four could probably have been sent against oil targets. On two of the days in question, Bomber Command conducted separate day raids on both city area and oil targets.

One should realize that RAF daylight precision techniques landed a far higher percentage of bombs on or near the aiming point than RAF night raids did. This is a key point. Not only did Harris dispatch day raids against oil, his missions usually numbered 150 or fewer bombers. This maximized accuracy in that if one sent more than 150 aircraft to attack the same point, bombing accuracy of the excess aircraft was severely degraded by the preceding unit's smoke and damage, not to mention the extra time given to German antiaircraft artillery to get the range. Harris bombed up to the point of diminishing returns, and no further, thereby making the most efficient use of his resources although he may not have obeyed the spirit of his directive. On November 1 the Air Staff emphatically ordered Harris to concentrate on oil. He openly disagreed with the orders but carried them out, sending thirteen raids. The weather was so bad that none of Harris' four night oil raids and only two of his nine daylight raids used visual sighting. In November only five of forty of the Eighth's major oil raids used visual sighting. Bad weather made it necessary to employ area techniques, but thousands of bombs drenching a target area probably did not ensure that as many bombs actually hit the oil targets as would have had far fewer bombs been dropped visually during daylight. Every month before November 1944 the Eighth's percentage of sorties devoted to oil exceeded that of Bomber Command's by 25 to 50 percent. In November the two air forces devoted an equal percentage of resources, and from December until war's end, Bomber Command's percentage of effort more than doubled that of the Eighth's. It would appear that Harris fulfilled his directives, including the British city area policy which remained in force, albeit at a lower priority, throughout the period. Harris justified his effort on the basis of weather conditions and tactical considerations. Overall it can be said that American bombs ruined the oil industry, and that British *and* American bombs flattened it and kept it flattened.

The Combined Bomber Offensive database also supplies insight into one of the most complex and perplexing problems concerning Anglo-American operations, the question of city area bombing. For Bomber Command, which had a series of War Cabinet–approved directives authorizing the practice, the question revolves around the extent of its efforts and their necessity. This paper will not address the moral aspects of the necessity. However, it must be acknowledged that throughout the conflict weather and technological limitations on accuracy made area bombing a tactical imperative for both the British and the Americans. From January 1942 onward Bomber Command spent 56 percent of its sorties on city area bombing. When one subtracts the night harassing raids of Mosquitoes, Bomber Command expended 50 percent of all its heavy bomber sorties, almost 500,000 tons, on area bombing.

The composite figure masked variations over time. For example, from April 1943 through March 1944, when Harris finished the Battle of the Ruhr and fought the Battles of Hamburg and Berlin, Bomber Command released 40 percent of all its city area tonnage, which accounted for 87 percent of its total tonnage for the period. The percentage of city area tonnage declined during the pre-D-Day and Normandy campaigns, reaching an all-time low of 3 percent in June of 1944, and most of that area tonnage was on French cities at the direct order of Eisenhower. From December 1944 until the end of the war, the Command dropped 50 percent of its entire city area tonnage. That effort amounted to 46 percent of its entire tonnage for the period. Those are the figures. They should serve as a baseline for any further discussion.

For Americans the question is not only how much, but whether it occurred at all. As mentioned above, at least one major report of the Eighth Air Force prepared immediately after the war eliminated all reference to "city" bombing. However, individual mission reports prepared shortly after execution of the operations present a somewhat different story. They state that the Eighth expended 12.5 percent of its total tonnage, 85,100 tons, in city bombing. Of that total, 72,000 tons were in 117 command bombings of Germany, bombings either expressly ordered or authorized by Eighth Air Force headquarters. Such orders to the combat units either expressly designated the center of the city as the target or authorized the bombing of the center of the city by radar as a specified secondary target if the visual primary target, such as a tank plant, was clouded over. Another 10,100 tons were dropped in 159 opportunity raids over Germany. With the permission and encouragement of official policy, small units separated from their main formations or from those unable to bomb their primary and secondary targets and sought out cities, towns, or villages of opportunity to bomb. A final 3,000 tons landed on 21 French villages and towns near the Normandy landings in a series of attacks expressly ordered by Eisenhower. The records of the Fifteenth Air Force, which fought a much different war, acknowledged only 10,700 tons of city bombing, 3 percent of its total tonnage. Some 2,000 of those tons fell on Yugoslav towns designated and specifically requested by Marshal Tito's forces as containing "enemy" garrisons.

The Eighth did not begin city bombings until September 27, 1943, with a mission against the port of Emden. It was no coincidence that the raid was the first operational use of radar by American bombers. In the 103 previous missions, in which weather en route or over the target substantially interfered with 20 missions, the Eighth attempted to strike its targets with daylight precision techniques. Some criticize this effort as a Pavlovian adherence to outmoded doctrine. It may have been, but the Eighth had no alternative. The Norden and Sperry bombsights that equipped its B–17s and B–24s could not see through clouds, and no alternative sighting method was available until the advent of airborne radar. To resort to area bombing made no sense. Such limitations promoted the selection of precision targets, even if accuracy in practice may have left something to be desired. The advent of radar changed all that. The Eighth could now strike targets through overcast, as long as it could take off and land at its bases. Now, the rate of operations and the number of bombs delivered to enemy territory greatly increased, but at a price. The most common American radar, the H2X, a variant of Bomber Command's H2S, could identify coastal cities or cities with a distinctive river running through them because the images presented by ground and water contrasted markedly. H2X could also identify a city or built-up area, but over a large city the radar tended to fuzz up with the clutter of too many varied returns. In the hands of an ordinary operator, it could not usually identify specific targets, such as marshaling yards or arms plants, within a city. Acknowledging these limitations, raids dispatched in the expectation of encountering clouds over the target were authorized to do what they were going to do in any case—drop their bombs on the city if they couldn't see the target. Because of the dangers associated with bringing back bombs, bomber crews seldom did so. H2X could not locate small targets, such as synthetic oil plants, which meant that the few days of visual bombing available for nine months of the year were reserved for them. After September 26, 1943, the Eighth flew 256,500 effective combat bomber sorties; 48 percent of them (124,000) used some form of radar-assisted bombing. Twenty-three percent of those sorties were city area strikes. On October 10, 1944, the Eighth ordered its first visual area raid, when 138 bombers attacked Münster. It would have been especially ironic four days latter if the second Schweinfurt mission had arrived over its target and encountered clouds, instead of fair weather. The Eighth ordered it to bomb the city area of Schweinfurt as a secondary target if overcast obscured the ball bearing plants. Instead of the gallant Air Force equivalent of Pickett's Charge, that famous raid might have gone into the books as something else entirely.

On July 21, 1944, a date on which six separate groups of the Eighth's bombers totaling 312 aircraft attacked cities visually as targets of opportunity, Spaatz' Deputy for Operations, Maj. Gen. Frederick L. Anderson, sent a new bombing policy memo to Doolittle and Twining. Anderson pointed to Spaatz' oft-reiterated and continuing intention to bomb precision targets, and he categorically denied any intention to area-bomb. But having denied the intention, he proceeded to authorize the practice: "We will conduct bombing attacks through the overcast where it is impossible to get precision targets. Such attacks will include German marshaling yards whether or not they are located in German cities."[22] This memo had a chilling effect on the area bombing that was reported. Three-quarters of all reported raids appeared in the Eighth's records before this memo. However, using the profile of known command city raids—those consisting of more than 100 aircraft that nearly always carried more than 20 percent incendiaries and bombed by radar over 80 percent of the time—and applying it to all Eighth Air Force raids, the database indicates 64 more "area-like raids." Fifty-five, or 85 percent, of those raids occurred after Anderson's memo. The addition of area-like raids and their 60,750 tons of ordnance increased the total of the Eighth's city area and area-like raids to 21.5 percent of its total effort.

The Eighth conducted several unusual and little-understood missions during February 1945. On February 3 it executed the Thunderclap Plan over Berlin, where 933 B–17s conducted the Eighth's largest visual city area raid. The mission intentionally struck the governmental center of the city to produce confusion and perhaps finally break the will of the German government and force its surrender. On February 21 the Eighth flew its largest raid of the war against a single target when all three air divisions, 1,198 heavy bombers strong, used H2X to attack the main marshaling yard of Nuremberg. They dumped 2,869 tons (41 percent incendiaries) on the key transportation center and symbolically important city. The next day all Anglo-American air power (Bomber Command, British 2d Tactical Air Force, and the U.S. Eighth, Ninth, Twelfth, and Fifteenth Air Forces) joined in Operation Clarion. The Americans did not intend to kill German civilians as much as they hoped to damage the Germans' psyches. Supreme Headquarters Allied Expeditionary Force's (SHAEF's) proposed psychological war plan to accompany Clarion aimed to impress upon the German people, especially train crews and yard workers, the necessity of avoiding railway stations, tracks, freight yards, and so on.[23] Shortly before initiating the operation, and after the American press furor over Dresden, Spaatz issued specific instructions:

> In planning for Operation Clarion it is important that Public Relations and Communiqué Officers be advised to state clearly in communiqués and all press releases the military nature of all targets attacked. Special care should be taken against giving any impression that this operation is aimed at civilian population or intended to terrorize them. In addition to the above, care must taken to insure that all crews are thoroughly briefed that attacks will be limited to military objectives. This is extremely important for the safety of our crews in case they should be shot down in enemy territory.[24]

By attacking numerous unbombed targets near small cities and towns, the Allies hoped to impress upon millions of Germans their helplessness in the face of Allied air superiority. British and American fighters and bombers would spread out all over Germany, blasting transport targets such as grade crossings, stations, barges, docks, signals, tracks, bridges, and marshaling yards. The plan purposefully selected targets near small towns heretofore untouched by the war and therefore not likely to have strong antiaircraft defenses. To heighten their accuracy, the Eighth's and Fifteenth's heavy bombers came in at unusually low altitudes. Some of them bombed from 6,000 feet, while the Ninth's medium bombers buzzed up and down the rail lines, destroying locomotives and disrupting traffic. British 2d Tactical Air Force joined in the operations with over 1,600 sorties, and Bomber Command made four attacks. In Italy British 1st Tactical Air Force and the American Twelfth also joined in. In all, more than 3,500 heavy bombers and 4,900 fighters participated. The bombers attacked 219 transportation targets while the fighters destroyed or damaged 594 locomotives and 3,803 rail cars.[25] The Allies lost 90 aircraft. Of the Eighth's 13 fighter groups, 11 strafed targets of opportunity.

The bombing itself proved remarkably accurate. The combination of lower altitude and smaller attacking formations produced good results. Ninety-six of the Eighth's 124 attacking squadrons bombed visually, and the Air Force's Operational Analysis Section plotted 76 of those bomb patterns and compared them to the average of operations from September 1, 1944, through January 31, 1945. In Clarion the bomb patterns were considerably more compact with only one-third as many gross errors (8 percent to 28 percent). In addition 26 percent of Clarion's visually aimed bombs fell within 500 feet of the aiming point and 82 percent fell within 2,000 feet, as opposed to the winter's average of 12 percent within 500 feet and only 57 percent with in 2,000 feet.[26] Relatively few bombs fell on populated areas, and for its entire effort the Eighth loaded less than 0.2 percent incendiary bombs. The Fifteenth chipped in with 48 squadron or smaller-sized attacks on rail targets in Germany, Austria, and Italy, while the medium bombers of the Ninth Air Force dropped 850 tons on 11 marshaling yards and 44 other rail targets. Fighter-bombers from the Ninth's three tactical air commands hit rail targets with an additional 376 tons and conducted armed reconnaissance along tracks from Düsseldorf to Giessen.

Any consideration of Eighth Air Force city area attacks in general and its particular operations in February 1945 must address one of the chief charges on its blotter: the Dresden raid of February 14, 1945. The Eighth and I, myself, have defended this raid as a typical marshaling yard attack. Three hundred and thirty-one B–17s of the Eighth's 1st Air Division, carrying 771 tons of bombs, 40 percent of them incendiaries, attacked the already pulverized city's Friedrichshafen marshaling yard and encountered at least 20 percent overcast, which forced two-thirds of the force to resort to radar bombing. Given the usual bomb dispersal in such circumstances, bombs scattered all about the center of the city. The Eighth's supposed intention made it, at worst, an area-like raid.

However, it was not a marshaling yard attack or even an area-like attack. The orders issued by the 1st Division to its bombers clearly defined the mission objectives:

Primary Target	Visual—Center of built up area DRESDEN.
Secondary Targets	Visual—M/Y Chemnitz. H2X—Center of Dresden.
Last Resort	Any military objective positively identified as being in Germany and east of the current bomb line.[27]

The 281 P–51s escorting the 1st Air Division had permission "to strafe rail and road transportation on withdrawal if no enemy aircraft had been encountered."[28] The bomb plot photograph accompanying the 1st Division's after action report clearly pictures the aiming point as the center of the city, although one group's bombs landed squarely on the marshaling yard. Other units of the 1st Air Division lost their way and failed to reach Dresden. But in their zeal to complete the mission they misidentified several Czech cities as their targets. Sixty B–17s dropped 153 tons into the center of Prague, while 25 attacked the city of Brux and 12 struck the city of Pilsen. Bombers of the 3d Air Division also wandered into Czechoslovakia. Thirty-eight of its B–17s attacked the town of Eger, and 24 more hit the town of Tachau. In all, the Eighth dropped 397 tons on Czech territory. The 2d and 3d Air Divisions had orders to attack marshaling yards, with no mention of city areas. They made area-like attacks that day. The 2d hit the Buckau marshaling yard at Magdeburg with 333 B–24s carrying 799 tons (31 percent incendiaries), and the 3d struck the Chemnitz marshaling yard with 306 B–17s carrying 747 tons

(27 percent incendiaries). Both attacks used radar-assisted sighting. The next day 211 of the 1st Air Division's B–17s, after finding their primary target, a synthetic oil plant covered with clouds, released an additional 465 tons of high explosives through complete overcast on Dresden. They reported their target as "military installations," a designation that all of the hundreds of Eighth and Fifteenth Air Force missions over Germany never used. No longer can there be any doubt that the U.S. Army Air Forces purposefully bombed the city area of Dresden.

Taken as whole, many of February's strategic bombing operations were conducted with the seeming purpose of breaking the German will to resist. Like strategic operations in the Gulf War more than forty years later, they illustrated the difficulty, if not impossibility, of bringing down a police state with bombing alone.

In conclusion, one can see that the Combined Bomber Offensive database offers a valuable new tool for the analysis of air operations. In this paper I have not shared all that I have discovered, nor do I claim to have developed more than a small fraction of the possible new perspectives that might come from my compilation. Therefore, the database can be made available to those who request it, and presumably other historians will also shed new light on the Combined Bomber Offensive.

Notes

1. Richard G. Davis, draft manuscript, "The Combined Bomber Offensive: A Statistical History," May 1997. As of this writing, May 1997, the manuscript consists of an electronic spreadsheet (Excel 7.0 for Windows95) containing the bombing data (approximately 500 sheets of paper printout or 4 megabytes of data) plus a narrative of 250 pages, a statement of methodology, and a detailed and annotated key to the spreadsheet.

2. This calculation is based on Table F–4: "USAF Weighted Inflation Indices Based on Inflation and Outlay Rates," USAF "Statistical Digest, FY 1993," prepared by the Deputy Assistant Secretary (Cost and Economics) and Assistant Secretary (Financial Management and Comptroller) of the Air Force, Washington, D.C., Nov 1, 1994, p. F–127. The procurement cost of a B–2 ($1,000,000,000 1993 dollars adjusted [multiplied by 0.158] to constant 1949 dollars), $158,000,000, is divided by the cost of a B–17, $250,000, in constant 1949 dollars. The actual average cost of all B–17s procured from 1937 to 1945 in then-year dollars would probably make this comparison even more unfavorable to the B–2.

3. Kenneth P. Werrill, *Eighth Air Force Bibliography: An Extended Essay and Listing of Published and Unpublished Materials* (Manhattan, Kans.: Aerospace Historian/Eighth Air Force Historical Society, 1981), lists 2,794 separate items.

4. "Eighth Air Force Target Summary: Statistical Summary of All Bomber Attacks, Alphabetically by Location, Period 17 Aug. 1942 Thru 8 May, 1945," date of security classification stamp, 5/31/45, USAF Historical Research Center, Maxwell AFB, Ala., File No. 520.308.

5. For the opinion of the Air Corps Tactical School, the font of U.S. strategic air doctrine, see the memoirs of one of its instructors and theoreticians, Haywood S. Hansell, Jr., *The Strategic Air War Against Germany and Japan: A Memoir* (Washington, D.C.: Office

of Air Force History, GPO, 1986), pp. 7–14. RAF thinking on this subject has been well documented. See the official history, Sir Charles Webster and Noble Frankland, *The Strategic Air Offensive Against Germany, 1939–1945*, Vol. I, *Preparation Parts 1, 2 and 3* (London: HMSO, 1961), pp. 50–64. Hansell is quite explicit in stating that U.S. doctrine provided for attacks against both the enemy's capacity to resist and his will to resist. RAF thinking was somewhat less clear. The Chief of the Air Staff, Air Chief Marshal Sir Hugh Trenchard, advocated bombing military targets, but he assumed that the concomitant destruction of civilian lives and property would have a telling affect on the will to resist.

6. Webster and Frankland, *The Strategic Air Offensive*, Vol. I, p. 64.

7. C.J.C. Molony, F.C. Flynn, H.L. Davies, and T.P. Gleave, *The Mediterranean and the Middle East*, Vol. V, *The Campaign in Sicily 1943 and the Campaign in Italy, 3rd September 1943 to 31st March 1944* (London: HMSO, 1973), p. 172.

8. Albert N. Garland and Howard McGaw Smyth, *Sicily and the Surrender of Italy* United States Army in World War II: The Mediterranean Theater of Operations (Washington, D.C.: Center of Military History, GPO, 1965), p. 266.

9. Ltr, Spaatz to Lyle G. Wilson, May 8, 1943, U.S. Library of Congress, Manuscript Division, Washington, D.C. (LOC/MD), The Papers of Carl A. Spaatz, Diary File.

10. Command Diary Entry, Jun 14, 1943, Spaatz Papers, Diary File.

11. Air Historical Branch, British Air Ministry, "The Bombing Offensive," Vol. V, p. 93.

12. *Ibid.*, pp. 95–96.

13. Denis Richards, *The Hardest Victory: RAF Bomber Command in the Second World War (New York: Norton, 1995)*, p. 196.

14. Msg PZ 861, from the Air Ministry from the [British] Joint Intelligence Committee (JIC) to Freedom [Allied CinC Mediterranean], Feb 16, 1944, AF/HSO microfilm reel A6068.

15. The death in August 1943 of the 49-year old King Boris, an able if somewhat slippery ruler and politician, forced a regency. The regents had neither the skill or courage of King Boris. Though pro-Western, they dithered until the Red Army crossed their border and lost all.

16. Msg PZ 861, Feb 16, 1944.

17. Davis, *Spaatz*, pp. 386–387.

18. Ronald Schaffer, *Wings of Judgement: American Bombing in World War II* (New York, N.Y.: Oxford University Press, 1985), p. 56.

19. Minute, [Churchill] to Anthony Eden, Apr 29, 1944, Public Records Office, Kew, United Kingdom, Records of the Foreign Office, FO 371/43999/R 6819.

20. Ltr, Ira C. Eaker to H.H. Arnold, September 17, 1944, LOC/MD, The Papers of Henry H. Arnold, Folder "Letters to General Marshall," Box 44. Arnold also sent a copy to the President (see Box 45, Folder, "Letters to FDR").

21. Max Hastings, *Bomber Command* (New York: Dial Press, 1979), pp. 388–389.

22. Memo, Anderson to Director of Operations, Jul 21, 1944, Spaatz Papers, Subject File 1929–1945.

23. Memo to CG, USSTAF, from Gen. Robert A. McClure, Chief, Psychological Warfare Division, SHAEF, Subj: Psychological Warfare Operations in Connection with Clarion, Jan 16, 1945, AF/HSO microfilm frame 637.

24. Msg F–6055Al (USSTAF MAIN IN 20170), CG, Ninth Air Force to USSTAF, AF/HSO microfilm reel A5616, frame 93. This message cites Spaatz' message in full. I have not yet been able to locate a copy of the original.

25. "Summary of Clarion," Spaatz Papers, Diary.

26. Rprt, Eighth Air Force Operations Analysis Section, subj: "Report on Attacks against Enemy Rail Communications—22 February 1945," Mar 8, 1945, AF/HSO microfilm reel A5923, frame 48.

27. Rprt, HQ 1st Air Division, subj: "Report of Operations, Dresden 14 February 1945," Feb 25, 1945, AF/HSO microfilm reel B5018, frame 642.

28. Tactical Command Rprt, Field Order 1622A, Feb 14, 1945, from Col Fred C. Grey, Director of Fighters, AF/HSO microfilm reel B5018, frame 688.

Command and Control of Air Operations: A Chimera of the Korean War

William T. Y'Blood

From the time the airplane was first used as a military weapon, the issue of who commands it and how it is controlled has been an elusive chimera, a mirage tantalizingly close but always fading from the grasp of those seeking the authority. Among its several meanings, *chimera* is also defined as a monster. Perhaps mirage and monster go hand-in-hand, depending on one's perspective concerning command and control (C^2).

As recently as the Gulf War C^2 remained a problem. It is an amorphous term that can mean many things to many people, too often used at cross-purposes. Over the years C^2 terminology has grown to encompass not only command and control, but communications, computers, intelligence, and the like. One wit even proposed "C^{27}E—command, control, communications, computers, cohesion, counterintelligence, cryptanalysis, conformance, collaboration, conceptualization, correspondence, camaraderie, commissaries, camouflage, calculators, cannon, caissons, canteens, canoes, catapults, carpetbaggers, caddies, carabineers, carrier pigeons, corn whiskey, camp followers, calamine lotion, etc."[1]

Fortunately, Lt. Gen. George E. Stratemeyer, the Far East Air Forces (FEAF) commander during the first year of the Korean War, and his successor Lt. Gen. Otto P. Weyland did not have to deal with C^{27}E. They did, however, have to contend with C^2, and their experiences during the Korean War were not particularly happy. Many of their problems related to targeting and a rather vague concept known as "coordination control."

The stormy squabbles over roles and missions, the result of severe budget cuts by the Truman administration and publicly exemplified by the B–36/supercarrier controversy of 1948–1949, left a bitter residue that could still be tasted during the Korean War. Distrust of another service's motives tainted many decisions. Competing interservice doctrines tended to fuel the fires started by these quarrels.

The Air Force viewed an air campaign as one distinct from other operations. Therefore, the Air Force maintained, one commander (usually an Air

Force officer) would plan and direct an air campaign no matter where the air assets came from. Tactical air operations should never come under ground or naval control, but would be responsible to the theater commander. Naturally, the tactical air commander would be best situated to allocate resources for the missions in the theater.[2]

Inevitably the Navy and Marine Corps disagreed with the Air Force. To the Navy, naval air operations were integral parts of overall naval operations, and naval air should never be confined to a specific operational area, which would nullify its major strength—mobility. The Navy, however, agreed with the Air Force on a couple of points. Naval air assets should not come under a ground or air commander, nor should air or ground commanders decide how much support to provide or when to provide it.[3]

The Marine Corps was the most adamant about the use of its own aircraft. More than in the other services, aviation was seen as an integral part of the Corps. Marine aviation existed to serve ground components, especially because marines lacked strong artillery support and therefore had to rely heavily on aviation. Using Marine Corps air assets elsewhere left marines in combat highly vulnerable.[4]

Generals Stratemeyer and Weyland had to contend with these conflicting interservice views during the war. They were also hampered by the pernicious influence of Maj. Gen. Edward M. Almond, MacArthur's chief of staff and commander of the X Corps. Almond (who, by the way, was a student at the Air Corps Tactical School in 1938–1939) was an especially arrogant and abrasive individual not particularly well liked or respected outside his own close-knit coterie of staffers. Unfortunately, he believed he knew more about close air support than any Air Force officer, and he became especially enamored of the Marine Corps version of close air support. Owing to his close relationship with MacArthur, he proved singularly troublesome in the matter of command and control of air assets.

MacArthur was Commander in Chief, Far East (CINCFE) and, as such, exercised unified command of all U.S. forces in his area. Theoretically, under the unified command concept, his Far East Command (FEC) headquarters (known as GHQ) included staff representation from all the services. As was his wont however, MacArthur preferred to do things his way. FEC remained almost wholly an Army-staffed headquarters, and MacArthur never established an Army component command. Thus, instead of taking a joint, unified view of operations in MacArthur's area of responsibility, FEC tended to look at things through olive-drab eyes.

Not until Gen. Mark Clark took over as CINCFE and as Commander in Chief, United Nations Command in 1952 were steps taken to make FEC a true unified command. GHQ was dismantled and an Army component command finally established. Clark's staff eventually consisted of 91 Army, 48 Air Force, and 41 Navy officers. Unfortunately, this unified staff became operational only on January 1, 1953, just six months before the end of the war.[5]

Two component commands, FEAF and Naval Forces Far East (NAVFE), were established under FEC. As a sop to "jointness," MacArthur declared that the chiefs of staff of FEC's components would meet weekly with General Almond, the FEC chief of staff, to discuss "coordination of interservice matters."[6] But as far as the Air Force knew, this "mysterious group . . . never formally met."[7] In reality, the extent of FEAF's participation on the FEC staff was limited primarily to two or three officers who were members of FEC's Joint Strategic Plans and Operations Group.

Concurrently, Vice Adm. C. Turner Joy's NAVFE command was strapped for personnel and equipment, as were all of the services. At the outbreak of war only about 25,000 Navy personnel were stationed in the Far East, and only one carrier from the Philippines-based Seventh Fleet was immediately available to Joy. The Admiral's resources were spread thin because the defense of Formosa, not Korean operations, remained the Seventh Fleet's primary mission. The marines too were ill prepared; few, if any, marine combat aircraft were stationed in the Far East until early August.[8]

With 1,172 aircraft assigned, FEAF was the component with the most available aircraft. Only 657, however, were available for use in Korea. Three widely spaced air forces comprised FEAF: the Thirteenth, headquartered at Clark Field; the Twentieth, at Kadena; and the Fifth, based at Nagoya. Maj. Gen. Earle E. "Pat" Partridge's Fifth Air Force would provide most of the Air Force resources used in Korea.[9] Prior to the war FEAF's primary mission had been the air defense of the FEC theater of operations. Secondarily, it was charged with maintaining "an appropriate mobile strike force" and providing "air support of operations as arranged with appropriate Army and Navy commanders."[10]

For the first days of the war FEAF aircraft were limited to their primary mission of air defense. Chafing at this restriction, Stratemeyer pleaded with MacArthur for permission to strike targets in North Korea. On June 29 MacArthur granted permission to attack north of the 38th parallel, but he emphasized that these attacks were to stay well clear of the Soviet and Manchurian borders. However, the general had neither presidential nor JCS authorization for the action. The JCS finally authorized such attacks the next day, but this was not the last time MacArthur made a major decision without consulting either the President or the JCS.

The first strike north of the 38th parallel, an eighteen-plane effort against the main Pyongyang military airfield, came just hours after receipt of MacArthur's authorization. Within a few days the North Korean Air Force ceased to be an effective force, being reduced to nuisance-style raids. With little effort, FEAF had gained air superiority.

For Stratemeyer, obtaining another kind of superiority—the matter of who controlled the air units—proved fruitless. The issue came to a head when

Navy aircraft flew their first combat missions in attacks on Pyongyang on July 3 and 4. Although FEAF knew about the July 3 strikes, it was initially unaware that the Navy also intended to attack the following day. FEAF had planned a B–29 attack on the same target for the same day. When it learned of the Navy's intentions, FEAF had to cancel the B–29 mission.

Stratemeyer was incensed by the Navy's actions, particularly when a Navy representative briefed MacArthur, Stratemeyer, and some visiting Army and Air Force generals on the attacks. Stratemeyer wrote in his diary that the "results as reported by the Navy representative [are such that] anyone who attended that briefing might be led to believe that the Navy was winning the air war in Korea. It is my opinion that it was deliberately done because of the visiting group from HQ USAF and the Department of the Army."[11] Staffers at GHQ who wished to run the air show from Tokyo also interfered with Stratemeyer's air operations. General Almond was a particular offender. Initially he ordered that all requests for air support had to go through GHQ before being passed on to FEAF and Fifth Air Force. Stratemeyer strongly objected to this slow, laborious, and utterly inefficient way of running air operations in Korea. On this matter, MacArthur sided with his air commander. Later however, as X Corps commander, Almond continued to meddle in tactical air operations.[12]

The FEAF leader was less fortunate when he attempted to gain operational control of Navy and Marine Corps air assets. On July 8 he wrote to MacArthur seeking such approval stating, "in order that proper coordination can be maintained . . . , I must be able to direct their [Navy and Marine Corps] operations, including the targets to be hit and the area in which they must operate."[13]

Admiral Joy considered Stratemeyer's move as an example of "Air Force imperialism" and an attempt to control carrier operations.[14] Stratemeyer's efforts to allay his Navy counterpart's concerns by modifying his position to mean "the authority to designate the type of mission, such as air defense, close support of ground forces, etc., and to specify the operational details such as targets, times over targets, degree of effort, etc, within the capabilities of the forces involved" met with the same cold shoulder.[15]

Attempting to break this impasse, Stratemeyer, Joy, and Almond met on July 11 to thrash out a solution. Almond proposed a compromise that, if not completely satisfying to both sides, at least mollified them. Almond's compromise read in part:

> Commanding General, FEAF, will have command or operational control of all aircraft operating in the execution of Far East Air Forces mission as assigned by Commander-in-Chief, Far East. This includes operational control of naval land-based air when not in execution of naval missions which include naval reconnaissance, anti-submarine warfare, and support of naval tasks such as

> an amphibious assault.
>
> Commander, U.S. Naval Forces, Far East, will have command or operational control of all aircraft in execution of missions assigned by Commander-in-Chief, Far East, to Naval Forces, Far East.[16]

Those present at the meeting seemed to think that the statement met most of FEAF's and NAVFE's objections. Unfortunately, this compromise contained other provisions that only further muddied the water. Under the heading "Coordination" the directive stated:

> Basic selection and priority of target areas will be accomplished by the GHQ target analysis group with all services participating.
>
> Tasks assigned by CINCFE, such as amphibious assault, will prescribe the coordination by designation of specific areas of operation.
>
> When both Naval Forces, Far East, and Far East Air Forces are assigned missions in Korea, coordination control, a Commander-in-Chief, Far East, prerogative, is delegated to Commanding General, Far East Air Forces.[17]

MacArthur established a GHQ Target Group to select targets in Korea. Initially it was composed of four relatively junior officers from GHQ's G–2 and G–3 sections and of Air Force and Navy members from the Joint Strategic Plans and Operations Group. This party had broad powers, including the authority to select targets well behind the front lines and to advise on the "employment of Navy and Air Force offensive airpower in conformity with the day-to-day situation."[18]

Seeing the Target Group as another attempt to limit his control over air operations, Stratemeyer complained to MacArthur. Stratemeyer proposed that requests for air strikes, rather than going to FEC headquarters, instead be funneled through Partridge, who had established a Joint Operations Center (JOC) adjacent to Eighth Army headquarters. Partridge would honor such requests within his capabilities. Excess requests would go directly to Stratemeyer who would then work out details of air attacks with his tactical and strategic forces.[19] MacArthur agreed but reserved the right, based on recommendations of the GHQ Target Group, to direct B–29 attacks against general air support or strategic targets.

Problems concerning target selection quickly surfaced. The Target Group had little comprehension about proper targeting. The official Air Force history later recorded that "of a total of 220 targets designated by the group, some 20 percent of the objectives did not exist."[20] The poor showing could be blamed upon the use of obsolete maps, misreading of these maps, and a failure to consult with the many available intelligence sources.

The underlying cause of the targeting problem was obvious to General Weyland, then the FEAF vice commander for operations. GHQ was not a joint staff and thus could not employ air power efficiently. Then too, the Target Group did not have the experience or the rank to perform its duties properly. Weyland proposed that a senior GHQ target selection committee, composed of general officers, make all target recommendations based on the legwork of the GHQ Target Group and FEAF's own target section. Such a group, the FEC Target Selection Committee, was formed, but it lasted only six weeks. Admiral Joy refused to name a Navy member to the committee, stating that Formosa remained the priority mission and that General MacArthur was responsible for decisions to commit the Seventh Fleet's aircraft against Korean targets. The demise of the committee was preceded by that of the GHQ Target Group, which closed shop around August 2, leaving only FEAF's own Formal Target Committee composed of FEAF operations and intelligence personnel and representatives from Fifth Air Force and FEAF Bomber Command. For the remainder of the war this group acted as the theater agency for target selection.[21]

Although target selection was eventually resolved to almost everyone's satisfaction, the matter of control of air assets remained the chimera that exasperated Stratemeyer and Weyland throughout the war. The FEC directive did not explain "coordination control," nor was any definition provided until much later in the war when a GHQ staff officer prepared an unofficial statement:

> Coordination control is the authority to prescribe methods and procedures to effect coordination in the operations of air elements of two or more forces operating in the same area. It comprises basically the authority to disapprove operations of one force which might interfere with the operations of another force and to coordinate air efforts of the major FEC commands by such means as prescribing boundaries between operating areas, time of operations in areas and measures of identification between air elements.[22]

General MacArthur evidently attached little importance to FEAF's and NAVFE's concerns for he never clarified the directive's somewhat disingenuous statements, and apparently never intended to.

Stratemeyer revisited the matter of coordination control during the planning for the Inchon landings. On September 4 he sent MacArthur proposed revisions to the air annex of the Inchon operations order, repeating his insistence that he, as Commanding General, FEAF, had to maintain coordination control over all air assets.[23] A few days later FEAF received from Almond a letter stating that Stratemeyer's objections were noted but were not vital to the operation. All commanders had previously approved the air annex, the letter continued, and it was too late to amend the plan.[24]

The day of Almond's reply but before Stratemeyer had read it, the FEAF commander visited MacArthur to register his complaints. During this meeting Stratemeyer again insisted that "someone must control all air effort in Korea and that individual is I."[25] MacArthur agreed to Stratemeyer's points, as the FEAF leader recorded in his diary. MacArthur had made Stratemeyer "responsible for coordination control" and told him, "Why, of course, Strat, there is no other way to do it."[26] MacArthur was, however, a master at telling subordinates one thing and doing the opposite. Stratemeyer, rather sycophantic in his relations with his boss, tended to take the general's word without question, this being one example. To Stratemeyer's distress, despite MacArthur's presumed support, the matter was never satisfactorily resolved.

The success of the Inchon landings led to predictable mischievousness as the Air Force and Navy (and Almond) placed their own "spin" on how the air units had performed. Almond's X Corps had the almost exclusive service of the 1st Marine Air Wing during the landings. Now he wished to have such support, and more, all of the time. But FEAF and the Fifth Air Force were unable to comply and repeatedly turned down his requests for air support. As a result Almond became an even more fervent supporter of the marine style of close air support and his meddling continued to have a baleful effect on air affairs, an effect that senior Air Force leadership in Korea spent an inordinate amount of time combating.

Although Stratemeyer and Weyland were responsible for most air operations (the Navy being a special case), they delegated tactical control to the Fifth Air Force. In turn, General Partridge established, and his successors continued, a JOC to coordinate air-ground operations. (Even before the war, after seeing disastrous results in some joint exercises, Partridge had agitated for such a center but had been turned down by MacArthur.)[27] The center was located next to the Eighth Army headquarters. At first the title "Joint Operations Center" was a misnomer. The JOC was almost entirely Air Force–manned; Eighth Army was unable to supply many people to staff the facility. Eventually enough personnel from both services were assigned to the JOC for it to merit a multiservice designation.

A completely different situation pertained to the Navy. Admiral Joy viewed the JOC as a cumbersome, inefficient method of controlling air operations, which also impinged on the Navy's prerogatives to control its own aircraft. He thus refused to assign naval personnel as integral members of the JOC, although he assigned a permanent liaison officer whose function was to forward to Task Force (TF) 77 the JOC's mission requirements and, in turn, inform the JOC of available Navy aircraft. He had no authority to commit any aircraft to any mission.[28] This arrangement continued until almost the end of the war. In late June 1953 the Navy finally provided the JOC with personnel who could select targets for naval aircraft in support of Eighth Army and who could ensure an effective coordination of TF–77 and Fifth Air Force aircraft. At last the JOC was truly a *joint* operation.[29]

In addition to its rigid insistence that FEC and FEAF should leave it alone, the Navy harbored serious doubts about the efficacy of the JOC's communications. In fact Navy and Air Force communications philosophies and equipment were highly incompatible. Naval forces normally operated under prebriefed orders, thus their messages tended to be relatively short. Also, since space aboard ships was tight, communications equipment was not usually large in size or capability. On the other hand, because space was not normally a problem and because message traffic was more widespread, Air Force communications were generally elaborate, in both size and capability. Too often, long Air Force messages overloaded Navy radio circuits, causing delays or cancellations of missions.[30] Ironically, more than forty years later during the Gulf War, similar communications difficulties resurfaced as Navy units were unable to properly receive the long, daily Air Tasking Orders.

In contrast to the Navy, C^2 relations with Marine Corps aviation units worked surprisingly well. Most Marine Corps aircraft were land-based and tied therefore into the JOC's communications net. General Partridge also realized the 1st Marine Air Wing's unique capabilities and gave it great leeway within the overall confines of Fifth Air Force's C^2 procedures.[31]

Where command and control worked at all during the Korean War is owed perhaps more to personalities working toward a common goal than to any institutional doctrine. The poisonous debates on roles and missions kept the services from working together to formulate effective joint C^2 policies and procedures. The hemorrhaging of the services' fiscal resources as their budgets were slashed after World War II exacerbated the situation. Until late in the war the most serious problem to affect C^2 lay at the CINCFE level. MacArthur's command was an Army, not a joint, command. Because the other services had little representation on his staff, they would cooperate or coordinate activities at their own discretion. Thus unity of command was mangled, and needless disputes arose that threatened to disrupt the proper conduct of actions to be taken against the enemy.

Sadly, command and control, as exemplified by the term "coordination control" (an oxymoron if there ever was one), was a chimera—both the mirage and the monstrosity of the Korean War.

Notes

1. Greg Todd, "C[1] Catharsis," *Army*, Feb 1986, p 14, as quoted in Thomas P. Coakley, *Command and Control for War and Peace* (Washington: National Defense University Press, 1992), pp. 9–10.

2. James A. Winnefeld and Dana J. Johnson, *Command and Control of Joint Air Operations*, RAND Study R-4045-RC (Santa Monica, Calif.: RAND, 1991), p. 6.

3. *Ibid.,* p. 7.

4. *Ibid.,* p. 8.

5. Timothy R. Keck, *Unity of Command and the Role of the Air Component Commander in the Pacific, 1941–1989* (Hickam AFB, Hawaii: Office of PACAF History, Feb 26, 1990), p. 32. This document is classified Secret. Information used is unclassified.

6. *Ibid.,* p. 31.

7. *Ibid.*

8. James A. Field, Jr., *History of United States Naval Operations: Korea* (Washington: Department of the Navy, 1962), pp. 47–48.

9. Robert F. Futrell, *The United States Air Force in Korea, 1950–1953* (Washington: Office of Air Force History, 1983), pp. 2–4.

10. *Ibid.,* p. 2.

11. William T. Y'Blood, ed., *The Three Wars of Lt. Gen. George E. Stratemeyer: His Korean War Diary* (Washington: Air Force History & Museums Program, 1999), pp. 53–55.

12. Futrell, *United States Air Force in Korea,* pp. 45, 48.

13. *Stratemeyer Diary*, pp. 57–59.

14. Field, p. 389.

15. Futrell, *United States Air Force in Korea,* p. 50.

16. *Stratemeyer Diary,* pp. 164–168.

17. *Ibid.*

18. Futrell, *United States Air Force in Korea,* p. 51.

19. *Ibid.*

20. *Ibid.,* p. 52.

21. *Ibid.,* pp. 53–55, 501–504.

22. Robert F. Futrell, *United States Air Force Operations in the Korean Conflict, 25 June–1 November 1950*, USAF Historical Study No. 71 (Washington: Office of Air Force History, 1951), p. 12.

23. *Stratemeyer Diary,* pp. 164–168.

24. Futrell, *United States Air Force in Korea,* p. 151.

25. *Stratemeyer Diary,* pp. 179–181.

26. *Ibid.*

27. Futrell, USAF Hist Study No. 71, pp. 61, 78.

28. Winnefeld and Johnson, pp. 29–30.

29. Futrell, *United States Air Force in Korea,* pp. 676–677.

30. Winnefeld and Johnson, p. 37.

31. Futrell, *United States Air Force in Korea,* p. 342.

A Different Air Force: War and Change from Vietnam to Bosnia

Wayne Thompson

In the thirty years from the onset of Operation Rolling Thunder over North Vietnam in 1965 to Operation Deliberate Force over Bosnia in 1995, the U.S. Air Force underwent a remarkable transformation. The Air Force that dropped a few hundred guided bombs in Bosnia was less than half the size of the Air Force that dropped six million tons of bombs in Southeast Asia. Improvement in guided bombing was the most influential, but not the only outcome of air power's increasingly sophisticated technology. While technology had advanced, people and politics had also changed. A leadership shaped in World War II gave way to one tempered by Vietnam. The dominance of the Strategic Air Command gave way to an Air Force with fighter pilots in charge—an Air Force without a Strategic Air Command. The central tension of the Cold War with the Soviet Union gave way to local warfare disconnected from great power rivalry. An overwhelmingly white male Air Force with wives at home gave way to a more diverse force; black officers grew in number and a few rose to the highest ranks, while some women flew planes and more repaired them.

It is easier to list such changes than to assess their significance. Should we view the Air Force of today as an essentially different institution from the one that entered the Vietnam War? Or should we note familiar themes sounded in ongoing interservice competition over the budget, and conclude that the more things change the more they remain the same?

During this fiftieth anniversary year, Air Force leaders frequently invoke the names of forebears who won the service's independence. Some of this is dry ritual, but some of it reveals a real feeling of kinship. When he speaks about "Billy" Mitchell or "Hap" Arnold, Gen. Ronald Fogleman (the Chief of Staff) displays an unmistakable emotional connection as well as humor. In one recent talk, General Fogleman paid tribute to Gen. Curtis LeMay for bringing Gen. "Benny" Foulois out of forgotten penury, housing him on Andrews Air Force Base, and sending him around the Air Force to tell the story of the service's roots. In this way Cadet Fogleman met General Foulois at the Air Force Academy.[1]

In another example filled with some ironies, Gen. George Butler, last commander of the Strategic Air Command, has often paid tribute to General LeMay as the man who built the command Butler dismantled. General Butler likes to show a photograph of Cadet Butler and General LeMay at the Air Force Academy. Since he died in the fall of 1990, a few months before Butler took command at Omaha, we cannot know how LeMay would have reacted to the end of the Strategic Air Command or Butler's subsequent personal campaign against nuclear weapons. But most observers would agree that in LeMay and Butler we have men shaped by very different experiences. The triumphant devastation of World War II refracted LeMay's gruff taciturnity, while the ambivalence of Vietnam pervaded Butler's cerebral warmth. To the extent that these men are emblematic of their service, we may conclude that a profound change has occurred.[2]

General LeMay and his generation were acquainted with violent death on a scale that made nuclear weapons seem less a revolutionary than an incremental development. A few months before two atom bombs destroyed Hiroshima and Nagasaki, a night of fire-bombing wreaked comparable devastation on Tokyo. Although most air raids into Japan and Germany had been far less efficiently destructive, the cumulative damage on the ground was severe, and the cost in planes and aircrews, very high. American airmen died at a rate almost inconceivable to those whose combat experience came later. The Army Air Forces lost more than 40,000 killed in action during World War II, and nearly as many in accidents—compared to fewer than 3,000 Air Force deaths in the Vietnam War, 35 in the Gulf War, and none in Bosnia.[3]

In Vietnam and since, most Air Force commanders and aircrews have put more emphasis on aircrew survival than target destruction. Thanks to the development of guided bombing, electronic warfare, and stealth, it is now possible to hit targets routinely and come home safely. But early in the bombardment of North Vietnam, the Air Force attempted to achieve accuracy with dive bombing, which can only be accomplished by flying low enough to encounter considerable antiaircraft fire. Air Force commanders sensibly told pilots to pull out high enough to save themselves, even though they were too high to bomb very accurately.[4]

In recent years combat flying has proved considerably less dangerous than flight training used to be. When Stuart Symington, the first Secretary of the Air Force, criticized the first Chief of Staff, Gen. Carl Spaatz, for his lack of emotion at a pilot's funeral, Spaatz angrily retorted that his whole life had been one long attendance at the funerals of his friends.[5] That grim duty is now endured much less frequently by Air Force pilots. Indeed even the traditional wide disparity in risk between aircrew and ground crew is diminishing. Last June, a terrorist truck-bombing of quarters in Dhahran, Saudi Arabia, killed nearly as many Air Force people as the entire Gulf War did, and it wounded many more.[6]

The decline in aircrew losses has also contributed to a decline in glamour. Since airline travel has become nearly as common as a bus ride (possibly more common) and with no more appeal (possibly less), the thrill of flying is less obvious. Nor does the pilot's life on the ground seem quite as alluring as it once did. Men based in Southeast Asia (especially Thailand) during the Vietnam War had ample opportunity to sample exotic delights, with a consequent upsurge in venereal disease. The experience in Southwest Asia has been far different, with the presence of a significant proportion of uniformed women in an American military force largely isolated from the local culture.

For operations over Bosnia, the Air Force has returned to an environment offering plenty of interaction with local people, in this case the Italian communities around the principal base at Aviano. But much like stateside bases, Aviano is dominated by military family life. Married military personnel bring their spouses and children; some singles bring parents. Aircrews have returned from a combat mission to sit down to a family meal. Single men on base pursue their normal interests, usually with deference to the fact that women at the club bar may be military or married or both.

Whatever else goes on at Air Force club bars, per capita consumption of alcohol appears to have declined. Heavy drinking in public is no longer as acceptable as it was in the days when a drinking problem did not necessarily block promotion to high rank. A more restrained lifestyle parallels a cautious approach to career advancement. Many fear that any mistake can destroy a career, so they avoid risk-taking and any real responsibility. Meanwhile they are careful to fill all the squares necessary to promotion. Square-filling is not all bad, and it is probably true that we have a more disciplined and better educated force as a result. At the beginning of the Vietnam War, only about half of Air Force officers had a college degree. Now the bachelor's degree is a minimum, and some sort of master's degree is usually necessary for promotion to general officer. Graduation from a war college and a joint assignment are other tickets that should be punched.[7]

The promotion system that encourages a superficial sameness can still be spiced by the vagaries of war and peace. An officer who happened to be at the right place when the Gulf War erupted, for example, could have his career turned around. Brig. Gen. Buster Glosson had just begun what might have been a quiet tour in the Persian Gulf when Iraq invaded Kuwait. Already well acquainted with Lt. Gen. Charles Horner, the senior Air Force general sent to the theater, Glosson became chief planner and fighter commander. Two more stars came his way in a couple of years before he was forced to resign amid allegations that he had tried to influence a promotion board. In the end his career offered another cautionary tale about playing by the rules and avoiding controversy.[8]

An even more publicized departure from the active duty Air Force occurred just as Glosson was beginning his ascent in the fall of 1990. During a visit to Saudi Arabia, the new Air Force Chief of Staff, Gen. Michael Dugan, talked to newsmen about a possible bombing campaign against Saddam Hussein's regime. In demanding Dugan's resignation, Secretary of Defense Richard Cheney seemed more concerned about the general's suggestion that air power might win the war on its own than about any security breach. There was little precedent for Cheney's action. President Harry Truman's sacking of Gen. Douglas MacArthur during the Korean War came after a far more serious challenge to presidential authority.[9]

Most public controversy over Air Force officers since the Vietnam War has involved only rule-breaking or perceived incompetence rather than opinions at variance with the military or political mainstream. The service may revere the open rebellion of Brig. Gen. "Billy" Mitchell and other early air leaders, but intellectual and political ferment usually has been less evident since then. Nevertheless, a few post-Vietnam Air Force reputations were built on advocacy. Col. John Warden has been a highly controversial proponent of air power. Sparks flying from his encounters with his critics have illuminated the changing contours of the Air Force.[10]

Colonel Warden was one of many who came away from the Vietnam War looking for better ways to use air power, and his advocacy of air campaigns independent of ground operations figured prominently in the genesis of 1991's Desert Storm air campaign against Iraq. To some observers, all the fuss over Warden's ideas seemed puzzling. Much of what he said echoed strategic bombing advocates of World War II, and most airmen familiar with Rolling Thunder shared his contempt for the gradual employment of air power in North Vietnam. But there was a countervailing legacy of that war—a war in which American air power had been expended lavishly to support ground forces in South Vietnam. Those operations left a vast reservoir of experience employing air in close cooperation with the Army. When the American military refocused on Europe in the 1970s and 1980s, Army plans to use air power under the rubric of "AirLand Battle" meshed with an increasing emphasis on joint and combined operations.[11]

Warden disliked the fact that so much of the energy of Tactical Air Command (with its headquarters at Langley Air Force Base, Virginia) was dedicated to improving air support for the AirLand Battle theory being developed by the Army's Training and Doctrine Command (with headquarters at nearby Fort Monroe). He was also distressed by the Strategic Air Command's equating *strategic* with *nuclear*. As a fighter pilot, he argued that fighter aircraft should drop conventional bombs on strategic targets.

Warden thought that the guided bombing capability which the Air Force had been developing since the Vietnam War could permit air power to win a war before ground forces engaged. In the final five years of American combat in Southeast Asia, the Air Force had expended nearly 30,000 laser-guided bombs, but only in 1972 was a laser-targeting system available that could be used in the face of heavy air defenses. Housed in a pod mounted under the wing, this system permitted the F–4 carrying it to maneuver while designating a target. Only six of these pods were available in the spring of 1972, and only four by midsummer. The Seventh Air Force commander, Gen. John Vogt, sent large formations into North Vietnam to protect the F–4s carrying the precious laser target-designation pods.[12] By 1991, the Air Force could call upon about a hundred aircraft with laser-targeting systems capable of guiding bombs in a high-threat area, and these systems used infrared technology to make laser-guided bombing as effective at night as in daylight. Indeed more so, because the new F–117 stealth fighter could penetrate alone and pose a significant problem for enemy air defenses at night even before dropping guided bombs to cripple them.

Since most unguided bombs missed their targets, it had been necessary in past wars to employ many aircraft to destroy each target. Guided bombing promised to reduce that requirement dramatically and free planes to hit more targets. Damaging numerous widely scattered targets on opening night had become feasible. For an air campaign against Iraq, Warden and his Checkmate staff in the Pentagon returned to traditional target sets like oil refineries and electrical power plants, but the great accuracy available permitted them to think in terms of taking down an electrical power grid in a few hours or days. Warden even considered disabling systems in ways that would permit their rapid repair after the short air war he envisioned.

Although his Instant Thunder plan for bombing Iraq was a reaction to the gradualism of Rolling Thunder operations in North Vietnam, Warden had internalized the determination to avoid civilian casualties imposed by the Johnson administration in the earlier war. Not only was he enamored of the logic of precision which counted as waste any bomb that did not hit a target, he also saw the Iraqi people as potential allies against Saddam Hussein. Warden thought that Saddam would be overthrown once his leadership apparatus had been severely damaged by bombing. Saddam proved to have a strong hold on Iraq, however, and the U.S. Air Force found that precision is not enough if the attacker does not know where key targets are located. Saddam and much of his weapons-producing capability survived the war.[13]

Unlike Warden's original plan, Desert Storm emphasized unprecedented destruction of the Iraqi army's tanks, artillery, and ammunition before a coalition ground offensive. Warden himself contributed to this shift in emphasis Indeed, he was delighted by "tank plinking"—the employment of 500-pound guided bombs against tanks—so long as that job was left to F–111s and F–15Es while F–117s continued to bomb targets in Baghdad and elsewhere in Iraq.

Vivid televised coverage of precision bombing in Southwest Asia submerged older depictions of urban area bombing in World War II and napalm in Vietnam. If the new images fostered public belief in the success of air power, they also promoted a demand for low casualties among enemy civilians and even troops. Yet the public learned much less about B–52 area bombing of Iraqi troop positions in the desert, not to mention B–52 raids on the large Taji military complex near Baghdad.

While fewer than ten percent of the bombs dropped in Desert Storm were guided, less than five years later a much smaller Operation Deliberate Force in Bosnia mostly expended guided bombs. Indeed, allies who lacked guided bombing capability dropped almost all the unguided bombs. Even in the case of guided bombs, the international context of Bosnian operations argued against destroying major targets. Warden's notion of quickly striking all important targets was discarded in favor of a more cautious approach which put the highest priority on the avoidance of civilian and military casualties.[14]

The North Atlantic Treaty Organization's air commander in Italy, the U.S. Air Force's Lt. Gen. Michael Ryan (who had served in the Vietnam War when his father commanded Pacific Air Forces), personally approved aiming points for all bombs to be used. He feared that collateral damage might lead to an outcry which would abort the campaign. His concern paid off, and this very limited bombing campaign was enough (in conjunction with Croatian and Muslim ground offensives) to bring Bosnian Serbs to a cease-fire. If, on the other hand, the Bosnian Serbs had persisted, the United Nations and the North Atlantic Treaty Organization would have been left to debate whether to proceed with a gradual escalation of the air war. We have a very different Air Force than the one which entered the Vietnam War, but it is not necessarily an Air Force which has seen the last of gradualism.

The Air Force's recent experience drives it toward more guided bombing, and the technology is improving so that even bad weather will cease to be the impediment it has been. We should not be too eager, however, to announce the death of area bombing, even urban area bombing. We live in a world where the employment of missiles with nuclear, chemical, or biological warheads is a dangerous possibility. Yet today's Air Force seeks to solve this problem with precision rather than with the threat of retaliation in kind.

Notes

1. Gen. Ronald R. Fogleman, talk at the National Air and Space Museum, Mar 13, 1997.

2. Gen. Butler spoke at a banquet honoring Gen. LeMay, Bolling Air Force Base, May 16, 1993; Butler spoke on his role in terminating the Strategic Air Command at an Air Force Historical Foundation symposium, Andrews Air Force Base, Sep 18, 1992; Butler's "The General's Bombshell: What Happened When I Called for Phasing Out the U.S. Nuclear Arsenal" appeared in the *Washington Post* on Jan 12, 1997.

3. Army Air Forces casualties in World War II included more than 25,000 killed in aircraft accidents. Of the thirty-five USAF personnel who died in the Gulf War, twenty were killed in action.

4. By 1967 Air Force pilots attacking targets in Route Package VI, North Vietnam, were supposed to pull up above 6,000 feet.

5. This story was recounted at a conference by Dr. David Mets based on an interview with Symington. See Wayne Thompson, ed., *Air Leadership*, Proceedings of a Conference at Bolling Air Force Base, April 13–14, 1984 (Washington, 1986), p. 49.

6. The Dhahran truck-bombing killed nineteen USAF people (seventeen enlisted and two officer) and seriously wounded about twice that many others. In the Gulf War, thirty-five Air Force people died (twenty-two officers and thirteen enlisted) of which twenty were killed in action; only nine others were wounded. Perry Jamieson of the Air Force History Support Office is writing a study of the Air Force response to the Dhahran truck-bombing.

7. On the transition to a college-educated officer corps, see Vance O. Mitchell, *Air Force Officers: Personnel Policy Development, 1944–1974* (Washington, 1996), especially pp. 197–201. On the more free-wheeling style of fighter pilots in the 1950s, see John Darrell Sherwood, *Officers in Flight Suits: The Story of American Air Force Fighter Pilots in the Korean War* (New York, 1996). By then Gen. LeMay had already brought a more disciplined approach to the Strategic Air Command, and subsequently his disciples spread LeMay's approach through the Air Force. The increasingly cautious lifestyle of Air Force officers was paralleled by changes in the lifestyle of the enlisted force; see Janet R. Bednarek, ed., *The Enlisted Experience: A Conversation with the Chief Master Sergeants of the Air Force* (Washington, 1995), especially pp. 148–149.

8. See, for example, John Lancaster and Barton Gellman, "Air Force Reprimands Deputy Chief for Meddling in Promotion Process," *Washington Post*, Dec 4, 1993. The most extensive coverage of this affair was in the *Air Force Times*, especially Mar 28 and Jul 18, 1994.

9. Michael R. Gordon and Gen. Bernard E. Trainor give a summary of the Dugan affair in *The Generals' War* (Boston, 1995), pp. 100–101.

10. Most books on the Gulf War discuss Col. John A. Warden III. See, for example, the book by Gordon and Trainor cited in the previous note. The current Chief of Staff of the Air Force, Gen. Ronald Fogleman, has included Col. Richard T. Reynolds' *Heart of the Storm: The Genesis of the Air Campaign Against Iraq* (Maxwell AFB, Ala., 1995) on his recommended reading list; see also the companion volume by Col. Edward C. Mann III, *Thunder and Lightning: Desert Storm and the Airpower Debates* (Maxwell AFB, Ala., 1995). The second volume of the *Gulf War Air Power Survey* (Washington, 1993) has a report on planning by Alexander Cochran *et al.* The most thorough history of planning for the Gulf War air campaign is a classified manuscript by Diane Putney of the Air Force History Support Office. Warden's own book, *The Air Campaign: Planning for Combat* (Washington, 1988), preceded the Gulf War and does not fully reflect his thinking at the time of the war. This author formed his impressions of Warden while working in Warden's Checkmate planning group during the Gulf War.

11. A good introduction to Air Force involvement in AirLand Battle preparations is Richard G. Davis, *The 31 Initiatives* (Washington, 1987).

12. Considerable insight into Vogt's experience with guided bombing can be gained from the interview he gave to Lt. Col. Arthur W. McCants, Jr., and Dr. James C. Hasdorff of the Air Force history program, Aug 8–9, 1978.

13. See the author's "After Al Firdos: The Last Two Weeks of Strategic Bombing in Desert Storm," *Air Power History*, Summer 1996, pp. 48–65.

14. The author's impressions of Deliberate Force are drawn primarily from his interviews with American aircrews, commanders, planners and intelligence officers in Italy shortly after the operation.

Advances in Technology

Military Power and the Revolution in Military Affairs

Richard P. Hallion

It is a pleasure to have the opportunity to speak to you all today on the subject of "Military Power and the Revolution in Military Affairs" and to examine just what that means, including its implications for the modern world. There are many ways in which we can address this subject, and my perspective will be largely from the perspective of modern joint service aerospace power. To look at the RMA and its future implications demands that we understand the place and pace of technology and, in particular, aerospace power, within modern military affairs.

Let's start with some quotes from through the years, beginning with two from the early part of this century:

> In our days wars are won not by mere enthusiasm but by technical superiority.—V.I. Lenin, 1918

> Victory smiles upon those who anticipate changes in the character of war, not upon those who wait to adapt themselves after the changes occur.—Giulio Douhet, *The Command of the Air,* 1921

The former is a cautionary one, for it shows that one of democracy's most implacable enemies had a pretty good grasp on the importance of technology investment at a time when the kinds of high-technology capabilities that modern nation-states today possess were only at best the dreams of visionaries. The second is what probably many think must be an obligatory requirement for airmen to root their thought in the hallowed precepts of Douhet—but the truth of that statement should not be underestimated, particularly in the present day, when there is such an international debate on the character and merits of aerospace power.

For my part, my favorite quote is quite different, and comes from that great theorist and student of warfare, Maj. Gen. J.F.C. Fuller, writing in his seminal *Armament and History,* in 1945:

> The weapon of superior reach or range should be looked upon as the fulcrum of combined tactics. Thus, should a group of fighters

> be armed with bows, spears and swords, it is around the arrow that tactics should be shaped; if with cannons, muskets, and pikes, then around the cannon; *and if with aircraft, artillery, and rifles, then around the airplane.*

Fuller's were strong words for 1945, but quite logical if one considers what the world had witnessed in air power development to that time, namely that the reach of air power forces—now aerospace forces—constituted the vital factor in military affairs.

Aerospace Power, Technology, and Military Transformation

Surely today, in an era of a much-discussed Revolution in Military Affairs, such sentiments would hardly be surprising, given the revolutionary character of high technology and its impact on all military affairs, not just aerospace. Or would they? Unfortunately, as the following three quotes indicate, such is far from the case. Not only is there no agreement as to where technology fits with military affairs, there is not even a consensus among experts whether or not an RMA is, in fact, taking place!

> War is a matter of heart and will first; weaponry and technology second.—Gen. Gordon R. Sullivan and Lt. Col. James M. Dubik, "Land Warfare in the 21st Century," Strategic Studies Institute, U.S. Army War College, Feb. 1993

> The ingredients for a transformation of war may well have become visible in the Gulf War, but if a revolution is to occur someone will have to make it.—Eliot A. Cohen and Thomas A. Keaney, *Gulf War Air Power Survey Summary Report,* p. 251, 1993

> Technology and air power are integrally and synergistically related. . . . Air power is the result of technology. Man has been able to fight with his hands or simple implements and sail on water using wind or muscle power for millennia, but flight required advanced technology. As a consequence of this immutable fact, air power has enjoyed a synergistic relationship with technology not common to surface forces, and this is part of the airman's culture.—Col. Phillip Meilinger, USAF, *Ten Propositions Regarding Air Power,* 1995

What is the actual situation? One can only offer one's own views. I believe that the Western world in particular is clearly in the midst of an ongoing "Revolution in Military Affairs," one that is largely technologically driven and characterized by a number of discrete factors representing, first and foremost, *the confluence of the aerospace and the electronic revolutions,* the two great revolutions that, together with the atomic revolution, utterly transformed science, technology, and society in this century. Coming out of this confluence are a number of attributes, four that I think are particularly important are:

—*increasing reliance on precision systems* (the precision of finding, fixing, and attacking, but also the precision of industry, in manufacturing techniques and design).

—*increasing information exploitation* (the product of overhead atmospheric systems and space platforms, but also the product of knowledge gathering and exploiting systems).

—*increasing communication availability* (a direct beneficiary of both the aerospace and electronic revolutions, which transforms understanding, plans, and operations alike, via sophisticated systems and architectures).

—*rapidly advancing predictive methods and materials science* (which enables the development of new and radically transforming tools, weapons, systems, and vehicles having greater operational effectiveness and greater readiness).

I would also suggest that this RMA has been a very long time coming and, in fact, that it dates to the middle of the Second World War. Further, it reflects a larger transformation, and that is the shift over the last ninety years from two-dimensionally constrained warfare with which the century began to three-dimensional warfare involving aerospace systems and submarines. This 2D to 3D shift has increasingly seen surface forces and surface movement hindered, constrained, and now, increasingly, held hostage to the wishes and intent of the 3D attacker. Today, what's happening *above or below* the surface is often far more important than what's happening on the surface itself.

A review of some very-broad-stroke significant chronological milestones in military aerospace history in this century points to this technologically driven transformation, all the more remarkable because of its rapidity (remember, the baseline dates are the Wright brothers' first flight at Kitty Hawk in 1903 and Robert Goddard's first liquid-fuel rocket flight in 1926):

1908: First military airplane flies.
1911: Aircraft attack against surface forces.
1914: Submarine attack against naval forces.
1918: Aircraft carrier attack against land targets.
1936: First militarily significant airlift of combat forces.
1939: First jet engine flown.
1940: First use of integrated air defense systems.
1943: Precision Guided Munition attacks against surface forces.
1944: Era of strategic cruise and ballistic missile attack begins.
1949: First air-refueled around-the-world flight.
1957: First earth satellite.
1958: Beginnings of attack-and-troop-lift helicopter assault.
1960: Era of surface-to-air missile combat operations begins.
1960: First reconnaissance satellite orbited.

1961: First manned orbital flight.
1968: High bypass ratio turbofan enters service.
1969: *Apollo XI* mission to the Moon.
1983: First operational stealth aircraft.
1991: Submarine missile attack against land targets.
1991: Space-based cueing of ground-based aerospace defenses.

View and Mobility

Aerospace power possesses two unique qualities that work to enhance its effectiveness as a power projection tool and an instrument of national policy: view and mobility. The first, *view*, is a traditional virtue throughout military history, and the aerospace revolution of this century has greatly increased its importance. The key to view is height: with height comes a natural vantage point, and with view comes awareness and the opportunity (hopefully) for informed decision-making leading to decisive action. From being restricted to the highest hills, armies came to rely upon tethered observation balloons; then, in the twentieth century, to airborne reconnaissance aircraft: the first military airplane, the Wright 1908 Military Flyer, was designed for reconnaissance. With the spaceflight revolution, view expanded in this century from battlefield to theater and now to global dimensions; thanks to advances in communications, the products of atmospheric and space reconnaissance systems are, for the most part, the primary means whereby national leaderships learn about global developments and then formulate plans to deal with them.

The second quality, the inherent rapid *mobility* of aerospace forces, has worked its own profound transformation of military affairs, as evident in operations from the Berlin Airlift of 1948 through the Yom Kippur War's Emergency Airlift, Desert Shield and Desert Storm, and on to the various crises we face today. Mobility has been an important factor in military affairs since Sun Tzu penned "Rapidity is the essence of war." In a century in which surface mobility rates have generally stagnated, the rate of mobility for joint service aerospace forces now approaches 500+ knots, ensuring global on-scene presence within hours, not days or weeks.

This inherent aerospace mobility advantage, first visible in the era of the piston engine but fulfilled only in the era of the high-performance gas turbine engine, has transformed the meaning of "crisis response." In the American case, it is greatly assisted by air refueling and space support (such as navigation, intelligence, weather, and communications). For nations able to deploy air mobility forces, those forces furnish tremendous innate flexibility: what might be termed the "bombs, bread, or both" options for delivery. Today rapid-deploying aerospace forces are to the world community what ships were to the nineteenth century: not without reason Britain's Foreign Secretary referred to "my 600 knot gunboats" as the RAF deployed its Tornadoes to the Gulf in 1990 prior to Desert Storm.

Any cursory examination reveals that there are a plethora of light and medium military transports available for the world's air forces, best exemplified, perhaps, by the ubiquitous Hercules. Additionally, given the capabilities of modern civilian widebody jet airliners, a relatively modest investment can buy significant "off the shelf" power and presence-projection capabilities using freighter derivatives of widebody commercial aircraft such as the Airbus family or the Boeing 767. (Canada has followed just such a course with its A–310-derived CC–150 Polaris program. Great Britain did the same with its Lockheed TriStar tanker-transport aircraft, as did the United States with the KC–10 Extender.) Special-purpose high-capacity jet airlifters typified by the C–141, C–5, or C–17 family are a different matter, but contract airlift (typified by the growing market today for high-capacity widebodies such as the An–124) can ease the access problem for nations lacking such craft. Jet airlifter "rental" can significantly enhance the airlift capabilities of larger nations and substitute for the lack of organic air mobility forces for smaller ones, though it is far less desirable for any nation seeking to undertake routine power and presence operations at a distance, particularly since the nation of origin may be unwilling to contract out its aircraft due to its own political goals and objectives. One special arrangement that has worked very well for the United States—particularly in the Gulf crisis—is the Civil Reserve Air Fleet, the so-called CRAF, the result of a partnership agreement between various American airline companies and the Department of Defense.

Since the 1950s, air refueling has been a significant mobility enabler for the world's larger air forces. Their substantial investment in air refueling technology has generated a consequent dramatic improvement in their ability to deploy forces at long range. Notable examples include both the U.S. Air Force's Tactical and Strategic Air Commands, and Military Airlift Command (now Air Combat Command and Air Mobility Command) and the British V-bomber force. The payoff of this investment has been evident in combat experience ranging from the RAF's Black Buck mission during the Falklands War and Operation El Dorado Canyon in 1986 to, most recently, the experience of the Gulf War and post-Gulf deployments and exercises, humanitarian airlift and relief missions, and NATO air operations over Bosnia. Even a relatively small investment in air refueling capability can have profound implications for deploying combat forces at long range, as was demonstrated by the Israeli air force during long-range counterterror operations in the 1980s.

Critics and the Reality of Aerospace Power

Understandably, aerospace power has had its critics, and this presentation is not to imply that aerospace power is the solution for all problems and situations. Nevertheless, it is fair to say that, given its impact on international affairs, aerospace power has consistently been underestimated by its critics, a tendency dating to the dawn of military aviation. For example, on the eve of the First World War, while lecturing to students at the British Army Staff College at Camberley, Gen. Douglas Haig bluntly stated:

> I hope none of you gentlemen so foolish as to think that aeroplanes will be usefully employed for reconnaissance from the air. There is only one way for a commander to get information by reconnaissance and that is by the use of cavalry.

Within months, of course, aerial reconnaissance had helped shape the outcome of both the Battle of Tannenberg and the Battle of the Marne, and proven its utter importance in military affairs. Speaking at the dawn of aviation, Haig might be somewhat forgiven his skepticism. But more distressing are critics today who seemingly argue that air power somehow has yet to fulfill its promise over the battlefield. (In fact, since the Korean War, not a single U.S. Army soldier has perished from enemy air attack, a tribute to the dominance of the U.S. Air Force over its foes.)

Such skepticism was rampant on the eve of the Gulf War of 1991. As the Gulf crisis built, Saddam Hussein had remarked that "The United States relies on the Air Force and the Air Force has never been the decisive factor in the history of wars." Only nine percent of the weapons employed by coalition air forces against Iraq were precision weapons, yet by the midst of the war, with nightly television evidence of blown-up headquarters, shattered aircraft shelters, cruise missiles finding their way to their targets with almost a dainty accuracy, and burning tanks, Chairman of the Joint Chiefs of Staff Gen. Colin Powell was confidently testifying before Congress that:

> Air power is the decisive arm so far, and I expect it will be the decisive arm into the end of the campaign, even if ground forces and amphibious forces are added to the equation. . . . If anything, I expect air power to be even more decisive in the days and weeks ahead.

After the war, President George Bush was more succinct when he stated "Gulf Lesson One is the value of air power," and Secretary of Defense Dick Cheney was equally blunt when, in a news interview, he remarked "The air campaign was decisive."

Such continued to be true in Bosnia, where NATO aerospace power proved crucial to halting a war and setting the stage for building a peace. Here, the overwhelming percentage—98 percent—of American ordnance was precision weaponry. At the end of NATO's Bosnian air campaign of 1995, former Assistant Secretary of State Richard Holbrooke stated: "One of the great things that people should have learned from [the NATO air campaign in Bosnia] is that there are times when air power—not backed up by ground troops—can make a difference."

Slobodan Milosevic, on the receiving end of NATO power, likewise understood the leverage of modern air attack. While dining at the Air Force Museum during the Dayton Peace Accords, the Serb leader wistfully looked at a cruise missile dangling overhead and remarked—within earshot of Richard Holbrooke—"So much damage from such a little thing."

Modern Aerospace Power: A Case of "Back to the Future"

The transforming nature of air power, evidence of the leverage of technology, is not something of recent origin, as a cursory review of military history illustrates. Writing after the First World War, Maj. Gen. Heinz Guderian noted in his book *Achtung Panzer* (1937) that:

> [in World War I] aircraft became an offensive weapon of the first order, distinguished by their great speed, range and effect on target. If their initial development experienced a check when hostilities came to an end in 1918, they had already shown their potential clearly enough to those who were on the receiving end . . . we do not have to be out and out disciples of Douhet to be persuaded of the great significance of air forces for a future war, and *to go on from there to explore how success in the air could be exploited for ground warfare, which would in turn consolidate the aerial victory.*

Post-"Great War" experience, even in this relatively primitive era of air power employment, supported those who saw in the airplane the embodiment of a revolution in military affairs. Writing after the Spanish Civil War, where air power had been employed in all its many roles, from battlefield support to reconnaissance, air mobility, and strategic attack, the Czech-born military analyst (and Spanish war veteran) Ferdinand Miksche wrote: "The air force has become the hammer of modern warfare on land. . . . Aviation gives modern battle a third dimension . . . modern battle is the fight for cubic space."

A plethora of military quotes from the Second World War attest to air power's significance, including from Prime Minister Winston Churchill's famous and oft-quoted "Never in the field of human conflict was so much owed by so many to so few" (from a 1940 speech in Parliament praising the victory of the Royal Air Force over the Luftwaffe in the Battle of Britain) to Field Marshal Erwin "The Desert Fox" Rommel's reflective lamentations after Alam Halfa in the Western Desert in 1942 that:

> Anyone who has to fight, even with the most modern weapons, against an enemy in complete command of the air, fights like a savage against modern European troops, under the same handicaps and with the same chances of success. . . . *In every battle to come the strength of the Anglo-American air force was to be the deciding factor.*

Golden Legacy, Boundless Future

The Normandy campaign offers a particularly juicy selection of air power assessments, from victor and (tellingly) the vanquished. Responding to a question from his son John, a newly graduated Army lieutenant fresh out of West Point, Dwight Eisenhower surveyed the exposed logistics and troop concentrations at Normandy after the invasion and stated emphatically, "If I didn't have air supremacy, I wouldn't be here." At nearly the same time, morosely, Field Marshal Erwin Rommel wrote to his wife that: "The enemy's air superiority has a very grave effect on our movements. There's simply no answer to it." Vice Admiral Friedrich Ruge, his naval aide, penned, "Utilization of the Anglo-American air forces is the modern type of warfare, turning the flank not from the side but from above." More importantly, the German commander in the west, Field Marshal Hans Guenther von Kluge, wrote to Hitler that: "In the face of the total enemy air superiority, we can adopt no tactics to compensate for the annihilating power of air except to retire from the battlefield."

In a strategic sense, both senior Nazi and Japanese leaders had little doubt what was causing them their greatest problems in 1944 and 1945. Reflecting on the defeat of the Third Reich, former Nazi armaments minister Albert Speer wrote in his memoirs (1970) that "[Bombing of oil targets] meant the end of German armaments production." The Japanese leadership was equally blunt. Responding to a postwar interrogator, Prince Fumimaro Konoye stated "The thing that brought about the determination [for Japan] to make peace was the prolonged bombing by the B-29s."

In sum, even in the days of relatively immature air power, guided largely by the human eye, and with aircraft woefully deficient in range, speed, and payload compared to today's technology, air power had a surprising and often decisive impact on military affairs. In the precision engagement era, what has changed most dramatically has been the *time scale* and *level of effort* required to achieve such effects. Today, for example, we do not speak of *sorties required to destroy a target,* we speak of the *number of targets destroyed per sortie.*

So, When Did the RMA *Really* Begin?

The record of air power through 1945 argues powerfully that the so-called "Revolution in Military Affairs" is not only long-standing, but that it dates back over a half-century, to the midst of the Second World War. In that war, traditional patterns of surface conflict on sea and on land were shattered forever. At sea, 77 percent of German ships were sunk by Royal Air Force air attack; 47 percent of German U-boats were sunk by Allied air attack, and (while 48 percent were sunk by submarines) 45 percent of all Japanese naval and merchant vessels were sunk by land- and sea-based air attackers. (In a foretelling of the Falklands War and the Gulf, rudimentary precision guided missiles and torpedoes sunk some of these vessels; for their part, the Germans employed an increasingly wide range of precision weapons against Allied shipping, with occasional disastrous results for their victims.) In short, the 3D attacker triumphed over the 2D surface opponent.

On land, air attack increasingly hindered and crippled the movement of surface forces, most evident in the clear terrain of the Western Desert, but also present in Europe and the Pacific. German road signs warned drivers not to use certain roads due to Allied "deep flyers" and "Jabos" (fighter-bombers) on both the Western and Eastern fronts. When one thinks of the length of a high summer day in 1944, after the Allied air forces already were roaming over much of Germany and Occupied Europe, the implications for time-warfare implicit in such signs is clearly evident. Direct air attack hindered the mobility of German forces so badly that one German commander in Italy compared himself to a chess player able to make only one move to an opponent's three. From 1943 onward, according to senior German medical personnel and records, Allied air attacks were the *primary* means whereby the German *Wehrmacht* suffered casualties on its fighting fronts, followed by artillery as a distant second, and then all other weapons. This trend in casualties continued and the disparity between air attack and other forms of attack grew even more pronounced over 1944 and 1945.

In fact, for the United States, this trend of inflicting losses and material destruction primarily through air attack continued into the postwar years for Korea, Vietnam, the Gulf, Bosnia, and other, lesser, contingencies. It may be considered, as some have termed it, a "New American Way of War," but it is less recent revolutionary than older evolutionary (with its roots in an earlier revolutionary period). In particular, air attack directed against land forces has been especially powerful in blunting and destroying opponents on the offensive, whether in older experience—such as confronting Rommel in the Western Desert, or Nazi armored forces trying to split the Normandy invasion at Mortain, or at the Bulge (where German commanders credited Allied fighter attacks on fuel trucks and supplies as being the decisive factor in halting their drive), in the opening and closing stages of the Korean War (where 75 percent of tanks, 72 percent of artillery, and 81 percent of trucks were destroyed from the air), and confronting the 1972 North Vietnamese Spring Invasion—or, more recently, in destroying the Khafji offensive of Saddam Hussein in 1991.

Aerospace Power: The Tool of Choice

It is surprising, given its record, that aerospace power advocates should still have to spend as much time as they do arguing the merits of three-dimensional war. Clearly, the RMA is here, has been for a long time, is largely an aerospace revolution, and must continue—if for no other reason than that aerospace forces are the most *responsive, flexible,* and, if need be, *lethal* and *devastating* form of power projection across the spectrum of conflict. These forces are by no means limited just to those employed by air forces. Each service has, to a greater or lesser degree, a commitment to use its own organic air-or-aerospace power resources, be they maritime patrol aircraft, attack and troop-lift helicopters, land-based long-range aircraft, and battlefield rocket artillery systems, and that service-specific aerospace power can often be formidable. (In the Gulf War, for example, U.S. Army AH–64A Apache helicopter gunships were credited with the destruction of nearly 950 tanks, personnel carriers, and miscellaneous vehicles.)

Understandably, then, aerospace forces are increasingly the most commonly employed military tool for crisis intervention for advanced nations, relied upon by national and international leaders. In the American experience, it may be carrier battle groups, air expeditionary forces, or operations of our total force Guard and Reserve components. Given this situation, for all services, how they structure and operate their aerospace forces is now of critical importance and will continue to be so in the future. Nowhere is there more interest, study, and, indeed, controversy than in the issue of joint operations between traditional surface forces and their aerospace brethren.

Yet even here has been real progress in the recognition, at least, that aerospace warfare has changed the nature and character of war, even if there is often profound disagreement on just how far that transformation and change goes. Reflecting this are the realities of defense procurement, where, for most NATO nations, procurement of traditional "2D" land warfare systems (tanks, vehicles, and infantry-support equipment) has been sharply reduced, while procurement and modernization of "3D" aviation (especially helicopter) and artillery systems has proliferated. To give but one example, in the ten years from 1986 to 1996, the number of tanks in the British Army declined from 1,030 to 500, and personnel from 163,000 to 116,000, while British Army aircraft increased from 323 to 391.

Aerospace Power and Minimizing the Risk of the Close Fight

The recognition by political and diplomatic leaders of aerospace power as the tool of choice has profound implications for how military services organize, train, equip, and fight in the joint and combined arena. Given rapid advances in the ability of aerospace forces to undertake precision targeting, tracking, and engagement, opportunities exist to exploit aerospace power's leverage to overcome the traditional problem of simultaneously trying to halt an enemy force on the move while attacking its means of waging war deep within the enemy heartland.

The authors of *The New Calculus,* a perceptive 1993 RAND study, concluded that:

> The calculus [of warfare] has changed and airpower's ability to contribute to the joint battle has increased. Not only can modern air

> power arrive quickly where needed, it has become far more lethal in conventional operations. Equipped with advanced munitions . . . and directed by modern C^3I systems, air power has the potential to destroy enemy ground forces either on the move or in defensive positions at a high rate while concurrently destroying vital elements of the enemy's war-fighting infrastructure. In short, the mobility, lethality, and survivability of air power makes it well suited to the needs of rapidly developing regional conflicts.

Traditionally, the greatest source of casualties in land combat operations have been from close combat; it is here not only that enemy fires are most intensive, but that there is the greatest risk of friendly fire incidents as well. In the Gulf War, for example, friendly fire casualties constituted 18 percent of all U.S. battle casualties and 24 percent of all U.S. deaths. (Despite much concern before the war about the potential for air-to-ground friendly fire casualties, ground-to-ground friendly fire cases were more than twice as numerous—2.14:1—as air-to-ground incidents.)

Opting for "boots on the ground" for whatever reason can be a costly mistake, even in conflicts judged (usually wrongly) as "unsuitable" for air power, or when planners and decision-makers believe them to be strictly humanitarian in nature. For example, October 3, 1993, "Bloody Sunday," in Mogadishu cost the United States 18 dead and almost 100 wounded in close combat—the most costly and intense U.S. Army combat engagement since Vietnam. Tragically, this was a combat fought in the absence of dominant, air-delivered fire support because appropriate naval and Air Force forces had been withdrawn from Somalia even though, in retrospect, air could have made a significance difference. Though not perhaps fully appreciated, the Bosnian experience likewise offers a cautionary tale: NATO airmen undertook Operation Deliberate Force in 1995 and established the conditions under which a peace could be secured in the Balkans; they did so with the loss of a single aircraft and the imprisoning (and subsequent release) of its two-man crew. Prior to this, however, the United Nations had struggled with no great success for nearly four years to bring about a peace—and the UN ground presence suffered 1,690 casualties with 214 killed, of which 708 casualties and 80 killed were as a direct result of enemy action. So much for "risk free" peace keeping.

Fortunately, the appropriate use of modern aerospace power can minimize the risk of the close fight by changing engagement strategies from ones emphasizing close-combat to those emphasizing reach and remote fires. "Seizing and Holding" is less important than "Halting and Controlling," permitting an *effects-based* strategy rather than a strategy that, at root, echoes the attrition warfare of the past. Such an approach offers the potential for asymmetric advantage over opponents, and is consistent with the increasing diminution of the battlefield as the arbiter of victory in warfare.

An example of one such approach is the increasing reliance upon so-called "No-Fly Zones" (NFZs). NFZs offer what is in effect aerospace-based diplomacy and statecraft. The imposition of an NFZ gives an advanced nation the means to control an opponent at minimal risk to its own personnel and resources: there are minimal "boots on the ground" (except in neighboring countries who are presumably allies or otherwise coalition partners). As the stealth revolution was predicated on the unhinging of the basic premises behind the Warsaw Pact's air defense system—namely the reliance upon early warning, search, and fire control radars and radar-dependent weapons such as missiles and fighters—NFZs may be said to negate a nation's basic investment in a large standing army.

As Brig. Gen. David Deptula, the U.S. Air Force Commander of Operation Northern Watch, has noted:

> Large armies exist for the express purpose of taking and holding territories. Nations with territorial ambitions put great stock in large armies for this reason alone. "Boots on the Ground" are an aggressor's weapon of choice—they certainly were for Saddam Hussein. Air occupation does not seize and hold territory in the same way that land forces do. It stops an adversary from operating in a specific area without accruing any territory for the nation or nations actually carrying out the air occupation. Thus it is a "non-provocative" action that cannot easily be misconstrued as an "imperial" action, and that is one of the reasons air occupation is becoming the intervention option of choice at the cusp of the 21st century.

As NFZ operations indicate, overall, as aerospace capabilities have matured, the effects obtainable through aerospace action have dramatically increased, while casualties to surface forces have equally dramatically declined.

The Investment Dimension

This illuminates an important principle, however: To obtain the advantages of aerospace power requires constant and appropriate investment in high technology. That investment, historically, has improved system performance, reliability, and readiness, and has resulted in fewer losses of both systems and people. The results are often dramatic. For example, an examination of four American conflicts found interesting connections between research and development budget authorizations, increases in bomb accuracy, reductions in the number of aircraft required to guarantee destruction of a target, and reductions in U.S. Army casualties in battle:

	WW-2	Korea	Vietnam	Gulf
Ave. R&D Budget Authority (Billions, Constant '98 USD)	0.49	3.23	13.35	13.71
USAF Bomb Accuracy (CEP, ft.)	3,300	1,000	400	10
Aircraft Required to Destroy a 60 x 90 ft. Target	3,024	550	44	1

	WW-2	Korea	Vietnam	Gulf
U.S. Army Casualties per Day	0.0500	0.0400	0.0300	0.0016
As a % of Theater Strength	(1/20)	(1/25)	(1/33)	(1/625)

The advantages of aerospace power only come through strong national support, and, for all nations that employ forms of aerospace power, that continued support is critical, particularly in an unstable and fragmented world such as we all occupy today. The ever-evolving threats to employing military forces from new advanced weaponry is such that if such support flags or lags, nations run the risk of ceding control of the air to potential opponents in the twenty-first century and, as a consequence, risking as well their ability to prosecute successful joint and combined warfare. At a minimum, a nation to be considered a true aerospace nation should have the capabilities to undertake air superiority, air mobility, precision attack, reconnaissance, and the attendant host of related missions from combat search and rescue to robust and realistic training, all within a well-maintained, motivated, trained, and led service. Above all, a nation has to have the ability to ensure control of its airspace, for control of the air is essential to all joint warfare operations. Prudent investment, even for smaller nations, can have surprising payoffs, particularly in this era of coalition-building and coalition-participation, as we have seen from Africa to the Gulf and on to the Balkans.

In this process, of course, thorough and well-thought-out testing is key. Not adequately considering the role of the tester can lead to, at best, delays and cost escalation, and, at worst, program failure and, perhaps, human lives. Sadly, such has occurred frequently in both American military history and that of other nations. In this regard, we have to be particularly careful in an era appropriately demanding as much "off the shelf" procurement as possible that we recognize that the particular and special needs of military forces are not necessarily congruent with those of the civilian community. Such "off the shelf" systems require special consideration and examination by the test community to ensure that they meet the operational and safety needs of our military forces. Additionally, we must not confuse—as many nontechnologists do—"test failure" with "program failure" lest we risk embarking upon a fruitless tail-chase for perfect or near-perfect solutions. Had such a mindset existed in planners of an earlier era, some notably successful weapon systems now in use (particularly precision munitions and missiles) would never have had the opportunity to enter service. Arguably, such a mindset in the so-called "defense reform" movement of the middle-to-late 1980s came surprisingly close to derailing many of the weapon systems that performed so well in the Gulf War, notably stealth, attack helicopters, battlefield missile systems, space-based navigation systems, and others both large and small.

In Conclusion . . .

It has been the unhappy lot of the Western Alliance since 1989 to have to assume a far greater role in ensuring global peace and stability than could have been predicted as waves of German youths tore down the Berlin Wall and images of a new millennial age of peace, freedom, and prosperity loomed. Since that time, ugly conflicts in far-flung corners of the globe and ongoing national, religious, and ethnic disputes have tempered the optimism with which many greeted the collapse of Soviet totalitarianism. The world today increasingly appears like its predecessor, but with far less stability and predictability. If large-scale alliance system threats have disappeared, there has nevertheless been a proliferation of smaller threats, and the specter of some truly violent conflicts to come, possibly involving the use of weapons of mass destruction, including nuclear weapons. For this reason, the rise of aerospace power, unique to this century, can only be seen as most welcome. Its capabilities today are consistent with historical experience and offer the potential of unprecedented advantages for the United States and its allies as we all enter the twenty-first century. Ensuring that the nations of the Western Alliance retain robust joint service aerospace power capabilities is arguably the greatest acquisition, testing, and organizational challenge facing our national defense establishments today. For that reason, one of the most important functions any of us can undertake is to further the defense debate and dialogue by examining what air power—and now aerospace power—has and can offer to our mutual national security concerns. I hope that this presentation has stimulated some thought and discussion to that end, and I welcome your questions and comments.

Developing Missile Flight Controls: From Guide Sticks to Impulse Thrusters

Donald R. Baucom

The Origins of Flight Control Technology

From the first appearance of the military rocket in China during the thirteenth century, the effort to achieve stabilized, controlled flight was one of greatest challenges of rocketry. Primitive gunpowder rockets attained a limited degree of flight control by means of a stabilizing guide stick, a simple pole that was attached to the side of the powder tube.[1]

The guide stick remained the basic means of ensuring stable flight until the middle of the nineteenth century when Englishman William Hale eliminated the need for the cumbersome guide stick by developing a system of ports that imparted a stabilizing spin to the rocket.[2] In Hale's first spinning rocket of 1844, the rotation was produced by means of holes drilled into the base of the metal rocket just above the rocket's single thrust port. These four holes were lined up equidistantly around the circumference of the rocket's base and were drilled at angles so that a small amount of the rocket motor's expanding gases escaped through the holes in a pinwheel pattern, causing the rocket to spin. Later modifications would steadily improve the efficiency of Hale's initial method of spinning rockets.[3]

Until the first half of the twentieth century, rockets remained relatively small and simple. However, by the 1930s inventors and developers were experimenting with liquid rockets that increased steadily in size and complexity. These new designs brought with them demands for greater control forces to assure the stable flight of large, heavy liquid-fueled rockets.

Goddard and Flight Controls for Liquid-Fueled Rockets

Liquid-fueled rockets developed in the 1920s and 1930s were launched vertically. As a result, they posed special control problems during the critical period between lift-off and the time when the rocket achieved sufficient velocity for aerodynamic surfaces to develop control forces adequate to offset factors such as the effects of wind gusts and minor discrepancies in calculations of thrust vector and center of gravity.

The first person to address this problem was American rocketeer Robert H. Goddard,[4] who is most famous for developing and flying the first liquid-propellant rocket. This flight took place at Auburn, Massachusetts, on March 16, 1926.[5]

Goddard's most important work on flight controls came after 1930 when he moved his base from Massachusetts to a site near Roswell, New Mexico. He understood that at the point of lift-off, crosswinds striking large stabilizing fins could cause loss of control. He also recognized that anything protruding into the slipstream would produce drag and should therefore be eliminated if possible. Goddard's solution was to use small vanes so located at the base of the rocket as to extend into the rocket exhaust. When properly turned, these jet or blast vanes changed the vector of the thrust, thereby generating control forces. The turning of the vanes was controlled by a gyroscope that sensed changes in the flight angle of the rocket. Goddard successfully tested this control system in a flight on April 19, 1932, and received a patent for the system on September 27 of the same year.[6]

Jet vanes were not without shortcomings. Since they protrude into the exhaust stream, they reduce the efficiency of a rocket motor.[7] In Goddard's words, they produce "a large parasitic resistance . . . at very high speeds." Additionally, once an engine burns out, the vanes are no longer effective. [8]

To improve stability during powered flight and to provide control after burnout, Goddard experimented with a variety of configurations that combined different sets of air vanes and stabilizing fins. One design had a set of four air vanes that were flush with the rear fuselage surface until extended. These resembled the air brakes or speed boards employed on modern fighter aircraft. A number of these control schemes were flight-tested in March, April, and May of 1937.[9]

But Goddard was not totally satisfied with any of his approaches to flight control. Therefore, in the summer of 1937, he developed a new approach that combined the effects of air and jet vanes without their increased drag and decreased engine efficiency. This new control method comprised two components. First, "the chamber and tapered tailpiece were accordingly mounted so as to be movable about a point above the chamber, in two directions at right angles. Sidewise motion was arranged to take place by gyroscopic control, and return to axial alignment was made forcibly, as soon as the gyroscopic control ceased." This technique meant that the rocket motor could be used to generate control forces as soon as it was ignited, just as jet vanes did, but without any protrusion into the rocket exhaust. The second component of Goddard's new technique "consisted in having the rear section of the tapered tailpiece, enclosing the chamber, capable of being moved laterally, and of being returned to axial position, by gyroscopic control." This movement would generate aerodynamic control forces after the rocket reached a certain minimum speed and would continue to provide these forces after engine burnout.[10]

Goddard's development of this first gimbaling technique and his other achievements were impressive. However, they had little influence on the mainstream of rocket development. Like the Wright brothers before him, Goddard was very concerned about securing patent rights on all of his developments. (He was eventually granted a total of 214 patents.) As a result, he was extremely secretive about his work. He swore his technical assistants to silence and published little until his famous 1936 report to the Smithsonian Institution. By that time, German rocketeers who were well along in developing their own liquid-fueled rockets found virtually nothing helpful in Goddard's work. It was the Germans who would turn a technical curiosity into the practical device that facilitated space flight and a new form of strategic warfare.[11]

Refining Controls: The German V–2

One of the most important steps in the development of the liquid-fueled military rocket occurred in 1930 when Capt. (later Gen.) Walter Dornberger was assigned responsibility for Germany's highly secret military rocket program. He had served with heavy artillery units in World War I, which had been dominated by the big guns. The artillery had found its apotheosis in the great Paris gun that hurled twenty-two pound artillery shells into Paris from a distance exceeding seventy miles. It is hardly surprising, then, that Dornberger made the performance of the Paris gun the standard against which Germany's first liquid-fueled military rockets were to be measured. Dornberger told his team of rocket developers that their goal was to develop a rocket that would exceed the capabilities of the Paris gun while eliminating the "terrible weight" of the gun itself. This liquid-fueled rocket was "to be launched vertically, and to be programmed later into an elevation of 45 degrees. The rocket should carry a hundred times the weight of the explosives of the Parisian gun [i.e., 1,000 kg] . . . over twice the range."[12]

Another critical step came in the fall of 1932 when Dornberger hired Wernher von Braun, a brilliant young engineer. Soon, von Braun was joined by others, setting in motion a chain of events that led to the establishment of the Peenëmunde rocket team.[13] With von Braun as its leader, the team developed a series of rockets designated A–1 through A–5, the "A" standing for Aggregate.

The first of these rockets, the A–1 and A–2, were stabilized by means of a large gyroscope that was spun around the longitudinal axis of the rocket. When this system proved unreliable, the Germans set about designing a new guidance and control system for the next test series, the A–3.[14]

This new system consisted of a gyrostabilized platform equipped with accelerometers and servomotors that were connected by means of control rods to molybdenum-tungsten jet vanes. Guidance commands went to the servomotors that moved the rods, changing the position of the vanes, thereby producing the desired control forces. Additionally, the A–3 was stabilized by fins at its base.[15]

The design of the fins was of considerable significance. Indeed, one problem with earlier efforts to develop fin-stabilized rockets was inadequate knowledge of fin properties. Through the Technical Office of the Luftwaffe, von Braun was introduced to one of Germany's "supersonic wind tunnel groups," which was located at the Technical University at Aachen. Dr. Rudolf Hermann of this group "made the preliminary drag measurements that allowed a calculation of the performance of the rocket. He then worked on the fin form so that stability through the whole range from zero velocity to supersonic was assured."[16]

The first four A–3 launches ended abruptly with the rocket going out of control. Analysis of these flights pointed toward an inadequate control system as the prime cause of the failures. Because of the inherent stability of the A-3, the jet vanes generated insufficient forces to counteract the effects of cross-winds on the rocket.[17]

The Germans had expected to go directly from the A–3 to the A–4, which was to be the prototype of the V–2. However, the major deficiencies in the A–3's guidance and control system meant that another stage in development was necessary to assure that the A–4 would function properly. Therefore, the Germans decided to proceed through an intermediate development stage; since A–4 had already been selected as the designation for the V–2 prototype, the new development stage was designated A–5.[18]

Efforts to resolve the guidance and control problems included both a technical and a managerial component. Where management was concerned, the Germans decided to introduce competition into the development of the guidance system. Kreiselgeräte Limited, which had been the central developer of the guidance system to this point, would continue its efforts to solve the problems of the failed A–3 guidance system. At the same time, the Siemens Corporation was to begin work on a guidance and control system that would build on the hydraulic servomotor technology it had developed for use in autopilots. In this system, electrical signals were converted into variations in hydraulic pressures which in turn were used to move the vanes in the rocket's exhaust. A third contender in the guidance and control competition was the Askania instruments firm.[19]

By mid-1941, "repeated launches with the A–5 had shown that stable flights could be achieved" with all three guidance and control systems that the Germans had then developed. However, the extensive up-scaling that would be necessary to achieve a missile with the operational capabilities expected of the A–4 meant that the operational system would have to generate considerably larger control forces. Only the hydraulic approach used by Siemens seemed capable of providing the greater control forces that the A–4 would demand, and even its success was uncertain. At this point, an important mixer device was developed that allowed the guidance and control system to better "read" the conditions of a missile's flight and provide more accurate guidance commands.[20] The mixer proved to be a critical breakthrough that hastened the solution to scaling up the guidance and control system.

The final denouement of the process was the decision to speed the development of the A–4/V–2 guidance and control system by combining components from all three of the competing companies to produce a workable hybrid system. Included in this decision were judgments as to which companies could produce which components in the fastest, most efficient manner.[21]

At least two other important technical changes were made to the control system. The jet vanes were manufactured from graphite rather than the expensive metal alloy, thereby reducing the cost of these vanes by a factor of one hundred. Additionally, small rudders were added to the stabilizing aerodynamic fins of the missile. Both the jet vanes and the rudders were activated by hydraulic servomotors.[22]

The solution of the guidance and control problems as reflected in the success of the A–4 tests was the spectacular final act in the V–2 development program. In "five short years," wrote historian Michael Neufeld, the Germans had established the "foundations for a technological revolution in rocketry."[23]

Rocket Developments at the Outset of the Cold War

After World War II, the German rocket program became the fountainhead of missile programs for both the United States and the Soviet Union. In the case of the United States, Project Paperclip uprooted the central elements of the Peenëmunde program and transplanted them at Fort Bliss, Texas; White Sands, New Mexico; and Redstone, Alabama. Over one hundred of Germany's top rocket scientists, along with one hundred operating V–2 rockets, were shipped to the United States where they formed the core of America's nascent missile program. Indeed, the V–2 became the basic model for the first large missiles built in the United States.[24]

One U.S. derivative of the V–2 was the MX–774 missile developed by the Air Force and Consolidated-Vultee Aircraft Corporation (Convair). This rocket used gimbaling to control its flight, although the project manager, Karel J. Bossart, was apparently unaware that Goddard had flight-tested a gimbaling system in July 1937.[25] Bossart's attitude control system was a marked improvement over the jet vane system used in the V–2.

Another early U.S. missile to employ gimbaling was the Viking, which made its maiden flight on May 3, 1949. Viking also employed "small hydrogen peroxide thrust jets placed at various points around the rocket" to enhance the missile's stability during flight through the upper atmosphere.[26]

In the same year that Viking first flew, American A.E. Wetherbee, Jr., developed the concept for a new form of missile control. It entailed injecting a fluid, either inert or reactive, into a rocket motor's exhaust stream, thereby changing the flow of hot gases and producing control forces that arise as a result of such things as disruptions in the boundary-layer flow and the formation of shock waves. In the case of the injection of an interactive fluid, primary and secondary combustion interactions are also generated, producing additional control forces.[27] This method of control was used not only in ballistic missiles, but in America's first operational missile defense system as well.

Control Systems for Early Missile Defense Interceptors

While a principal concern in developing large ballistic missiles was stability of flight, a missile defense interceptor had to be not only stable in its boost phase, but capable of dramatic high "g" maneuvers during the terminal phase of flight when it must maneuver to close with its target. In the first three decades after World War II, the requirement for maneuverability was lessened by the use of nuclear warheads that were required to compensate for limitations in sensors and computers. However, after the mid-1970s as technology advanced and the United States moved from missiles with nuclear warheads to hit-to-kill interceptors that actually collide with their targets, maneuverability demands increased substantially.

The only national missile defense system the United States deployed was known as Safeguard, a layered system that employed two types of missiles, each of which intercepted attacking warheads in different bands of the atmosphere. Spartan, the larger and longer-ranged of the two, operated in the high-endoatmospheric battle space from seventy to one hundred kilometers above the earth. The smaller, faster Sprint intercepted leakers (attacking warheads missed by Spartan) after they had penetrated deeply into the atmosphere where atmospheric friction would strip away decoys and booster debris, making it relatively easy for Sprint to find its target warhead. Since the state of the art in sensors, guidance, and control was rather limited in the 1950s and 1960s when Sprint and Spartan were developed, both missiles were armed with nuclear warheads. What the use of nuclear warheads meant regarding accuracy requirements can be seen by looking at the first test in which a Nike-Zeus missile, forerunner of Spartan, "successfully" intercepted a dummy warhead over the Pacific in July 1962. At its closest approach to the target, Zeus was about two kilometers away, yet this was deemed close enough for Zeus' powerful warhead to be effective.[28]

Spartan was hot-launched at an 85-degree angle, with a launch rail providing stability as it exited its silo.[29] After launch, the missile flew without changes in trajectory until the first-stage motor burned out. During this portion of the flight, directional stability was maintained by means of airflow over fixed vanes on the first and second stages and over the locked, but movable, steering vanes on the third stage. After first-stage burnout and jettisoning, the second stage ignited, and the movable vanes on the third stage were used to steer the missile toward its target. After second-stage burnout, when the missile was essentially outside the atmosphere, the third-stage motor was fired to move the missile into its final intercept trajectory. At the same time, some gases from this motor were vented through nozzles in the trailing edges of the third-stage control vanes to generate additional control forces to supplement the aerodynamic forces generated by the flow of thin atmospheric air over the vanes. Finally, the third stage was spun for stability as it approached its target.[30]

In spite of its nuclear warhead, Sprint's mission of picking up leakers in the lower atmosphere meant that its control system had to be capable of producing extremely high g maneuvers. Its mission profile called for it to intercept incoming warheads at altitudes of between 5,000 and 100,000 feet within seconds of launch. A typical intercept might occur at an altitude of 40,000 feet and a range of 10 miles after only 10 seconds of flight.[31]

Unlike Spartan, Sprint was cold-launched, with the interceptor ejected from its silo by a gas-powered piston. Once out of the silo, its powerful rocket motors rammed the missile through the dense lower atmosphere causing its skin to glow incandescently due to atmospheric heating. During first-stage burn, control forces were generated by a thrust vector control (TVC) system that injected Freon into the motor's nozzle from four different points. (Freon was selected because of the experience gained with its use in the TVC systems of Minuteman and Polaris.) After booster separation, the second stage was guided by means of aerodynamic forces acting on small control vanes at the base of this stage.[32]

Even as the development of Spartan and Sprint was being completed, the Defense Department's Advanced Research Projects Agency (ARPA) was supporting several programs to improve the performance of missile defense interceptors. Two of these, HIBEX and UPSTAGE, focused on Sprint. Their purpose was to develop an improved interceptor for hard-point defenses that would protect targets like missile silos.[33]

HIBEX, which stood for High-g Boost Experiment, was a two-year research program (1964–1966) sponsored by ARPA's Project Defender. It aimed to develop an improved first stage for Sprint, producing a booster with very high performance parameters. After burning for only 1.24 seconds, the 500,000-pound-thrust HIBEX booster imparted a velocity of 8,408 feet per second to the HIBEX vehicle. The g forces associated with such a flight were extremely high: an axial acceleration of 362 g and approximately 60 g of lateral acceleration. In its final flights, the missile achieved maneuvers of 75 degrees pitch change and azimuth changes of 45 degrees.[34]

As in the case of the Sprint first stage, the principal means of control in HIBEX was the injection of Freon gas into the exhaust of the booster. However, in later flights, experiments with other control techniques were performed. The TVC system of HIBEX consisted of four valves spaced at 90 degrees around the nozzle of the motor; each valve was capable of injecting a total of 194 pounds of Freon per second at 1,400 psi. Each valve fed three nozzles. HIBEX carried a maximum of 98 pounds of Freon, but only 78 pounds were usable. The Freon was fed by means of a blow-down system that used compressed nitrogen as its source of pressure. This system was designed to provide 2.5 degrees maximum thrust vector deflection which amounted to 2.5 percent of motor impulse with a maximum response time of 20 milliseconds. This thrust was the equivalent to a "side force" of 15,000 pounds in less than 0.05 second.[35]

A total of seven flights were carried out in the HIBEX program. The last two (D–3 on December 2, 1965, and D–4 on January 5, 1966) included reaction-control experiments,[36] which can be understood through an analogy with conventional aerodynamic controls. "As fins attain their control-force generation by deflecting streamlines over the fin surface, thereby achieving a favorable interaction with the passing atmosphere, so reaction controls obtain their favorable interaction with the atmosphere by deflecting the passing flow over the vehicle body outward from the body." In other words,

> reaction controls are those controls which attain this favorable interaction with the atmosphere by utilization of some phenomenon other than the deflection of the surface. This streamline deflection can be attained by heating the air by burning fuel in it, by injecting a jet of gas or liquid into the passing air stream and creating a shock and/or separation region by the issuing jet, or perhaps by heating the vehicle surface and deflecting the air as a result of the heating, or alternatively, by seeding the passing air stream with an ionized material and deflecting the total stream electrostatically or magnetically.[37]

> In the reaction control tests of flights D–3 and D–4, a pyrophoric substance, triethylaluminum (known as TEA), was fed into the stream by an injector fifteen inches from the base of the second stage at 1.5 seconds into the flight. The results from these two experiments were disappointing. In D–3, the second stage did not separate; and although the external burning seemed to operate as planned, test results were inconclusive. In the case of D–4, the effects of the external burning were only about 30 percent of the predicted value.[38]

In the 1965–1968 period, the external burning experiments of HIBEX were extended in the PRESTAGE program, which explored external burning in a hypersonic flow and examined the problems associated with controlling the lateral and axial thrust that resulted from the burning. PRESTAGE also entailed experiments with "'disposable' vanes" as well as lateral jets for thrust vector control.[39]

External burning, along with jet interaction, was explored further in UPSTAGE (Upper STage Acceleration and Guidance Experiment), an ARPA project begun in 1968 to develop a second stage to match first-stage developments stemming from HIBEX. UPSTAGE was to be extremely agile so it could be used against a maneuvering reentry vehicle. Five UPSTAGE flights were completed. In these demonstrations, the vehicle developed over 300 g of lateral acceleration and "provided ample demonstration of the effectiveness of both E[xternal]B[urning] and J[et]I[nteraction]." External burning developed control forces of more than 33,000 pounds and specific impulses that exceeded 610 seconds. Two experiments with jet interaction produced specific impulses of 649 and 565 seconds.[40]

As impressive as were the results of programs like HIBEX and UPSTAGE, they did not solve the basic shortcoming of Safeguard. As already noted, both Spartan and Sprint had to be armed with nuclear warheads to have a reasonably high probability of destroying their targets. Yet the detonation of a nuclear warhead essentially blinded Safeguard's radar systems, disrupting the defender's ability to control the defensive battle. Safeguard was further hampered by the ABM Treaty of 1972 and its 1974 Protocol. The one hundred interceptors allowed under these agreements could be easily overwhelmed by Soviet strategic rocket forces. For these reasons, Congress closed the Grand Forks, North Dakota, Safeguard site in early 1976, about three months after it became operational.[41]

With the closing of Grand Forks, the U.S. Army focused its missile defense research on eliminating the technical deficiencies exhibited by Safeguard. One promising possibility was the exploitation of hit-to-kill technology, which had been under development for a decade and a half by the time Safeguard was closed.[42]

Origins of Hit-to-Kill Technology

Discussions of hit-to-kill interceptors date back to ARPA's Project Defender which was started soon after ARPA was established in 1958. In a July 1960 address to a gathering of representatives of the missile defense community, Dr. Harold N. Beveridge noted that the "quest for a cheap kill in a terminal defense system" had led Project Defender participants to conclude that hit-to-kill systems were feasible:

> Computer simulation runs on several types of interceptors weighing about 50 lbs., and using IR homing have resulted in miss distances of one or two feet. This certainly indicates hyper velocity impact kill could be employed. Incidentally, a nose cone traveling at ICBM velocities in collision with one pound of material releas-

es the energy equivalent of 6 pounds of TNT. In a word, the kinetic energy at that velocity exceeds the chemical energy available at that mass.[43]

Within about two years of Beveridge's remarks, LTV Aerospace Corporation conceived the Homing Interceptor–Terminal (HIT). HIT was to be "a small and lightweight, spin stabilized, optically guided interceptor that achieves hypervelocity direct impact kill of reentry vehicles in the exoatmosphere."[44] In spite of its small size (about fifteen pounds), it was to have "all the features of a large conventional interceptor." Furthermore, HIT's small size meant that several interceptors could be mounted on a single booster, offsetting to some extent the advantage of MIRVed ICBMs. Finally, HIT was to have a fundamentally simple design that involved no moving parts.[45]

HIT's control forces were produced by tubular, solid-propellant impulse motors, each with a nozzle located midway along its tube. A number of these motors were assembled into a tube of tubes, with the motor nozzles pointing outward. In one version, sixty-four motors were joined to form a motor assembly that also served as the main structure of the interceptor's body. Each of these motors provided a single thrust pulse yielding a ΔV (velocity change) of about 20 feet per second for a total system ΔV of approximately 1,265 feet per second. Since the HIT vehicle was spin-stabilized, directional changes were accomplished by firing a motor when it was in the proper position to provide the required thrust vector.[46]

Around 1975, the Vought Corporation began to apply HIT technology to the Miniature System Project that was sponsored by the U.S. Air Force Space and Missile System Organization. This project called for a HIT vehicle similar to the one described above to collide with an orbiting satellite after being launched either by a ground-based or air-based rocket booster, depending on the orbit of the satellite being attacked.[47] A major milestone in the HIT technology program came on September 13, 1985, when an Air Force antisatellite (ASAT) system launched by an F–15 fighter destroyed an Air Force satellite designated P78–1, known primarily for its principal payload, a gamma ray spectrometer belonging to ARPA. The kill vehicle of this ASAT system was the miniature homing vehicle, which had emerged from the Miniature System Project and was virtually identical to the HIT vehicles developed by LTV and tested in that company's 1976 integrated system tests.[48]

Missile Interceptor Control: The Case of ERINT

In January 1983, a little over two years before the successful ASAT test, the Army awarded Vought a $70 million contract to develop the small radar-homing intercept technology (SRHIT) interceptor, which was to destroy targeted missiles by crashing into them.[49]

SRHIT was to incorporate technologies developed over the previous decade by the Air Force and the Advanced Technology Center of the Army's Ballistic Defense Command. The Army's contributions to SRHIT included advances in on-board sensors and computers, as well as a system for flight control that was similar to the system developed in the HIT program. Moreover, the laser-gyro inertial reference system that had been pioneered in Vought's HIT and Miniature Homing Vehicle programs was incorporated into SRHIT.[50]

The flight vector of SRHIT was to be controlled by one hundred small rocket thrusters that formed a belt around the missile, an arrangement reminiscent of the thruster configuration of the HIT vehicle. Also like HIT, SRHIT was to rotate in flight, with SRHIT's rotation rate being one hundred revolutions per minute.[51]

This rotation was not so much to stabilize the missile as to assure that the control system would operate properly throughout SRHIT's flight. Each of the thrusters could fire only once. Therefore, if the missile did not rotate, firing the thrusters in a given sector of the thruster belt would create a dead section, making it impossible to accomplish more than a single turn in a given direction. Rotation ensured that a live thruster would always be available in all firing positions until all thrusters in the belt had been fired. The number of thrusters would be based on operational analysis so that in theory the intercept mission of an SRHIT would never require the firing of more than one hundred thrusters.

A total of nine flight tests were planned for the SRHIT program. These were to demonstrate "progressively greater combinations of the total set of desired flight vehicle performance characteristics."[52] However, about the time of the third test, the name of the program was changed from SRHIT to FLAGE, for Flexible Lightweight Agile Guided Experiment.[53] FLAGE inherited what was essentially the test schedule for the SRHIT program so that tests four and five in the SRHIT program became tests one and two for FLAGE.[54]

In its first two tests, FLAGE missiles were to demonstrate the "ability of the rocket motors to produce adequate control authority to guide the missile, and test the radar's ability to home on a stationary target." This target was an aluminum sphere, forty-four inches in diameter, suspended beneath a tethered balloon, 12,000 feet above the ground.[55] On April 20, 1986, a FLAGE missile destroyed one of these tethered targets.[56]

In its third test on June 27, 1986, the interceptor destroyed a target missile that was traveling at five times the speed of sound.[57] This test confirmed "that FLAGE's guidance and control technologies could provide the accuracy needed for direct impact of hypersonic targets with simple radar signatures."[58] The test had a further significance in that it was the first demonstration of a hit-to-kill intercept of a tactical ballistic missile.[59]

The fourth test came on May 21, 1987, when FLAGE destroyed a short-range surface-to-surface Lance missile at an altitude of 16,000 feet. This was a more realistic test, as the Lance missile more nearly replicated the radar signature and performance of a tactical ballistic missile.[60]

In 1987, the work started under SRHIT and FLAGE was folded into the ERINT (Extended Range Interceptor) program, which began as an $80 million, three-year contract between the Army's Strategic Defense Command and LTV Aerospace. Under this contract, LTV was to extend the technology developed in the FLAGE program so that intercepts could be completed "at more realistic intercept altitudes, velocities and mission timeliness." FLAGE had been designed to intercept targets with speeds of 3,000 feet per second at an altitude of about 2.5 miles. The ERINT interceptor was to be capable of intercepting targets moving at 11,000 feet per second at altitudes as high as 9 miles. Like FLAGE before it, ERINT was to explore the efficacy of hit-to-kill technology as applied to the theater missile defense mission.[61]

The greater performance demanded of ERINT meant that the new missile would have to differ substantially from FLAGE. At the outset of the SRHIT program, the SRHIT/FLAGE missile was to have been 9 feet long and 9 inches in diameter; as tested, it was 12 feet long. ERINT was to be 15 feet long and 10 inches in diameter. In addition to its greater size, ERINT was also fitted with a lethality enhancer, a device consisting of "a ring of twenty-four dense tungsten pellets that fire out from the missile in a disk pattern." The pattern of these pellets was to extend "a specific radius from the interceptor" that was equivalent to the "miss distance" that might be caused by a maneuvering target.[62]

ERINT's control system was also different. Throughout most of its flight, ERINT would be guided by "steerable fins." During endgame (the final seconds of the flight before collision with the target), directional control would be provided by 180 thrusters in a ring around the missile's body near its nose.[63] Like FLAGE, ERINT rotated as it approached its target, firing its thrusters as necessary. Since the interceptor would be moving at a very high velocity during endgame, each thruster pulse would produce very large aerodynamic control forces by moving the nose of the missile relative to the slipstream.[64]

ERINT's first two flights verified the soundness of the missile's structure and propulsion system and demonstrated the operability of the onboard radar and lethality enhancer. A third flight in August 1992 tested the missile's control system and verified its inertial flight performance. After failing to intercept its target in a June 1993 test, ERINT then successfully intercepted targets in two other tests, one on November 30, 1993, and another on February 15, 1994.[65]

Four days before the second test, the Army System Acquisition Review Council announced that ERINT would be the missile incorporated into the Patriot system under the PAC-3 upgrade program.[66] This decision marked a milestone in missile defense history, for it meant that ERINT would become the world's first operational hit-to-kill interceptor when it entered service around the year 2000.

Conclusion

Over the last seven hundred years, missile control technology has evolved from the simple guide stick designed to make a rocket fly a somewhat predictable course to the sophisticated attitude control system that allows ERINT to hit another missile traveling at two miles per second. During the last fifty to seventy-five years of this period, the rate of development has accelerated dramatically. It took seven centuries for rocketeers to produce the A–4/V–2, yet within fifteen years of the first missile attack on London, both the United States and the Soviet Union had deployed operational missiles that could deliver nuclear weapons over intercontinental ranges. Why this acceleration in the pace of development?

Prior to our own century, the development rate was constrained by limited theoretical knowledge and/or a restricted technology base. But as we entered the twentieth century, scientists and engineers gained increasing knowledge of complex phenomena through the application of sophisticated technology like supersonic wind tunnels, high-speed cameras, and electronic instrumentation. To this expanding knowledge base was added advanced techniques for manufacturing complicated devices and for producing materials tailored to withstand various forms of stress. The power of this mix increased further with the advent of state-funded and -guided research and development, which placed at the disposal of developmental groups the vast resources that modern, bureaucratic governments could mobilize. The result of this process has been optimistically referred to as invention on demand. We see this transformation illustrated in the development of liquid-fueled rockets.

Robert Goddard's operating mode contrasts sharply with that of Wernher von Braun's Peenëmunde group. Goddard represents the old approach used by Thomas Edison and the Wright brothers. Here, the lone entrepreneur-inventor gathered around him a small dedicated team of technicians and used limited private funding to support his work. Furthermore, since one of his major concerns was securing patent rights that would allow him to reap the profits of his inventions, the entrepreneur-inventor was loathe to seek help from others who might gain a basis for challenging future patents if they became involved in the work.[67]

By the time Goddard finished his work, further advances in rocketry had become dependent upon costly and sophisticated techniques and increasingly esoteric theoretical knowledge. In Goddard's work we see examples of careful, detailed work in many if all not of the multiple fields of technology upon which ballistic missiles are based. Nevertheless, Goddard had pushed rocketry as far as it could go under the coaxing of individual genius.

Von Braun, on the other hand, was recruited by Dornberger to head up a research program that was organized by the German Army. As the project built momentum, more and more resources were placed at von Braun's disposal. He was given sufficient funds to purchase the Peenëmunde site and establish there a lavishly equipped test facility. Moreover, he had at his disposal the German university structure and government laboratory system to assist in the solution of difficult problems such as the proper design for stabilizing fins. With the establishment of the German team at Peenëmunde, we see the birth of a future that would be dominated by command technology.[68] Peenëmunde foreshadowed the U.S. and Soviet missile programs of the Cold War.

When Robert Goddard died in August 1945, a developmental tradition died with him. But like Moses thirty-three hundred years earlier, he was allowed to glimpse the promised land he would never enter. In March 1945, he was invited to examine a captured V–2 rocket. One of his colleagues later reported that Goddard never got over what he saw. "He felt the Germans had copied his work and that he could have produced a bigger, better, and less expensive rocket, if only the United States had accepted the long-range rocket."[69] This melancholy episode serves to emphasize the point that from World War II the driving force in rocketry had become state-sponsored research and development.

Notes

1. For discussions of early rocketry, see Wernher von Braun and Frederick I. Ordway III, *The Rockets' Red Glare* (Garden City, N.Y.: Anchor Press/ Doubleday, 1976); Fang-Toh Sun, "Early Rocket Weapons in China," in Tom D. Crouch and Alex M. Spencer, eds., *History of Rocketry and Astronautics,* Proceedings of the Eighteenth and Nineteenth History Symposia of the International Academy of Astronautics, Lausanne, Switzerland (1984) and Stockholm, Sweden (1985), Vol. 14, American Astronautical Society (AAS) History Series, R. Cargill Hall, Series Editor (San Diego, Calif.: AAS Publications Office, 1993), pp. 3–15; Frank Winter, *The First Golden Age of Rocketry* (Washington, D.C.: Smithsonian Institution Press, 1990).

2. Winter, *Golden Age*, pp. 179, 182, 193.

3. *Ibid.*, pp. 194, 196–197.

4. For biographical information on Goddard, see Frank H. Winter, "Goddard: A New Perspective of the Man and His Achievements," *Space Times*, Mar–Apr 1997, pp. 4–9; J.D. Hunley, "The Enigma of Robert H. Goddard," *Technology and Culture*, Apr 1995, pp. 327–351.

5. Esther C. Goddard, "Introduction," pp. xi–xviii, in Robert H. Goddard, *The Papers of Robert H. Goddard*, ed. by Esther C. Goddard and G. Edward Pendray (New York: McGraw-Hill Book Co., 1970), Vol. I: 1898–1924. See p. xii.

6. Robert H. Goddard, "Liquid-Propellant Rocket Development," Mar 16, 1936, Report to The Daniel and Florence Guggenheim Foundation, in *Papers of Goddard*, Vol. II: 1925–1937, pp. 974–978. See also *Papers of Goddard*, Vol. II, pp. 822, 857. Apparently, Goddard did not make a specific entry in his diary about the April 19, 1932, flight, although p. 822 shows several pictures of the rocket fired that day. See also Michael J. Neufeld, *The Rocket and the Reich: Peenemünde and the Coming of the Ballistic Missile Era* (New York: The Free Press, 1995), p. 6. Here, Neufeld credits Goddard with being

the first to use vanes for flight control of a rocket. Winter, "Goddard," p. 9, also credits Goddard for being the first to use these vanes. For general information about Goddard, see von Braun and Ordway, *The Rockets' Red Glare*, pp. 126–127.

7. Jacob Neufeld, *The Development of Ballistic Missiles in the United States Air Force, 1945–1960* (Washington, D.C.: United States Air Force Office of Air Force History, 1990), p. 47, states that the jet vanes reduced the thrust of a rocket engine by as much as 17 percent.

8. *Papers of Goddard*, Vol. III: 1938–1945, pp. 1109, 1110, 1117.

9. *Ibid.*, pp. 1113–1116.

10. *Ibid.*, pp. 1110, 1117–1118.

11. Hunley, "The Enigma of Robert H. Goddard," p. 332; Winter, "Goddard," pp. 4, 9; M.J. Neufeld, *The Rocket and the Reich*, pp. 7, 53. Neufeld makes the point that the Germans probably did not have substantial information about Goddard's work until 1936. By this time, the Germans had surpassed Goddard. Speaking of Goddard's 1936 report to the Guggenheim Foundation, Neufeld wrote: "Nothing in the report would have shaken the [German] Ordnance group's confidence in its lead, nor did they glean any significant new technological concepts from Goddard." (p. 53) For information on the interest of the Wright Brothers in patent rights and their own tendency to keep the results of their work to themselves, see Tom D. Crouch, *The Bishop's Boys: A Life of Wilbur and Orville Wright* (New York: Norton, 1989), p. 231. Edison's biographer, Matthew Josephson, pointed out that after years of bitter patent litigation, Edison "became fairly secretive." Matthew Josephson, *Edison: A Biography* (Norwalk, Conn.: Easton, 1959), p. 390.

12. M.J. Neufeld, *The Rocket and the Reich*, pp. 51–52. On p. 52, Neufeld wrote: "Thus, in a fundamental sense the A–4 was another Paris Gun."

13. Frank H. Winter, *Rockets into Space* (Cambridge, Mass.: Harvard University Press, 1990), p. 35.

14. M.J. Neufeld, *The Rocket and the Reich*, pp. 35–38. Two A–2 rockets were successfully flown, but both flights were ended when wind gusts against the rockets caused their gyrostabilizers to precess and tip them over in flight.

15. *Ibid.*, pp. 66–67. These fins, of course, acted like feathers on an arrow. When the yaw and pitch of the missile changed, the fins produced counteracting aerodynamic forces that tended to return the missile to a stable position, with its nose pointing into the airstream. The Germans' used the term "arrow stability" to refer to the longitudinal stability of their rockets.

16. *Ibid.*, pp. 67–68.

17. *Ibid.*, pp. 69–71. The Sg 33 stable platform that was the heart of the A–3's guidance system was not designed to allow rotation around the missile's longitudinal axis. If the roll rate exceeded 6 degrees per second, it would cause the platform to tumble. Since the rocket was expected to pitch over at the top of its trajectory, causing the platform to tumble, the tumbling of the platform was to trigger the deployment of a parachute to bring the rocket down. In test flights, the parachute deployed early in the flight. This indicated that the platform had tumbled and could no longer properly sense the flight path of the rocket.

18. *Ibid.*, pp. 71, 74, 88–89. The A–5 looked like a scaled-down V–2. The body of the A–5, which became the model for the aerodynamic shape of the A–4, was slightly fatter than that of the A–3. Although the Germans faced a considerable challenge in going from the 3,000-pound thrust A–3 engine to the 55,000-pound thrust engine required if the V–2 were to meet its operational requirements, power plant development was not a major objective in the A–5 program, since the A–5 used the same engine as the A–3. See also photograph SI Neg. No. 76–15523 and its caption in the photograph section between pp. 82–83.

19. M.J. Neufeld, *The Rocket and the Reich*, pp. 94–99.

20. *Ibid.*, pp. 105–106.

21. *Ibid.*, pp. 99, 105–106, 108.

22. G. Harry Stine, *ICBM: The Making of the Weapon That Changed the World* (New York: Orion, 1991), p. 56. M.J. Neufeld, *The Rocket and the Reich*, p. 108, refers to "hydraulic vane servomotors."

23. M.J. Neufeld, *The Rocket and the Reich*, p. 108.

24. Winter, *Rockets into Space*, p. 52.

25. J. Neufeld, *Development of Ballistic Missiles*, pp. 36–37, 44–50, calls attention to the importance of Convair's MX–774 as the forerunner of America's first ICBM, the Atlas missile. Neufeld notes on pp. 36 and 45 that the point of departure for MX–774 was the German V–2 upon which its design was based. According to Stine, *ICBM*, pp. 143–146, although the Air Force canceled the MX–774 contract on July 1, 1947, Consolidated-Vultee continued the work, building and flying three missiles between July and December 1948. Hi-Roc (formal designation RTV–A–2) was the nickname of the missile that emerged from project MX–774. While Stine (p. 143) notes that Hi-Roc was the first American-designed rocket, he also states that it "used the basic configuration of the V–2" and even looked like a "baby V–2." Stein also noted that Bossart, Hi-Roc's designer, used gimbaling as the missile's control mechanism and that the work of Bossart and his team led eventually to the stage-and-a-half design of the Atlas missile.

26. Winter, *Rockets into Space*, pp. 66–67. Stine, *ICBM*, pp. 143–146, claims that gimbaling was pioneered in Hermes, Hi-Roc, and Viking. Dr. Goddard consulted at least briefly with General Electric on Project Hermes. However, General Electric canceled this relationship with Goddard, apparently because of Goddard's patent arrangements with Curtiss-Wright, which controlled the rights to a number of Goddard's patents. Nevertheless, Goddard had talked with GE about the development of rocket motors and may well have discussed the use of gimbaling as a form of flight control. For Goddard's contacts with GE, see *Papers of Goddard*, Vol. III, pp. 1580, 1588, 1590. For more information on Goddard's relationship with Curtiss-Wright, see *Papers of Goddard*, Vol. III, pp. 1472–1475, 1477.

27. George Sutton, *Rocket Propulsion Elements: An Introduction to the Engineering of Rockets* (New York: John Wiley & Sons, 1986), pp. 336–337.

28. Bell Laboratories, *ABM Research and Development at Bell Laboratories: Project History, 1975,* study completed for the U.S. Army Ballistic Missile Defense Systems Command under Contract No. DAHC60–71–C–0005, p. I-26. This test was classified as a partial success because the Zeus lost hydraulic power during the last ten seconds of its flight. Presumably, had the hydraulic system not failed, the interceptor would have come closer to its target.

29. Bell Laboratories, *ABM Research and Development at Bell Laboratories*, p. 10-6. Mr. Jack W. Kalish, a veteran of missile defense work, confirmed that the guide rail stabilized Spartan as it exited the silo. This confirmation came in a March 31, 1997, telephone conversation, between Mr. Kalish and the author.

30. Bell Laboratories, *ABM Research and Development at Bell Laboratories*, pp. 10-3–10-4. In the original Zeus design, the aerodynamic control fins were to have been located at the base of the second stage of the missile. A separate "jetavator" system was to be installed in the third stage. Developers of the missile decided to combine these two control systems in a set of fins that included jet nozzles for missile control outside the dense region of the atmosphere where aerodynamic control was possible. This allowed a reduction from two control systems to one and made possible the placement of all electronic controls in the nose of the missile. During early flight tests, the Zeus missile failed catastrophically, shortly after the missile reached its peak velocity. Ground cameras seemed to show a fire developing on the third stage, just before the failures. This made engineers suspect hydraulic failure as the source of difficulty. Not until pieces of a failed Zeus were recovered and analyzed was it found that the problem was in the design of the control fins. A tiny gap between the third-stage fins and the missile's body allowed heat to build up on the steel control rods going to the fins with the result that the fins were cut

from the missile by excessive heating. A redesign of the fins eliminated this problem. (p. I-22)

31. Bell Laboratories, *ABM Research and Development at Bell Laboratories*, p. 2-9.

32. *Ibid.*, pp. 2-8, 2-9, 9-15, 9-16. The information about the use of the Skybolt pump is found on p. 9-16, while the information about Freon is from p. 9-15. In his March 31, 1997, conversation with the author, Jack Kalish pointed out that the conical shape of the Sprint missile itself was a stabilizing force during the missile's flight.

33. Richard H. van Atta, Sidney Reed, Seymour J. Deitchman, *DARPA Technical Accomplishments: An Historical Review of Selected DARPA Projects*, Institute for Defense Analysis Paper P–2429, Apr 1991, Vol. II, pp. 3-1–3-3.

34. Van Atta *et al., DARPA Technical Accomplishments*, Vol. II, pp. 3-6–3-8; Albert M. Jacobs *et al.*, "Interceptor Propulsion Technology," *Journal of Defense Research*, Series A: Strategic Warfare, Vol. 2A, No. 2, Summer 1970, p. 188, gives the dates of the HIBEX program as 1964–1966. According to van Atta (p. 3-8), a symposium on HIBEX was held in 1966 to review the results of the program. Several articles from this symposium provided the basic content for Vol. 2A, No. 2, Summer 1970, of the *Journal of Defense Research.*

35. Van Atta *et al., DARPA Technical Accomplishments*, Vol. II, p. 3-6; Boeing Company, *HIBEX Final Technical Report*, D2–99600–1, Mar 5, 1966, pp. 109, 119–121.

36. Boeing, *HIBEX*, p. 23

37. D.B. Harmon, Jr., "Reaction Controls for Interceptor Missiles," *Journal of Defense Research*, Series A: Strategic Warfare, Vol. 2A, No. 2, Summer 1970, pp. 231–232.

38. Boeing, *HIBEX*, pp. 37, 256–258.

39. Van Atta *et al., DARPA Technical Accomplishments*, Vol. II, p. 3-9.

40. *Ibid.*, Vol. II, pp. 3-1, 3-9; Riverside Research Institute (RRI), *Ballistic Missile Defense Research Tasks and Studies for the Period 10 December 1971 to 30 November 1972: Final Report F/186–3–16* , Contract No. DAHC60–71–C–0042, Jan 10, 1973, pp. 2–10, 22. The UPSTAGE jet maneuvering control technology was incorporated into SDI's HEDI missile (van Atta *et al.*, p. 3-1). RRI (p. 6) explains that external burning "consists of a combustion process that takes place upon the surface of a vehicle immediately subsequent to the addition of a pyrophoric fuel to the boundary layer. . . . Specifically, EB occurs when a fuel burning in air results in a transfer of thermal energy to the air flowing along the vehicle surface. When the air is thus heated, its volume increases and the streamlines are deflected. This deflection of the streamlines is accompanied by a change in the momentum of the air stream, and the force causing the change is transmitted to the vehicle surface in the form of varying surface pressures. As a consequence, the EB control technique makes possible the attainment of an aerodynamically clean vehicle design. As an added virtue, ultra fast control system responses are achieved for a low control subsystem weight investment." Both of these results—low mass of the control system and fast reaction time—are critical for light and agile interceptors. RRI (p. 8) notes that jet interaction is also a "fast-response control concept." In this control method, "a reaction jet exhausts into the flow field surrounding the vehicle, . . . The jet flow can be produced from a broad spectrum of possible system designs which include warm- or hot-gas solid propellant gas generators, and liquid bipropellant or monopropellant gas generators. The jet thus produced, which deflects the free-stream flow, creates a detached shock wave. A localized high-pressure area on the vehicle surface upstream of the reaction jet results. This high pressure, in turn, produces a control force on the vehicle surface. In addition to this in viscid interaction, there is a viscid interaction in which normal force is increased by the occurrence of boundary layer separation upstream of the shock wave. Both the viscid and in viscid terms provide control force increments which add to the momentum of the jet."

41. For information on the closing of Safeguard, see Donald R. Baucom, *Origins of SDI: 1944–1983* (Lawrence: University Press of Kansas, 1992), pp. 89–97.

42. R.A. Mail, R.A. Nordsieck, and J.W. Blum, *HIT System Study: Final Report*, General Research Corporation CR–12–144, May 1973, p. 1.

43. Harold N. Beveridge, "Defender Introduction," in Advanced Research Projects Agency, *A Review of Project Defender for the Director of Defense Research and Engineering, 25–29 July 1960,* pp. 17–18.

44. Missiles and Space Division, LTV Aerospace Corporation, *HIT Technology Program: Final Report*, Rprt No. 00.1372, Vol. I: *Executive Summary,* Dec 3, 1970, p. 1.

45. Vought Corporation, *Hit-to-Kill Homer Ground Test (HIT Phase II)*, Rprt No. 3–371–3R–Y–70024, sponsored by the U.S. Army Ballistic Missile Defense Advanced Technology Center under Contract No. DAHC60–71–C–0072, Feb 1977, p. 2.

46. Missiles and Space Division, LTV Aerospace Corporation, *HIT Technology Program :Final Report*, Vol. I, pp. 2, 17–18.

47. Vought Corporation, *Miniature System Project (Restructured Program)*, Mar 1979, pp. I, I-1–I-2, and sections III and IV. For a discussion of the application of the Vought vehicle to the ASAT program, see Craig Covault, "Antisatellite Weapon Design Advances," *Aviation Week*, Jun 16, 1980, pp. 243–245, 247. B. Shratter, J. Outenreath, and P. Sparrow, "HIT-to-Kill Vehicle Technology," *Journal of Defense Research*, Vol. 18, No. 4, Winter 1986, p. 676, state that after 1977 the HIT program became the basis for the Air Force ASAT program.

48. Vought Corporation, *Miniature System Project*, pp. iii-2, iv-1; Covault, "Antisatellite Weapon Design Advances," pp. 243–245, 247; "Defense Dept. Plans Next Test Firing of Air-Launched ASAT System," *Aviation Week*, Sep 23, 1985, pp. 20–21; David J. Lynch, "ASAT Hits Its Target in Space," *Defense Week*, Sep 17, 1985, p. 2.

49. "Army to Flight Test Nonnuclear ABM," *Aviation Week*, Jan 24, 1983, p. 30.

50. *Ibid.*, pp. 30–31. Covault, "Antisatellite Weapon Design Advances," p. 245, states that the use of the laser-gyro inertial system had been pioneered in Vought's HIT and Miniature Homing Vehicle programs.

51. "Army to Flight Test Nonnuclear ABM," *Aviation Week*, Jan 24, 1983, p. 31. HIT concepts called for various rates of spin. Two that I have seen are 20 and 50 revolutions per second.

52. "Public Affairs Plan for Flight Experiments of the Small Radar Homing Intercept Technology (SRHIT) Program," Mar 8, 1984, pp. 1–2; attachment 1, News Release 84–11–43, n.d.; and attachment 2, "Questions and Answers: SRHIT Flight 3."

53. I found no clear explanation of this name change. Ruth Currie-McDaniel and Claus R. Martel, *The U.S. Army Strategic Defense Command: Its History and Role in the Strategic Defense Initiative* (Huntsville, Ala.: Historical Office, U.S. Army Strategic Defense Command, 1989; 3d ed.), p. 51, simply state that the name SRHIT was changed to FLAGE. Dr. James Walker, U.S. Army Space and Strategic Defense Command Historian stated that although he could find no specific documentation on this name change, his records indicated that the change occurred between January 26, 1986, and May 16, 1986 (telephone conversation, Dr. James Walker and Dr. Donald R. Baucom, Jul 24, 1995). Dr. James Carlson, who was the director of the Army's Advanced Technology Center in the 1970s, stated that he did not know the exact reason for changing the name of SRHIT, but he did know that the acronym was constantly being misinterpreted to mean "short-range homing interceptor technology." Because of this, decision-makers in the Pentagon tended to see SRHIT as an insignificant program because the interceptor's "legs" (range) would be too short to permit an intercept at the minimum range for an effective defense. (Discussion, Dr. James Carlson and Dr. Donald R. Baucom, Jul 25, 1995.)

54. *N.B.*: I have found one indication of a possible difference between the SRHIT and FLAGE vehicles. U.S. Army Strategic Defense Command, Public Affairs Office, FLAGE Fact Sheet, Apr 1991, and Office of the Assistant Secretary of Defense (Public Affairs), "SDI-Related Test Intercepts Tactical Missile," News Release 268–87, May 22, 1987, state that FLAGE changed direction by selectively firing combinations of the 216 small rocket engines that girdled the missile just behind its radar dome. These rockets were

about the size of shotgun shells. As noted above, "Army to Flight Test Nonnuclear ABM," *Aviation Week*, Jan 24, 1983, p. 31, states that the flight vector of SRHIT was to be controlled by one hundred small rocket thrusters that formed a belt around the missile.

55. "Army/LTV Missile Intercepts Reentry Vehicle," *Aviation Week*, Jul 14, 1986, p. 119.

56. Office of Assistant Secretary of Defense (Public Affairs), "Experimental Flight Vehicle Destroys Moving Target during Experiment," News Release 325–86, Jul 1, 1986.

57. See note 55 above.

58. U.S. Army Strategic Defense Command, Public Affairs Office, FLAGE Fact Sheet, Apr 1991; Office of Assistant Secretary of Defense (Public Affairs), "Experimental Flight Vehicle Destroys Moving Target during Experiment," News Release 325–86, Jul 1, 1986.

59. Intvw, Raymond R. Ross II with Dr. Donald R. Baucom, the Pentagon, Washington, D.C., Sep 11, 1992, p. 10.

60. U.S. Army Strategic Defense Command, Public Affairs Office, FLAGE Fact Sheet, Apr 1991; Assistant Secretary of Defense (Public Affairs), "SDI-Related Test Intercepts Tactical Missile," News Release 268–87, May 22, 1987.

61. U.S. Army Strategic Defense Command, Public Affairs Office, FLAGE Fact Sheet, Apr 1991; "ERINT Shatters Warhead in Second Successful Intercept," *BMD Monitor*, Feb 25, 1994, p. 74.

62. "ERINT Shatters Warhead," p. 75.

63. *Ibid.,*

64. Fuller quoted in Hughes, "Patriot PAC–3," pp. 59, 61.

65. "ERINT Shatters Warhead," p. 75.

66. David Hughes, "Army Selects ERINT Pending Pentagon Review," *Aviation Week*, Feb 21, 1994, p. 93; U.S. Army Program Executive Office, Missile Defense, Public Affairs Office, Redstone Arsenal, Ala., "ERINT Intercept—Memorandum for Correspondents," n.d., provided Feb 15, 1994, by BMDO's Maj. Christine Queen.

67. Hunley, "The Enigma of Robert H. Goddard," p. 332, sees this facet of Goddard's method as being part of an American tradition. Thus, Hunley wrote:

> Goddard was born in Worcester on October 5, 1882, to a family of modest means but with deep roots in the rocky New England soil. His father, Nahum Danford Goddard, was a minor inventor who encouraged Robert's early inclination toward experimentation and invention both directly and by example. Nahum also inculcated in his son the notion that it was better to work for himself than for someone else and that it was advisable to mind his own business rather than to interfere in the concerns of others. Because of Nahum's business interests and his wife's diagnosis as tubercular in 1898, the family moved back and forth between the industrial city of Worcester and Boston, about forty miles to the east. Living in Worcester appears to have been influential in Robert's development because the city's glorification of individual inventors like Eli Whitney and Ichabod Washburn helped stimulate the young man to become an inventor himself. In the process, he got so concerned about patenting and protecting his inventions . . . that he became unusually secretive.

68. For information on the rise of command technology, see William H. McNeill, *The Pursuit of Power: Technology, Armed Force, and Society Since A.D. 1000* (Chicago: University of Chicago Press, 1982), pp. 173–176, 278–279, 331, 357–360; Walter A. McDougall, . . . *the Heavens and the Earth: A Political History of the Space Age* (New York: Basic Books, Inc., 1985), p. 5. Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm, 1870–1970* (New York: Viking, 1989), p. 353, had this to say about the roots of command technology in the United States: " The prowess of the independent inventors, the well-publicized achievements of the industrial research laboratories, and the organization and management of large systems of production spread the belief that America could invent and produce its future by design."

69. Winter, *Rockets into Space*, p. 52. I found no mention of Goddard having seen a

complete V–2 in *Papers of Goddard*, Vol. III, pp. 1577–1609, which covers the period in Goddard's life from March 1, 1945, until his death on August 10. There are grounds for concluding that Goddard believed the Germans had stolen his design. On December 28, 1944, he completed an eight-point comparison between the V–2 and his own rocket design, concluding that the design of the two was virtually identical. (Vol. III, p. 1556) There is also reason for believing that Goddard may have felt that the government's refusal to support his efforts denied him the opportunity to develop a rocket as capable as the V–2. In 1940 and 1941, Goddard and his major supporter Harry F. Guggenheim had tried to persuade the Army and Navy and others of the importance of the rockets Goddard had been developing. Guggenheim offered the federal government the use of the facilities his foundation's grants had developed at Roswell, New Mexico, along with the services of Goddard and three machinists. This was to be at no cost to the government. This proved impossible to arrange, although the Army and Navy reached a contract agreement for the use of these facilities to develop a jet-assisted takeoff system for aircraft. These arrangements were made toward the end of 1941. During this time, little or no interest was expressed in long-range rockets. (See *Papers of Goddard*, Vol. III, pp. 1311, 1313, 1314, 1409, 1432–1437.) Shortly before the United States entered World War II, Goddard was concerned that the Germans might be developing long-range rockets. See *Papers of Goddard*, Vol. III, 1334—the document here is a Jul 10, 1940, letter from Goddard to Wallace W. Atwood. Evidently, when Goddard first began working for the government in World War II, at least two of his rockets were flight-tested before the "shop force" was put to work on other Army and Navy problems. Of this Goddard wrote later: "Reason for no action by the military on long-range rocket in 1940: the liquid-fuel rocket discussed was for use in comparatively large sizes and for relatively long periods, hence more suitable for long-range rather than short-range rockets. The United States had no need for long-range rockets at that time." (Vol. III, 1558) That Goddard examined parts of V–2s is noted in several places. In fact, at the request of the Navy, Goddard wrote a detailed evaluation of the V–2's pump (see Vol. III, p. 1598). For other mentions of the V–2 in this time frame, see Vol. III, pp. 1582, 1583, 1598.

The Satellite—
From Definite Possibility to Absolute Necessity: Five Decades of Technological Change

Rick W. Sturdevant

Satellite technology has changed remarkably over the past fifty years. The hardware has advanced from mere ideas to complex machines. Organizational structures have evolved from a research and development (R&D) focus to an operational one. As evidenced by annual appropriations, support for space programs has waxed and waned. The basic functional areas envisioned for satellites have remained consistent over five decades, even though one—a dedicated military manned spaceflight capability—went unfulfilled. Meanwhile, the capabilities of space systems have proliferated to meet an expanding variety of conflicts. Initially, the U.S. military dominated space activities, and civil (including scientific) space programs often served the Cold War objective of enhancing national prestige. More recently, however, burgeoning commercial and international activities have added new dimensions of complexity to the space arena. Given such trends, no simple recitation of changes in satellite *hardware* can adequately explain advances in the *technology*.

Rather, several interrelated elements have significantly influenced the rate at which satellite technology has advanced. Those elements include, but are not necessarily limited to, technical capabilities as manifested in material products; leadership; policies, procedures, and processes as reflected in management approaches and organizational forms; supportive networks or coalitions; a certain rhetoric; crises; priorities; funding; and goals or objectives. Taken together, such elements constitute a social construction of satellite technology.[1] Defining the technology in this way helps us explain how and why it grew in infancy from ideas akin to those of science fiction to become in its maturity a bulwark of U.S. military, economic, and political security. Understanding this might help us gauge the prospects for further development at the dawn of the twenty-first century.

Technical Capabilities

Technical capabilities certainly rank high in any assessment of technological advance. On November 7, 1944, Gen. Henry H. "Hap" Arnold, Army

Air Forces (AAF) chief of staff, directed Dr. Theodore von Kármán, director of both California Institute of Technology's Jet Propulsion Laboratory in Pasadena and the newly formed AAF Scientific Advisory Group in Washington, D.C., to prepare a survey that could become a guide for the AAF's future research and development program. In his first formal report to Arnold on August 22, 1945, von Kármán stated that further V–2 development would make it possible to launch missiles that would achieve speeds of 17,000 mph or more, which is orbital velocity.[2] That report, titled "Where We Stand," became part of a multiauthored, multivolume survey called *Toward New Horizons*, which von Kármán delivered to Arnold on December 15, 1945. In his introduction, titled "Science, the Key to Air Supremacy," von Kármán briefly addressed German V–2 rocket development and concluded, "The 'satellite' is a definite possibility."[3] Less than six months later, on May 2, 1946, RAND's seminal engineering report on the "Preliminary Design of an Experimental World-Circling Spaceship" proclaimed the feasibility of satellites. RAND said the Air Force could produce a successful booster-satellite combination within the limits of existing technology, given $150 million and five years' time.[4]

Uncertainty about the nation's technical ability to field an operational long-range rocket for launching warheads or satellites caused development schedules to lengthen. The decision to fund only research and development of major components, not entire rocket or satellite systems, tended to retard the rate of overall technological advance during the early 1950s.[5] The same was true for satellites, which moved little beyond the paper-study stage until 1956, and even then most people were concerned exclusively with full-scale development for reconnaissance purposes.[6] Not until the mid-1960s through the early 1970s did most other types of military satellite systems become operational. The latter systems subsequently tended to evolve block-by-block as technical improvements became possible, and that "block" approach to the upgrade of existing operational systems continues with even the newer satellites like the Global Positioning System (GPS) and the Military Strategic and Tactical Relay Satellite (Milstar). This approach advances the technology with less risk, less R&D time, and less cost than fielding entirely new systems every dozen or so years.

Advancement of technical capabilities in other fields sometimes has spurred change in space technology. The ability to significantly reduce the size and weight of nuclear weapons rendered long-range rockets, the type that could be used for spacelift, more immediately useful. Solid-state electronics, printed circuits, microchips, and the appearance of ever smaller, more powerful computers had an almost incalculable effect on satellite development. Weight and volume reductions resulting from nanotechnology have rendered plausible the satellite-on-a-chip concept. Progress in propellant chemistry has given more boost per pound. Technical advances in power-generation hardware, especially those associated with collecting and storing solar energy, proved vital to extending the life and overall performance of satellites. Recent successes with ion propulsion offer the prospect of increasing satellite longevity by an order of magnitude.[7] Metallurgy and, more recently, the burgeoning study of composite materials have contributed to lighter, cheaper spacecraft. Frequently, industrial laboratories or commercially sponsored academic research facilities have led these kinds of technical improvements.

This recognition led the authors of *New World Vistas* to conclude in December 1995 that the Air Force had to abandon the old perspective that large-scale, government-funded R&D programs would push military satellite technology forward. The space technology volume of the *New World Vistas* survey of air and space power for the twenty-first century emphasized "cross-cutting technologies" for spacecraft manufacturing and operation that will be developed commercially and will pull military satellite technology forward. Furthermore, the report concluded that "the Air Force's hierarchy of preference in acquiring space capabilities should be to buy commercial services where possible" unless some compelling reason exists to augment commercial systems with military capabilities or employ dedicated military systems.[8] This does not mean the Air Force should cease its own efforts to advance satellite technology; it does mean those efforts might shrink significantly to focus on the sort of high-risk, high-payoff R&D programs that commercial interests find too uncertain.

During January 1998, the Air Force Research Laboratory at Wright-Patterson Air Force Base, Ohio, sponsored industry briefings in Atlanta and San Francisco on a new Dual Use Technology Development Program. Aimed at leveraging commercial industries to obtain new products or process technologies with potential applications in both military and commercial sectors, this program sought to accomplish what *New World Vistas* had recommended. Technical topics for fiscal year 1998 included ground-based imaging and inspection of orbiting satellites; rocket-based, combined-cycle engine technology; upper-stage nozzle integration for medium-lift, expendable launch vehicles; low-power electronics for space; and a common interface between spacecraft and spacelift vehicles. Bidders on any of those projects had to bear at least 50 percent of the total cost of the proposed effort. They also were required to present the Air Force with a convincing description of how the developed product or process would enter the commercial marketplace.

Leadership

The presence of influential leaders tended to promote more rapid technological advance. A particularly stellar constellation of individuals appeared in the military, government, industry, and academia during the late 1940s and rose to high positions of responsibility throughout the 1950s and into the early 1960s. In January 1945, "Hap" Arnold appointed Maj. Gen. Curtis E. LeMay as first Air Staff Deputy Chief of Staff for Research and Development. Although that position lacked sufficiently broad powers of supervision to draw together the AAF's diverse R&D activities, LeMay succeeded in creating two very important institutions: the Air Force Institute of Technology and, with Frank Collbohm's help, the Research and Development Corporation (RAND). The latter's May 1946 report and its subsequent studies identified potential uses, both military and scientific, for a satellite vehicle and set the stage for Air Force Vice Chief of Staff Gen. Hoyt S. Vandenberg's approval in January 1948 of a policy statement asserting that "The USAF . . . has logical responsibility for the Satellite."

During this same period, a small group of so-called Young Turks or Junior Indians led by Lt. Gen. Donald L. Putt further advanced the concept of a partnership among science, industry, and the military as the best way to stay in the technological race. Seeking more autonomy for R&D within the Air Force, the Young Turks sought to establish an R&D command and implement a systems approach to R&D in which specialized task forces would be assigned to particular weapon systems or components. An Air Research and Development Command, albeit with strong ties to Air Materiel Command, was finally created on January 23, 1950. Those ties ultimately would prove too binding, which led to their severance and establishment of Air Force Systems Command (AFSC) on April 1, 1961. Instrumental in that organizational transition was Gen. Bernard A. Schriever, who in 1954 had played a starring role in implementing the Teapot Committee's recommendations as first commander of Western Development Division (WDD).

The organizational forms that worked so well for space-system R&D and the fielding of the first operational satellites proved incapable of effectively expanding the usefulness of those satellites to warfighters in the air, on land, and at sea. A group of younger officers commonly known as space cadets found themselves making increasingly shrill calls during the late 1970s and early 1980s for establishment of a major command for space operations. Through the efforts of Col. Thomas S. Moorman, Jr., and others, the Air Force created such a command on September 1, 1982. To further promote the U.S. military's commitment to making satellites an integral part of war planning and war fighting, the Department of Defense (DOD) established the joint United States Space Command three years later with separate Air Force, Navy, and Army space commands as its components. Despite these changes, the institutionalized momentum of the Systems Command bureaucracy delayed the transfer of such basic functions as satellite control and space launch to Air Force Space Command until 1987 and 1990, respectively. This almost certainly retarded efforts to normalize space operations within the Air Force as a first step toward integrating them with other facets of war planning and war fighting.

After the Persian Gulf War in early 1991, Air Force leaders, with Moorman in the forefront, began to seriously address the question of how satellites might more fully, and directly, aid the warfighter and what could be done to better educate senior field officers in all the services about the usefulness of space systems. A result of their deliberations was the establishment of the Space Warfare Center at Falcon AFB, Colorado, in November 1993. Further demonstration of Air Force senior leaders' commitment to space technology came in October 1996 at their Corona Fall meeting, where they acknowledged the Air Force is really an air and space force that will become a space and air force early in the next century.

Policies, Processes, and Procedures

General Schriever and his fellow innovators introduced processes, procedures, and policies that encouraged a somewhat revolutionary approach to development through centralized organizational structure at a time when many others believed technical limitations and financial constraints dictated a more traditional, evolutionary approach. To develop and field long-range missiles as quickly as possible, Schriever relied on the programmatic concepts of concurrency and parallel development that had proved so reliable during the Manhattan Project of World War II. Parallel development involved designing and building two different ICBMs simultaneously, which stimulated competition to produce a missile in the shortest possible time and, because each major subsystem of the two different missiles had different associate contractors, provided insurance against failure of a single contractor. Concurrency aimed to save valuable time by having missiles, sites, equipment, and trained crews all ready simultaneously, but it drove costs significantly upward.[9] Using these techniques, which amounted to a systems rather than a functional approach, it took just three years to design and build a successful Atlas; the Titan took slightly more than a year longer. In addition, the Gillette Procedures, which were announced on November 8, 1955, simplified administrative channels by cutting through unnecessary bureaucratic red tape and allowing both the WDD commander and Ramo-Wooldridge Corporation officials, the system integrators, to go directly to the Air Force's senior leaders.[10]

President Eisenhower's assignment in February 1958 of the highest and equal national priority to the development of Atlas, Titan, Thor, and Jupiter missiles and reconnaissance satellites signaled a "primary policy" stance. Breaking with past decisions and perspectives, the nation's senior leadership set in motion organized, innovative efforts to find a long-term solution to a specific, serious problem, i.e., the threat to national security posed by the Soviet Union's demonstrated capability to launch long-range missiles and space vehicles. This meant relatively easy access to, and strong support from, the sources of political, economic, and technical power. Although rapid technological change resulted for a few years, success and shifting priorities soon relegated development of military space systems to an ancillary position on the national agenda. Consequently, pathbreaking leaps gave way to incremental changes in the technology; clearly defined, long-range goals tended to blur in favor of narrower, short-range objectives. Politics rather than substantive issues or problems tended to drive decisions about Air Force space programs after the mid-1960s, and managing the growth of military space technology gave way to controlling it.[11]

The innovative management processes and procedures used by Schriever and his people for the early ICBM and satellite programs proved remarkably effective. One-time leader of AFSC Gen. Robert T. Marsh described a "very interesting historical paradox," however, when other people attempted to document what had been done in so-called procedural volumes, which ultimately became the Air Force–wide 375-series regulations and DOD directives on program management. Institutionalization of the procedures removed their flexibility, made them more obstructive than beneficial, and ultimately forced their abolition. Based on that experience, which illustrates people's propensity to "institutionalize almost anything that comes along," General Schriever has remarked that any *good* management approach lasts only five years, seven at most, before it succumbs to bureaucratization and should be scrapped for something new.[12]

No fundamentally new approach to the acquisition of military space systems occurred until the 1990s. Escalating development and procurement costs compelled the Air Force in early 1994 to seek centralization of all defense-related space requirements. Air Force officials argued that because multiple acquisition agencies had led to expensive, less effective capabilities, all military space acquisitions should be centralized. That initiative helped crystallize efforts to provide new, more effective organizational changes for military space. By the summer of 1995, DOD had created a Deputy Under Secretary of Defense for Space, established a Joint Space Management Board to coordinate activities between the Pentagon and CIA, and designated a DOD Space Architect. The last became responsible for ensuring compatibility and smooth operations among different military and commercial systems. Although occupied by an Air Force officer, the Space Architect position remained within DOD's joint structure.[13]

Further restructuring of the Pentagon's space policymaking function occurred on June 1, 1998. Based on guidance in the 1997 Defense Reform Initiative and extensive discussions between Gen. Howell M. Estes III, Commander in Chief, United States Space Command, and Keith Hall, Director, National Reconnaissance Office (NRO), the DOD decided to merge high-level management of classified and unclassified satellite systems. The Deputy Under Secretary of Defense for Space was disbanded; a newly established Deputy Assistant Secretary of Defense for Command, Control, Communications, Intelligence, Surveillance and Reconnaissance (C^3ISR) and Space Systems became the singular national security space architect. Skeptics viewed this change as evidence of space officials' declining influence in the Pentagon bureaucracy, but advocates saw it as a significant step toward cost-effective, procedurally beneficial integration of the traditionally separate worlds of "black" and "white" space.[14]

Meanwhile, the earlier effort at reforming policies and procedures to encourage innovative acquisition approaches showed signs of success. Program officers for GPS used performance-based specifications and best commercial practices to slice two years from the cycle time for the acquisition of Block IIF satellites, saved $1.1 billion, and reduced project manpower requirements by 38 percent. Another acquisition success story appeared to be the "high" portion of the Space-Based Infrared System (SBIRS) to augment and ultimately replace Defense Support Program (DSP) satellites for missile warning and missile defense. Total life-cycle costs were projected to be less than DSP because of smaller launch vehicles, reliance on a commercial spacecraft bus, and use of the cost as an independent variable technique to determine the best-value approach to meeting users' requirements. To bridge the gap between evolving space requirements and available budgets, it seemed almost certain that DOD should institutionalize its pursuit of acquisition reform.[15]

Support Networks and Rhetorical Strategies

A large-scale technology such as space systems advances more rapidly if supported by a strong network of relationships or a coalition of actors that uses a certain rhetoric of technology to win and sustain support.[16] The secrecy of the Cold War period undoubtedly prevented the Air Force from using some of the rhetorical strategies that might have achieved more cohesive coalitions and broader acceptance of its technological goals. National security considerations prevented the Air Force from publicly touting its Defense Meteorological Satellite Program (DMSP) in the way the National Aeronautics and Space Administration (NASA) promoted its weather satellites. The latter's rhetoric of long-range forecasts or extended prediction drew developers and users under a common banner, and successful storm warnings dramatically presented with pictures on television screens across the country encouraged broad-based public support for further government expenditures on Metsat technology.

Not until the 1990s did the Air Force experience the benefits of a similar rhetorical strategy. The stunning success of satellite early warning systems in detecting Iraqi Scud missile launches during the 1991 Persian Gulf War and the subsequent decision to declassify much DSP material gave the Air Force an opportunity to broaden its network of support for military space systems. When the service campaigned openly for a new SBIRS to improve on DSP capabilities, an informed segment of the American public rallied to space-based warning, national missile defense, and protection against limited strikes. Others supported space-based warning after learning that DSP could detect such man-made disasters as the oil-field fires set by Saddam Hussein's troops. Even more possibilities for expanding the network of military space supporters arose in February 1995 with declassification of America's first photographic reconnaissance satellite system, the Corona project. Release of the Corona archives gave geographers and environmentalists detailed images of natural and man-made topographical changes going back a dozen years prior to anything they had previously collected. Many Americans saw clearly that even highly classified military space systems ultimately had dual-use—additional civil or commercial—applications.[17]

Historically, the Air Force and other military services cooperated minimally to advance satellite technology. Interservice rivalry during the late 1940s and 1950s might have spurred the Air Force to develop its own space program more vigorously than if there had been no competition, but that same rivalry contributed to President Eisenhower's negative view of costly military space efforts. The president's attitude, of course, led to his support for creation of that thorn in the Air Force's side, the Advanced Research Projects Agency, to oversee development of military space systems, and the preeminent NASA to handle the nation's civil space program. Even though responsibility for acquiring all military space systems resided with the Air Force after the early 1960s, both the Navy and Army jealously preserved and protected their respective interests in space technology. Over the years, the Air Force definitely established strong ties and nurtured a common language among itself, defense contractors, and academic research institutions; it also cultivated support from certain congressmen and administration officials. Nonetheless, interservice rivalry frequently prevented the military services from assembling the sort of coalition and adopting the kind of rhetoric that would have made it easier to "sell" continuous improvement of military space capabilities to DOD, the President, the Congress, and the American people.

In the case of at least one specific type of satellite, the GPS, the President's science adviser simply deemed it too hard to build a supportive coalition. Over a quarter-century ago, Ivan Getting went to science adviser Lee DuBridge to enlist the latter's support for development of satellite navigation. Getting reasoned that a presidential commission might enlist support from many potential users: the Coast Guard, Air/Sea Rescue, the Air Force, the Navy, the Army, and foreign countries. After waiting approximately one month, Getting revisited DuBridge to see if there had been any progress. The science adviser said, "Well, I thought about it and decided it was too hard to get from here to there. There are too many people, too many bureaucracies, too much politics, and too many agencies involved. Why don't you just have the Air Force develop it the way we always did?"[18] The Air Force did precisely that and completed a fully operational 24-satellite GPS constellation on March 9, 1994.

Ironically, the rhetoric that might have built a coalition to develop GPS arose after the fact to support sustainment and improvement of Navsat capabilities. The system receives thunderous plaudits from all corners of the globe—hikers seeking to find their way in the wilderness, soldiers needing to fix their location on the trackless desert sands of Southwest Asia, commercial transporters tracking company vehicles on their delivery runs, military pilots pursuing targets on the ground or in the air, rental-car drivers seeking directions in a strange city, and operators of large computer systems that require precise timing to prevent crashes—the litany seems never to end. In the May 22, 1997, issue of *USA Today*, for example, an article waxes eloquent about how sports fishermen are benefiting from the "recent marriage of fish finders and GPS" and concludes that "it is a necessity."[19] This illustrates the importance of what one group of authors has described as "cross-cultural cooperation among varying space sectors, each with different goals, objectives, and interests" working in an atmosphere of trust and shared "space literacy" to achieve something mutually beneficial.[20]

It has not been, and never will be, easy to create and sustain viable coalitions for the advancement of space technology, but an attempt to do this becomes increasingly necessary as the national government seeks, and most Americans apparently favor, a balanced budget. One very strong signal that Air Force leaders recognize the importance of building coalitions and devising a rhetoric to sustain them was a joint announcement in April 1997 by Gen. Howell M. Estes III, Commander of Air Force Space Command, and Daniel Goldin, Administrator of NASA. They pledged that their organizations would cooperatively seek areas where sharing technical information, avoiding duplication of effort, and planning joint ventures might save money. Space Command people are working very closely with NASA, Lockheed Martin, and other contractors to explore the suitability of the X–33 VentureStar or something similar for manned military space missions early in the twenty-first century. A strong coalition among supporters of the X–33 increases the probability of bringing that program to fruition and of finally giving the Air Force the manned spaceflight capability it was unable to achieve through decades of fruitless, single-handed campaigning on its own behalf. Discussions between General Estes and Keith Hall during 1997–1998 committed their organizations to a heightened level of cooperation in space ventures.

Prospects for maintaining viable coalitions have improved considerably as a consequence of the Air Force's increasing reliance on both the civil and commercial space sectors. On May 29, 1998, the Air Force transferred management of its DMSP satellites to the National Oceanic and Atmospheric Administration (NOAA). That coalition, which resulted from a May 1994 White House directive to merge civil and military weather satellite systems, also involved NASA for the purpose of developing future systems. The goal was convergence of all U.S. weather satellites into a single National Polar-Orbiting Operational Environmental Satellite System early in the twenty-first century.[21] In another departure from decades of tradition, on August 5, 1997, the Air Force awarded its first satellite-imaging contract based on commercial off-the-shelf technology. Plans called for Orbital Sciences Corporation to piggyback the Warfighter–1 technology demonstration on its *OrbView–3* satellite, thereby reducing the project cost by 75 percent. The contract required Orbital Sciences to develop a mobile ground station for reception of satellite data and to provide software for both processing the hyperspectral data and assessing its tactical utility.[22] A broader community of interest—hence, a larger base of support for the advancement of space-based capabilities—could result from such ventures.

Crises and Priorities

A crisis atmosphere, particularly in the international arena, can accelerate the rate of technological advance by focusing the attention of congressional and high-level administration officials on a particular problem or threat. This certainly was the case in late 1953 when Professor John von Neumann's Strategic Missiles Evaluation Group, or Teapot Committee, chartered by Assistant Secretary of the Air Force for Research and Development Trevor Gardner pondered the increasingly probable development of an intercontinental ballistic missile threat from the Soviet Union. These fears led the Teapot Committee to recommend in February 1954 that development of an ICBM by the United States should be a matter of the highest national priority, not simply because it was technically feasible, but because advances in nuclear warhead development rendered such a missile useful as a delivery vehicle. President Eisenhower did, in fact, assign highest national priority to ICBM development on September 13, 1955.[23]

It took more than two years and another crisis, the launch of *Sputnik* on October 4, 1957, to gain equal status for Weapon System (WS) 117L, the Advanced Reconnaissance [Satellite] System. Finally, on February 3, 1958, Eisenhower gave highest and equal materiel priority to the Atlas, Titan, Thor, and Jupiter missiles; the WS–117L satellite; and the WS–224A (Ballistic Missile Early-Warning System) early-warning radar network.[24] A further sense of crisis surrounded fears that it was only a matter of time before the Soviet Union would be able to shoot down U–2 spy planes, and that spurred a fierce effort to launch a reconnaissance satellite via the Discoverer program at the earliest possible date. Of course, that date proved to be barely more than 100 days after Gary Powers' U–2 went down.

No comparable sense of crisis has emerged since that time to fuel demands for new satellite capabilities. The United States first used satellites militarily for meteorological and communications purposes during the Vietnam War, relied on them extensively for command and control during the Granada invasion (Urgent Fury) in 1983 and Panama operations (Just Cause) in 1989–1990, and extensively integrated space assets into theater operations for the first time during the Persian Gulf War (Desert Storm). While those experiences proved invaluable to advancing space technology from an applications or "user" perspective, they did little to promote the need for fundamentally different kinds of space-based capability. President Ronald Reagan's administration did its best during the 1980s to justify the Strategic Defense Initiative as something urgently needed to thwart sinister communist plots against the free world, but the sense of crisis never reached fever pitch and quickly disappeared with collapse of the Soviet Union in the early 1990s. Some might warn that terrorist groups or rogue nations pose a major threat, others might quake at the thought of an asteroid or comet colliding with Earth, but few people seem bothered enough by these things to label them an earth-shattering crisis.

If anything currently on the horizon could generate a sense of impending crisis, it might be a realization that the booming commercial space market and the looming international space sector pose serious questions about the future role of military space. Keith Calhoun-Senghor, Director, Commerce Department Office of Air and Space Commercialization, observed recently that global competition, technical advances, and a loosening of Cold War governmental restrictions are causing commercial space investment to rapidly outpace government spending. Annual revenues from commercial GPS applications are expected to surpass $8 billion by the year 2000, and those from satellite imagery should top $1.2 billion. When one includes satellite communications, total space industry revenues should exceed $100 billion annually within the next two years. These developments lend credibility to the comparison some military experts have drawn between freedom of the seas and freedom of access to space. In the future, preservation of our national security almost certainly will depend on our ability to exercise military space power to protect U.S. and allied commercial or civil satellites. The effective exercise of such power requires development of affordable access to space and new space-based military capabilities.[25]

Funding

Highest-priority designation allowed WS–117L program managers to finally obtain more funding. The level of funding, as well as the consistency of funding, for both long-range missile and satellite programs initially had been much less than desirable. A $1.4 million contract awarded by the AAF to Convair in April 1946 resulted in the MX–774 rocket, but sharp reductions in development funds led to cancellation of the contractual agreement in July 1947. The MX–774 program was cancelled entirely in February 1949, only to be resurrected as the MX–1593 Atlas program in January 1951 when the Korean conflict prompted an increase in military spending. General Schriever recalled that, as late as 1957, he had to campaign relentlessly before he finally convinced Secretary of the Air Force Donald Quarles to give a scant $10 million for satellite development. By comparison, the ICBM development budget for that year expanded to $491.5 million within a total ballistic missile budget of $1,135 billion.[26] Some even have argued that the "inadequate initial funding" which the Air Research and Development Center allotted WS–117L "ultimately resulted in the preeminence of civilian managers of U.S. satellite observation systems."[27]

Funding levels supported relatively steady development and fielding of operational satellite systems during the 1960s and 1970s. From the mid-1980s onward, however, planners could not rely on similar good fortune. Fluctuating annual appropriations threatened to reduce the size of the 24-satellite GPS constellation and probably contributed to AFSC's decision during the prototype stage to trim communication links in the commanding network to a level that proved inadequate once the system became fully operational. An unsteady funding profile lengthened Milstar's development schedule and forced cutbacks in the satellite's technical capabilities. Efforts to secure sufficient money for a follow-on to DSP were repeatedly rebuffed within the corridors of the Pentagon or the halls of Congress. Not until the spectacular performance of DSP in the Persian Gulf War, the resulting ground swell of support for ballistic missile defense, and marriage of "Star Wars" technical capabilities with existing infrared techniques did the Air Force gain approval and funds to acquire a new SBIRS.

While the amount and steadiness of funding over time can dramatically affect how long it takes to develop and field space-related systems, decisions on how the Air Force should invest available dollars are also important. Larry Lynn, director of the Defense Advanced Research Projects Agency observed in March 1997 that government should "invest in the highest-payoff technologies and military concepts—even when technical risk would inhibit others."[28] When declining budgets compel the military services to trim significantly their force structures, expenditures for research and development of new systems should focus selectively on whatever maximizes the capability of a smaller force to respond to the full range of future conflicts. Space systems, particularly those with dual-use applications that benefit both military and civilian sectors, can do precisely that sort of thing. Secretary of the Air Force Sheila Widnall should have surprised no one, therefore, when she commented in April 1997 that "our satellites on orbit increased by 250 percent" at the same time that fighter and bomber forces declined by 50 percent and overall Air Force budget and personnel cuts amounted to 40 percent.[29] Military space advocates cannot rest easy, however, because they too are being forced to choose among programs, rather than finding ways to fund all of them.[30]

Goals or Objectives

A final factor in the advancement of satellite technology is whether well-defined purposes, objectives, or goals drive the technology, or if the opposite prevails—technology drives the goals. The pursuit of rocket systems to launch nuclear warheads across intercontinental distances and reconnaissance satellites into space was a clearly stated objective during the 1950s. In subsequent decades, however, it became obvious that military satellites for other purposes, such as communications and meteorology, were being developed and launched without a precise understanding of how they might be employed in a conflict. With the end of the Cold War, satellites like DSP and Milstar that had been intended for strategic purposes suddenly had to be justified on the basis of tactical requirements. Among the reasons that the Air Force never managed to achieve a manned spaceflight capability for itself is that the purpose could not be defined clearly enough to justify the expense within the context of national space policy. It always has been more difficult to convince Congress and the President to spend money on hardware for which the purpose is unclear, and it becomes almost impossible during a fiscally tightfisted era. If we discover new applications for existing satellite systems, that constitutes technological advancement, but we can no longer afford new, technologically advanced systems for which the purpose is initially unclear.

Based on this survey of elements that contribute to technological change, it seems that periods of especially rapid advance occur under a particularly ideal set of circumstances. Technical capabilities must already be adequate to the task at hand. Strong, dynamic advocates must be present within the military, government, industry, and frequently, academia. A certain rhetoric of technology must exist to help assemble and sustain coalitions of support for large-scale space programs. Innovative and effective policies, procedures, and processes, as reflected in management approaches and organizational forms, must exist and be suitable to the task at hand. Funding must be at least minimally sufficient in amount and steadiness to meet the existing development schedule. Finally, urgency spawned by a sense of crisis elevates the priority accorded the technology.

These elements seem to have come together in an especially strong way only twice during the last fifty years, and when they did, satellite technology advanced at a much faster, more dramatic pace. The first time the elements conjoined ideally was during the middle 1950s to the early 1960s when they served to hasten the advance of the satellite from the status of a definite possibility to that of reality. A strong case might be made that these conditions resurfaced, perhaps with somewhat less intensity and clarity, during the late 1980s and 1990s. United Nations forces were so reliant on satellite systems during the Persian Gulf conflict that Chief of Staff of the Air Force Gen. Merrill McPeak called it the first space war. As the United States withdrew its forces from more and more overseas locations, cut the total force structure dramatically, and still sought to maintain a capability to project its military might whenever and wherever needed, space-based assets became an essential part of the strategic equation. They gave the nation a global presence that could, hopefully, preserve the peace by deterring potential aggressors who knew they were being watched and would be held accountable for their actions; in the event conflict did occur, satellites would contribute mightily to a more efficient, effective deployment of air, sea, and land forces. By the mid-1990s, the Air Force acknowledged that "technology today has evolved to the point that using space is essential to victory on the battlefield."[31] Looking ahead, Air Force leaders recognized that "space power" would evolve from its role of supporting forces in other media—land power, sea power, and air power—to become a separate and equal medium itself—space power.[32] The satellite had become an absolute necessity for military operations.

Military history informs us that when conflict arises it is best if we already have the required technology in place. Indeed, having the technology in place (as in the case of nuclear weaponry) might even deter potential aggressors and prevent war. Unfortunately, military leaders have focused almost habitually on preparing to avoid the mistakes of the previous conflict rather than anticipating the challenges of the next one. This means great advancements in the technology needed to deter or defeat aggressors generally await the propelling circumstances of an international crisis, which we might prefer not to experience. For this reason, the visionary perspective of current Air Force leaders on space technology is especially significant. It amounts to a clarion call, in a noncrisis environment, for rapid advancement of the technology needed to ensure America's dominance of near-Earth space. How successful they will be in achieving their objective remains to be seen.

Notes

1. Rudi Volti, *Society and Technological Change* (New York: St. Martin's Press, 1988), pp. 6–9.

2. Theodore von Kármán, Director, Scientific Advisory Group, Army Air Forces, "Where We Stand: First Report to General of the Army H.H. Arnold on Long Range Research Problems of the Air Forces with a Review of German Plans and Developments," Aug 22, 1945, p. 25.

3. Theodore von Kármán, Director, Scientific Advisory Group, Army Air Forces, "Science, the Key to Air Supremacy," in *Toward New Horizons* (Dec 15, 1945; commemorative ed., Andrews AFB, Md.: Air Force Systems Command History Office, 1992), p. 25.

4. Douglas Aircraft Co., Inc., Santa Monica Plant, Engineering Division, "Preliminary Design of An Experimental World-Circling Spaceship," May 2, 1946, pp. II–VIII.

5. Jacob Neufeld, *The Development of Ballistic Missiles in the United States Air Force, 1945–1960* (Washington, D.C.: Office of Air Force History, 1990), pp. 77–78; Alan L. Gropman, "Air Force Planning and the Technology Development Planning Process in the Post-World War II Air Force—the First Decade (1945–1955)," in H.R. Borowski, ed., *Military Planning in the Twentieth Century*, Proceedings of the Eleventh Military History Symposium, Oct 10–12, 1984 (Washington, D.C.: Office of Air Force History, 1986), pp. 154–230.

6. Merton E. Davies and William R. Harris, *RAND's Role in the Evolution of Balloon*

and Satellite Observation Systems and Related U.S. Space Technology (Santa Monica, Calif.: RAND, 1988), pp. 73–74.

7. "Solar-Powered Propulsion System Twice as Efficient" and "Electric Propulsion System Featured on New ComSat," *Space Tracks*, May/June 1998, p. 21.

8. USAF Scientific Advisory Board, *New World Vistas: Air and Space Power for the 21st Century* (Washington, D.C.: GPO, 1995), Space Technology Volume, pp. 65–71.

9. Neufeld, *Ballistic Missiles*, pp. 122–137, 199–201.

10. *Ibid.*, pp. 3, 112, 120–121, 135–137; Stephen B. Johnson, "Three Approaches to Big Technology: Operations Research, Systems Engineering, and Project Management," *History and Culture*, Vol. 38, No. 4 (Oct 1997), pp. 891–919.

11. Curtis Peebles, *The Corona Project: America's First Spy Satellites* (Annapolis, Md.: Naval Institute Press, 1997), pp. 52–54; Robert A. McDonald, "Lessons and Benefits from Corona's Development," in Robert A. McDonald, ed., *Corona between the Sun and the Earth: The First NRO Reconnaissance Eye in Space* (Bethesda, Md.: The American Society for Photogrammetry and Remote Sensing, 1997), pp. 255–259; Lyn Ragsdale, "Politics Not Science: The U.S. Space Program in the Reagan and Bush Years," in Roger D. Launius and Howard E. McCurdy, eds., *Spaceflight and the Myth of Presidential Leadership* (Urbana: University of Illinois Press, 1997), pp. 135–137; Mark D. Mandeles, *The Development of the B–52 and Jet Propulsion: A Case Study in Organizational Innovation* (Maxwell Air Force Base, Ala.: Air University Press, 1998), pp. 7–27, 159–182.

12. Jacob Neufeld, ed., *Reflections on Research and Development in the United States Air Force: An Interview with General Bernard A. Schriever and Generals Samuel C. Phillips, Robert T. Marsh, and James H. Doolittle, and Dr. Ivan A. Getting* (Washington, D.C.: Center for Air Force History, 1993), pp. 64–65.

13. David N. Spires and Rick W. Sturdevant, "From Advent to Milstar: The United States Air Force and the Challenges of Military Satellite Communications," paper presented at NASA Symposium "Beyond the Ionosphere: The Development of Satellite Communications," Oct 17–18, 1995, Washington, D.C., pp. 17–18.

14. Warren Ferster, "Pentagon Overhauls Space Policy Structure," *Space News*, May 18–24, 1998, pp. 4, 34.

15. Dana J. Johnson, Scott Pace, and C. Bryan Gabbard, *Space: Emerging Options for National Power* (Santa Monica, Calif.: RAND, 1998), pp. 12–13.

16. W. Henry Lambright, "The Political Construction of Space Satellite Technology," *Science, Technology & Human Values*, Vol. 19, No. 1 (Winter 1994), pp. 47–69.

17. Peebles, *Corona Project*, pp. 266–268; McDonald, "Lessons and Benefits from Corona's Development," pp. 261–265; Jeffrey T. Richelson, "Scientists in Black," *Scientific American*, Vol. 278, No. 2 (Feb 1998), pp. 48–55.

18. Neufeld, ed., *Reflections on Research and Development*, pp. 91–92.

19. Sal Ruibal, "Bytes Point the Way to Bites," *USA Today*, May 22, 1997, p. 3C.

20. Johnson, Pace, and Gabbard, *Space*, p. 65.

21. "U.S. Military Satellites Now on NOAA's Watch," *Space News*, Jun 1–7, 1998, p. 2; AFSPC News Service, "First Satellite-flying Unit Inactivated," Jun 12, 1998.

22. L. Scott Tillett, "Air Force Purchases First Private Satellite Technology," *Federal Computer Week*, Aug 11, 1997, pp. 5, 8.

23. Neufeld, *Ballistic Missiles*, pp. 132–135.

24. Davies and Harris, *RAND's Role*, pp. 94–97.

25. Katherine McIntire Peters, "Space Wars," *Government Executive*, Vol. 30, No. 4 (Apr 1998), pp. 12–20; Remarks by Gen. Howell M. Estes III, Commander, Air Force Space Command and U.S. Space Command, at Air Force Association National Symposium, Los Angeles, Calif., Nov 14, 1997, published in "National Security: The Space Dimension," *Defense Issues*, Vol. 12, No. 52, pp. 1–6.

26. Neufeld, ed., *Reflections on Research and Development*, p. 88; Neufeld, *Ballistic Missiles*, pp. 131, 165–168.

27. Davies and Harris, *RAND's Role*, p. 74.

28. Remarks by Larry Lynn, director, Defense Advanced Research Projects Agency, to the Acquisition and Technology Subcommittee, Senate Armed Services Committee, Mar 11, 1997, published in *Defense Issues*, Vol. 12, No. 18, pp. 1–12.

29. Dave Jonta, "Space Now at Center Stage, Air Force Secretary Widnall Tells Symposium," *Orbiter* (Aerospace Corporation, El Segundo, Calif.), Apr 23, 1997, pp. 1, 3.

30. Joan Johnson-Freese and Roger Handberg, *Space, the Dormant Frontier: Changing the Paradigm for the 21st Century* (Westport, Conn.: Praeger, 1997), pp. 121–147.

31. Headquarters Air Force Space Command Office of Public Affairs, "Guardians of the High Frontier," [1996], p. 4

32. Director of Plans, U.S. Space Command, "Vision for 2020," February 1997.

Luncheon Address

History and Its Uses

Gen. Bryce Poe II, USAF (Ret.)

The history of American military aviation is an exciting subject, and I am both pleased and flattered to be asked to address such a distinguished crowd. I want to discuss the value of history, a subject sometimes unappreciated by the Air Force. About three or four years ago when downsizing started, one of the very senior officers decided the first thing to eliminate would be the history office. Fortunately, he had his mind improved, but the point is that many individuals have never understood that the historical perspective offers positive and important support to their mission.

I have always considered the study of history to be very useful to the military; it has certainly been important to me. With the distinguished scholars we have here today, I want to make absolutely clear that I do not consider myself a historian. Some years ago I was told I had been labeled as a meddling dilettante. When I looked up "dilettante," I felt a little hurt. Some definitions called it a dabbler or trifler. But I felt better once I found the "right" one: half scholar. That describes this dilettante—I have always read as much history as I can, in part to learn how men and women have acted and made decisions, and how complex circumstances have affected the outcome of events.

Of all military professionals, we in the aerospace business operate with weapons and tactics and techniques farthest removed from intervention. We work in a world of speed and flexibility and lethality that would have been unthinkable even a generation ago. As a result, among soldiers, those of us who deal mostly in the technological present and future have least appreciated the value of history. Still, not only have military scholars and some untried theorists defended the usefulness of the historical perspective, many of our toughest, most hard-headed combat leaders have as well.

We must be careful, however, with the way history is recounted. Besides those who discount the often grim lessons of the past, there are those who try to glorify it and those who elaborate on the facts, or even fabricate them. Today we must also be careful of the reworking of history in the name of "political correctness." One example of the glorification of historical events and personalities is the often repeated story of General Cambronne's request for surrender at Waterloo. He proclaimed, according to many printed accounts, "The guard dies, but never surrenders." In fact, we have no idea what he actually said. Similarly, popular history usually does not record that what Brig. Gen. Anthony C. McAuliffe said to the Germans at Bastogne was a little more crude than "Nuts." Thomas Jefferson's reminder should serve us well in this respect: "A morsel of genuine history is a thing so rare as to be always valuable." And, although Ben Franklin complained that "historians relate not so much what is done as what they would have believed," I think his comment applies more often to generals than it does to historians.

There are many ways to put history to advantage. We can benefit from traditional wisdom in the experience and writing of thoughtful men and women who came before us. Personally, I have often found it to be more successful to quote some dead prophet than to use my own words. To give you an example, I cannot recall how many letters I got from the Office of the Secretary of Defense that began, "It is not helpful for a senior officer, when asked to comment on the meaning of a carefully thought out and prudent order, to cut all numbers to 16 percent of the validated requirement." When asked what that meant, I once cited the retort of a British minister just prior to World War I who said, "Leave the old Army alone and don't make war under any circumstances."

I made that comment at a time when I had determined to resign from the Air Force in anger. Gen. Ira Eaker talked me out of it by putting his finger in a glass of water, pulling it out and saying, "Your resignation will make about that much difference. Somebody else who will be happy to jump through hoops will take the job, and nothing will change." So I stayed, and continued to use quotes and historical examples to try to make my points. Usually, the issue in contention had to do with the budget, but on one occasion the *Wall St. Journal* printed my remark that we are much like Sun-Tzu who said that we must not rely "on the likelihood of the enemy not coming, but on our own readiness to receive him." I went on to say that "what we are doing today is betting that we aren't going to have a war."

Another perspective I like comes from the old Duke of Marlboro who said, "There is a time for all things, there is even a time for change, and that is when it can no longer be resisted." As a logistician, I have a great deal of respect for John Churchill, the Duke of Marlboro, because of his talents as an organizer. In 1704, heading for a fight, he led his army along the Rhine. Whenever they stopped, the troops would find shoes and meals and bridges and hospitals. All they had to do was put their kettles on the fire and their tents up and go to bed. Yet, despite the duke's brilliance as a logistician and his theoretical recognition of the inevitability of change, he was reluctant to accept a new and better musket.

To give you another historical anecdote about commanders who, unfortunately, we all may have known, Marshal of France Comte Hermann Maurice de Saxe spoke of the "commander who tries to do everything and as a result does nothing," or "the commander who, in an attempt to clarify previous orders, will confuse the spirit of his whole army with multitudinous messages, throw everything into horrible confusion." The advice to "never substitute the decision" is another point worth taking.

Contemporary military men also have looked to the lessons of history. Lord Tedder freely quoted Sun-Tzu, Bacon, and Mahan in his postwar lectures at Cambridge. Air Vice Marshal Sir Robert Saundby cited Clausewitz in warning of the dangers of unilateral disarmament. Gen. Leon Johnson, who is no inexperienced theorist, having won the Medal of Honor, said, "The study of military history really comes into play after one has left the operational units. It seems terribly important to study the lessons of history when selecting weapons and determining national actions and reactions and deciding on the scope and the objective of war plans." Gen. Claire Chennault credited German ace Manfred von Richthofen with developing in 1916 the two-fighter team that he used so successfully in China. Many people do not think of Gen. Curtis LeMay as thinking historically, but nothing could be farther from the truth. He wrote:

> For centuries successful military strategies were based on principles that we have all learned and equally as many centuries of military experience. Those lessons came hard and at great cost in lives, in gold, and in national power. These principles have been successful for more than 2,500 years. We ignore these lessons at our peril. Modern war is far too destructive to apply those principles exactly the way Gen. Nathan Bedford Forrest would have applied them. Today the desired way to apply those principles is by strategic anticipation and development. For if we are not first with the most capability, we are very likely to be too late with too little.

What about the ability of our historians to prepare for and provide the kind of information that improves readiness, prevents problems, removes obstacles, and takes advantage of opportunities? Let me give you a few examples that have come to my attention. Early in the first winter in the Korean War our F–80s were parked next to some B–26s that were really taking a beating because the ground had frozen; they kept blowing up their own aircraft. The technical data was not helpful, but an official record of similar bombings in Italy a decade earlier provided the exact fuse settings required. That historical document solved the problem.

When I was in SAC in 1960, assigned to an Atlas missile squadron, I spent most of my little free time in the history library where there was a sign that read, "Ask history first." The historians were, in fact, extremely helpful. On one occasion their research allowed the cancellation of a single reconnaissance mission that saved the taxpayer over $6 million.

At that time, when the first few missile squadrons were activated, both the mission and the people were new, new to each other and to the Air Force. Some of the units were given famous old insignias whose heritage was provided by the historians. When the equipment of those new units was marked with an emblem that had flown missions over Germany or had been in the Pacific in World War II, and their colors displayed the battle streamers of a dozen campaigns, there was a marked increase in unit morale. The pride that comes from such intangibles cannot be overestimated. A friend once told me about having to break up a fight in which one of the youngsters, who had been ridiculed, responded, "That's right. I may be a clerk. But I am a clerk in the triple-nickel fighter squad." His pride in his unit gave him courage.

I was the night off-duty officer when the Cuban missile crisis kicked off. You know, you worry about yourself when you go into combat, but that night, that first night, standing there wondering if your family or half the people in this country are going to be alive the next day was the most stressful night I ever spent. At any rate, the historians were on our battle staff too. Their insights at the time and their documentation of wartime events became invaluable afterward. I would urge any historian who is not invited to the staff meeting to try to invite himself. Just slip into the back of the room and attend regularly until there is an opportunity to give a note to the commander or one of the senior staff officers to the effect that, "I thought the attached might be helpful in the circumstances that were brought up this morning." Pretty soon you establish the value of the historical perspective, so that people routinely look for your input.

Once they begin to understand it, commanders will come to value historical information—first, because of its honesty. As you no doubt recall, in the middle of World War II, President Franklin Roosevelt urged the military services to prepare histories of the conflict. They were to be absolutely unbiased, no matter whose feelings were hurt or where the truth lay. That directive led to the official military history programs of all the services, which have continued to write thoroughly researched, clear-sighted books and monographs about their nation's military actions during peace and war.

The accuracy and detail of official histories is often enhanced when historians are deployed along with the troops. Many of you know my friend Dr. Alfred Hurley, a prime example of the dedicated and professional historian. He came to my wing in Vietnam, where we had five bases. He went to every one of them and flew a lot of missions with my antique air force. Those included the three squadrons of EC–47s that were older than the crew. They flew to some pretty bad places to locate the enemy by radio transmissions and to bring friendly fire on the target. Flying with those guys, getting shot at, Al went directly to the primary sources.

I also had historians on my staff when I was wing commander of the 26th Tactical Reconnaissance Wing at Ramstein in 1969–1970. There, we had real problems in getting our aircraft to gunnery ranges in Spain. The French air traffic control delighted in holding us up until we sometimes had to get a tanker to refuel just to go the very short distance from Germany to Spain. A French armor regiment was stationed a few miles from us. My historian researched the history of that North African unit and its commander. The background of both were quite interesting. The French commander had been wounded several times, in Europe, Asia, and in North Africa. He and I became good friends. I surprised him with an F–4 flyover for his Bastille Day parade, and he loved every opportunity to fly in the Phantom. After a while, I said to him, "You know, I am having a terrible time getting across France in these planes." He—or somebody—must have pulled some strings, because the harassment stopped. I will always give him credit for the help because, although he denied it when I asked him, when I thanked him, he said, "Your shooting, like mine, is important. With your Phantoms and my tanks, we will sweep the Soviets before us."

In later years when I returned to USAFE, we experienced serious flying safety problems. There were just too many "dumb" accidents—failure to reset altimeters, lower-level acrobatics, and trying to fly visually in bad weather. Flying an F–4, I went to all the wings to talk about the situation. As some of our aviators here will tell you, a general has very little credibility. So, to get people's attention, I began carrying with me accident records. When I went to USAFE in 1974, the fighter rate was 3.9 accidents per 100,000 hours. I pointed out that when I had signed up for flight training in World War II, the rate was 44; 16,000 aircraft were destroyed and about 5,000 airmen died in that one year. When I got my wings after the war, the rate was 61, with 2,000 plus crashes and about 900 fatalities, including the same irresponsible flying that went on in Europe. None of these fatalities were combat losses, all were training accidents. I got some interesting reactions. One captain said, "General, you should have quit your story with a loss rate of 16 rather than 61; 16 would have scared the hell out of everybody, 61 is not believable." Another pilot asked, "How many classmates did you lose?" I told him that of the 105 who went to fighters, we lost 39. I think that the numbers, more than any lecture I might have given, sank in. Today the USAF Class A accident rate is 1.25. Our people are smarter and our weapons more lethal than ever before, and we pay great attention to safety.

Air Force historians served me especially well when I was assigned as legislative liaison in Washington between 1965 and 1967. I used to brag that those were the only 22 months of my career I spent in the Pentagon. On one occasion, a congressman called me to complain that "the Air Force ain't doing right by one of my constituents. You are flying them jets low over his farm, he is suing you, you are making him go to court needlessly." The JAG, the judge advocate, was no help. He told me that the constituent was going to win, but Secretary of Defense Robert S. McNamara had decided to make them all go to court, expecting that some of them would drop out. However, a check of the records turned up the fact that the small airfield used as an Air National Guard airstrip for some 15 years belonged to the farmer who was suing us. So I called the member back and, exceeding my authority by some great measure, said, "I am certain you will be as surprised as we were to learn that Mr. Booth (John Wilkes, I am sure, was in his background) is not just a farmer but the owner and operator of the airfield. I promise you that we can solve the problem quickly. Perhaps not immediately, but certainly within 90 or 120 days, I can get those airplanes out of there." I guess he had visions of the people employed cutting the grass and pumping the gas and flipping the hot dogs, so he said, "Now, son" (you know, you get to be a 45-year-old colonel and it is still "son"), "son, don't you do nothing hasty. I will go home this week and straighten all this out." He called me that night—at home—to say, "The Air Force don't have to worry its head no more. Mr. Booth was over at the county courthouse today to withdraw that case." I thanked the congressman. Then I went to bases and unit offices and asked if we couldn't get out of that damn patriot's airfield.

Both in legislative liaison and as a senior commander, I found the research done, often by the historians, to be priceless. I cannot remember a happier time in my life than the two times I was able to say, "Mr. Chairman, we could not agree with you more. What we are doing makes no sense at all. But we are required to do that by public law X, Y, Z. Here is a copy, sir, of the three things that we sent over during the last four years to try and get a waiver from those requirements."

On the other hand, when you are backed up by facts, you can get rather smug. Unfortunately, you do not always win, no matter how well prepared. For instance, I should have known better than to feel confident when jousting with Congressman Jack Brooks, who served on the Government Operations Committee. The subject of one of our debates was replacement of our ancient IBM computers, at one time the best in the world. But after several years of hard use they were going to pieces, and the contractor would not support us or give us parts. We were in real trouble. I requested permission to go "sole source," promising before God I would compete the contract within three years. When I finally went before the committee armed with much valuable information, I played my ace: "All I ask, and for the same reason, is to do what was approved just six weeks ago for Mr. Brooks' office, namely, obtain what is necessary to keep the system going now and look for a future time to do the rest. That way I can keep my system on-line." At that point, Brooks got up and, as he left the room, looked over his shoulder and said, "You need a lesson in civics." That was the end of it.

Incidentally, the most powerful House committee chairman during my days in Washington was Mendel Rivers. As chairman of the House Armed Services Committee, he did a great deal for the military, but he was extremely difficult to deal with. My Navy counterpart called one day to say that he was in "terrible trouble with the chairman. Rivers called up this morning and said, 'Son, the United States Navy has lost its mind. I understand that the nuclear submarine *John C. Calhoun* launched today is going to be based at Newport, Rhode Island. Now, Mr. Calhoun, God rest his soul, wherever he might be, heaven or hell, wouldn't want that boat anywhere but in Charleston, South Carolina.'" Even worse, he went on to say, "Defying any reason whatsoever, I have learned that tied up at the dock at Charleston today is the nuclear submarine, *Ulysses S. Grant*." As you can imagine, the subs swapped ports so that the *Grant* was moved from Charleston. That was the Navy's version of political headaches that had nothing to do with military requirements.

Much of the useful data I got when I was in the Pentagon concerned staff operations. I was often frustrated when dealing with people who had not been in and did not stay in government very long, but who instantly knew the best way to handle your business. One example was a young congressional staffer who told me, "You should just find out how the big boys do things; then you can manage your engine inventory like the airlines do." At the time, the biggest commercial airline had about 1,300 engines. I had 44,000, plus there were the thousands in the Army and Navy. The shelf life of those Hill staffers being so short, within 18 months the first guy had left, and his replacement, who had received the same simplistic briefing, had to be given the same explanation. Only by then the Air Force had 55,000 engines. It was essential, throughout these kinds of exchanges, to have the historian sitting in staff meetings to provide data and background.

Earlier I indicated that the value of history should be made clearer to Air Force officers, who tend to be somewhat blind to it. A military officer's first responsibility is to maintain the highest possible level of performance in his everyday job. It is not going to do any good to quote Clausewitz if you cannot put the bombs on target or conduct air refueling or man a missile silo. But sooner or later, probably sooner, a military officer is going to have to make decisions, and if he has learned some of the historian's habits of sifting and dissecting and questioning and comparing, he will have cultivated an invaluable mental discipline. You may have heard the story about the commander who said, "I am in a big hurry. Give me half the information so I can make a quick decision." As we all know, decisions are best made with *all* the relevant information, and from the long view of continuity and change over time.

History is, of course, one among several disciplines that broaden and deepen our decision-making capabilities. Business administration, mathematics, engineering, and especially economics all employ useful systems of analysis. But in my judgment, history has two advantages. The first is that the intellectual process is more closely attuned to the requirements of military decision-making. Second, history is about people, and much of our work is about people, whether in coordination with others or when taking major command responsibilities. Any reading of history makes clear how much personality and leadership affect the outcome of events. Human behavior is the most important factor in almost every military problem.

Historians can also provide models of how to write. In no other profession besides the military can the cost of misunderstanding be so great. If Robert E. Lee had written a little more clearly to Lt. Gen. James Longstreet, for instance, he might not have had such a bad three days at Gettysburg. Regrettably, many military people not only write poorly, often their writing is intentionally crafted to shelter them from criticism or responsibility. The historian's ability to cut through jargon or obfuscation can aid senior officers in understanding the underlying meaning and the implications of many opaque or inconclusive staff reports.

Similarly, too many people write too much. Once I reviewed an extensive plan with a 26-page annex that tried to second-guess everything that might happen and every conceivable action to take as a result of a test missile launch. However, the missile did not accommodate the plan. It reacted in an entirely unexpected fashion, so all the excessive verbiage and proposed "what-if" solutions were irrelevant. We might recall Gen. William Tecumseh Sherman's lengthy plan to move a modern army of 50,000 people through the heart of enemy country for six months, and how it compared to the events as they played out.

With that historical reminder to sober us up, I will let you go and thank you for your attention.

Glossary

AAA	antiaircraft artillery
AAF	Army Air Forces
AB	Air Base
ABC	American-British Staff Conversations
ABDR	Aircraft Battle Damage Repair
ABM	antiballistic missile
ACC	Air Combat Command
ACM	Air Chief Marshal
ACTS	Air Corps Tactical School
AEC	Atomic Energy Commission
AEF	American Expeditionary Force
AFB	Air Force Base
AFDD	Air Force Doctrine Document
AFHRA	Air Force Historical Research Agency
AFIT	Air Force Institute of Technology
AFLC	Air Force Logistics Command
AFLIF	Air Force Logistics Information File
AFM	Air Force Manual
AFMC	Air Force Materiel Command
AFSC	Air Force Systems Command
AFSPC	Air Force Space Command
AFSWP	Armed Forces Special Weapons Project
AGMC	Aerospace Guidance and Metrology Center
ALC	Air Logistics Center
ALS	Advanced Logistics System
AMA	Air Materiel Area
AMC	Air Materiel Command
AMC	Air Mobility Command
AR	Army Regulation
ARDC	Air Research and Development Command
ARPA	Advanced Research Projects Agency
ARVN	Army of the Republic of Vietnam

ASAT	antisatellite
ATC	Air Transport Command
AUTODIN	Automatic Digital Information Network
AWPD	Air War Plans Division
BEEF	Base Engineering Emergency Force
BMEWS	Ballistic Missile Early-Warning System
BOA	broad ocean area
BRAC	Base Realignment and Closure
C^2	command and control
C^3ISR	command, control, communications, intelligence surveillance, reconnaissance
CAS	close air support
CCS	Combined Chiefs of Staff
CENTAF	U.S. Air Force Component, CENTCOM
CENTCOM	U.S. Central Command
CIA	Central Intelligence Agency
CINCEUCOM	Commander in Chief, European Command
CINCFE	Commander in Chief, Far East
CINCPAC	Commander in Chief, Pacific Command
CINCSAC	Commander in Chief, Strategic Air Command
CJCS	Chairman of the Joint Chiefs of Staff
CLSS	Combat Logistics Support Squadron
CONUS	continental United States
CSAF	Chief of Staff of the Air Force
CSSA	CENTAF Supply Support Activity
CV	Vice Commander
DLA	Defense Logistics Agency
DMRD	Defense Management Review Decision
DMSP	Defense Meteorological Satellite Program
DOD	Department of Defense
DSA	Defense Supply Agency
DSP	Defense Support Program
ERINT	Extended Range Interceptor
EUCOM	European Command
EWP	emergency war plan
FEAF	Far East Air Forces
FEALOGFOR	Far East Air Logistics Force
FEC	Far East Command
FLAGE	Flexible Lightweight Agile Guided Experiment
GCC	Gulf Cooperation Council
GHQ	General Headquarters
GPO	Government Printing Office
GPS	Global Positioning System

HARM	high-speed antiradiation missile
HIBEX	High-g Boost Experiment
HIT	Homing Interceptor-Terminal
HMSO	Her Majesty's Stationery Office
HQ	Headquarters
ICBM	intercontinental ballistic missile
IDAD	Internal Defense and Development
ILM	intermediate-level maintenance
IRBM	intermediate-range ballistic missile
JCS	Joint Chiefs of Staff
JOC	Joint Operations Center
JSTPS	Joint Strategic Target Planning Staff
LANTIRN	low-altitude navigation and targeting infrared for night
LC	Library of Congress
LMS	Logistics Management System
LNO	limited nuclear option
LOGAIR	Logistics Airlift System
MAAF	Mediterranean Allied Air Forces
MAAG	Military Assistance Advisory Group
MAC	Military Airlift Command
MACV	Military Assistance Command, Vietnam
MAD	mutually assured destruction
MAJCOM	Major Command (USAF)
MAP	Military Assistance Program
MATS	Military Air Transport Service
MDAP	Mutual Defense Assistance Program
MICAP	Mission Incapable Parts
MIDAS	Missile Defense Alarm System
MIRV	Multiple Independently Targetable Reentry Vehicle
MIT	Massachusetts Institute of Technology
MMB	Modern Military Branch
MOB	main operating base
MSC	Military Sea Lift Command
MSTS	Military Sea Transport System
NA	National Archives
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NAVFE	Naval Forces Far East
NLF	National Liberation Front
NOAA	National Oceanic and Atmospheric Administration
NRO	National Reconnaissance Office
NSC	National Security Council
NSDD	National Security Decision Directive

NSDM	National Security Decision Memorandum
NTPR	Nuclear Targeting Policy Review
NUWEP	Nuclear Weapons Employment Policy
NVA	North Vietnamese Army
OL	operating location
OPD	Operations Plans Division
OSAF	Office of the Secretary of the Air Force
PACAF	Pacific Air Forces
PD	Presidential Directive
POL	petroleum, oil, and lubricants
PRC	People's Republic of China
PX	Post Exchange
R&D	research and development
RAF	Royal Air Force
RAM	Rapid Area Maintenance
RASS	Rapid Area Supply Support
RATS	Rapid Area Transportation Support
RED HORSE	Rapid Engineer Deployable, Heavy Operations Squadrons, Engineer
REMCO	Rear Echelon Maintenance Combined Operation
RG	Record Group
RIBS	Readiness in Base Services
SAB	Scientific Advisory Board (USAF)
SAC	Strategic Air Command
SAM	surface-to-air missile
SBIRS	Space-Based Infrared System
SHAEF	Supreme Headquarters Allied Expeditionary Force
SIOP	Single Integrated Operational Plan
SRHIT	small radar homing intercept technology
SRS	Strategic Reconnaissance Squadron
SRW	Strategic Reconnaissance Wing
STAMP	standard air munitions package
STRAPP	standard tank, rack, adapter, and pylon package
STRATCOM	U.S. Strategic Command
SUPRON	Support Squadron
TAC	Tactical Air Command
TACAN	Tactical Air Navigation System
TF	Task Force
TOT	time on target
TVC	thrust vector control
UCP	Unified Command Plan
UN	United Nations
UNIVAC	universal automatic computer

UPSTAGE	Upper Stage Acceleration and Guidance Experiment
USAF	United States Air Force
USAFE	United States Air Forces, Europe
USASTAF	U.S. Army Strategic Air Forces
USSTAF	U.S. Strategic Air Forces
VC	Vietcong
WDD	Western Development Division
WRM	war reserve materiel
WRSK	war readiness spares kits
WS	Weapon System
WSEG	Weapons Systems Evaluation Group

Contributors

Donald R. Baucom

Donald Baucom is the historian of the Ballistic Missile Defense Organization, popularly known as "Star Wars." He is a graduate of the Air Force Academy and served as a commissioned officer for twenty-eight years. He has taught history and strategy at the Academy and the Air War College and has directed the Air Power Research Institute at Maxwell AFB, Alabama. Dr. Baucom was editor of the *Air University Review,* currently the *Airpower Journal.* He is the author of *The Origins of SDI, 1944–1983,* which won the Organization of American Historians' Leopold Prize in History.

George W. Bradley III

Skip Bradley attended Ohio State University for graduate work in military history before joining the Air Force History and Museums Program. Currently he is the command historian for Air Force Space Command in Colorado Springs. Besides publishing numerous articles and contributing to several published anthologies, Mr. Bradley is the author of *From Missile Base to Gold Watch: An Illustrated History of the Aerospace Guidance and Metrology Center.*

Lt. Gen. Devol Brett

Lt. Gen. Devol Brett retired in 1980 after his last assignment as Commander of Allied Air Forces Southern Europe, with headquarters at Naples, Italy, and Commander of the U.S. Air Forces in Europe's Sixteenth Air Force based at Torrejon Air Base, Spain.

After graduating from West Point in 1945, General Brett was commissioned a pilot in the Army Air Corps. He began as a flight training instructor and earned his wings as a fighter pilot. The general logged 100 combat missions in P–51s in the Korean War. Subsequently, in Vietnam, he flew more than 100 combat missions in F–4C fighters, including being shot down and rescued from North Vietnamese waters.

Gen. John T. Chain, Jr.

Gen. John T. Chain, Jr., served as Commander-in-Chief of the Strategic Air Command and Director of the Joint Strategic Target Planning Staff before retiring from the U.S. Air Force.

After completing pilot training, General Chain began flying F–100s. He flew combat missions from Tan Son Nhut Air Base, Republic of Vietnam, as a member of the Air Force Advisory Group, and returned later in the war to fly combat missions from Thailand. The general was a master parachutist and logged 5,000 flying hours including 400 during combat. In 1985 General Chain became Chief of Staff, Supreme Headquarters Allied Powers Europe. The following year he assumed command of SAC.

General Chain earned a bachelor of arts degree in history from Denison University and a master's degree in international affairs from George Washington University.

Lt. Col. Mark J. Conversino

Lieutenant Colonel Mark Conversino has enjoyed a distinguished career on active duty with the Air Force, serving currently as commander of the 93d Maintenance Squadron at Warner Robins AFB, Georgia. While an assistant professor of history at the USAF Academy, Colonel Conversino completed his Ph.D. in U.S. political history at Indiana University. During his tenure as Professor of Airpower Theory and Employment, School of Advanced Airpower Studies, Colonel Conversino published one book and several articles on air power and defense-related issues.

Richard G. Davis

Richard Davis is a historian with the Air Force History Support Office. Best known for his biography, *Carl A. Spaatz and the Air War in Europe,* he has also completed a pioneering study of World War II strategic bombing and has published a number of articles and monographs on the subject. Dr. Davis wrote a classified monograph on the Gulf War, and is currently documenting the reorganization of Air Force units into air expeditionary forces.

Gen. Ronald R. Fogleman

Gen. Ronald R. Fogleman retired in September 1997, after serving as Chief of Staff, U.S. Air Force and member of the Joint Chiefs of Staff. General Fogleman began his career as a flight training instructor. He went on to qualify as a parachutist and fly combat duty as a fighter pilot and high-speed forward air controller in Vietnam and Thailand. He has amassed more than 6,500 flying hours in fighter, transport, tanker, and rotary-wing aircraft, including 315 combat missions.

General Fogleman was a 1963 graduate of the U.S. Air Force Academy and attained a master's degree in military history and political science from Duke University. He subsequently taught history at the Academy.

Richard P. Hallion

Richard P. Hallion is the Air Force Historian, directing the worldwide Air Force History and Museums Program. Before assuming his current position in December 1991, Dr. Hallion was a member of the Secretary's Staff Group. Previously he was the executive historian in the directorate of advanced programs in Air Force Systems Command and the director of the special staff office in the Aeronautical Systems Division. He has held positions as the Harold K. Johnson Visiting Professor at the Army War College and as the Charles A. Lindbergh Visiting Professor at the Smithsonian Institution's National Air and Space Museum.

Dr. Hallion received his Ph.D. in aviation history from the University of Maryland in 1975 and is currently the author of more than 15 books in the field.

Daniel L. Haulman

Daniel Haulman is a declassification and technical information specialist with the Air Force Historical Research Agency at Maxwell AFB, Alabama. Dr. Haulman is the author of *The United States Air Force and Humanitarian Airlift Operations, 1947–1994,* and *Air Force Aerial Victory Credits: WWI, WWII, Korea, and Vietnam.* He has also written official USAF history pamphlets and published several articles.

William P. Head

William Head is chief historian at Warner Robins Air Logistics Center, Georgia. Besides writing numerous articles and reviews and co-editing several volumes, he has written several Air Force Special Studies. Dr. Head is the author of *Yenan!: Colonel Wilbur Peterkin and the American Military Mission to the Chinese Communists, 1944–1945* and *Every Inch a Soldier: Augustine Warner Robins and the Building of U.S. Airpower* and a coauthor of *Time Capsule: A Chronological History of the Warner Robins ALC Robins AFB; Georgia, 1935–1995* and *Crown Jewel of Georgia: A History of the Museum of Aviation at Robins AFB.*

Lt. Gen. Thomas G. McInerney

Prior to his retirement in July 1994, General McInerney served as Air Force Vice Chief of Staff.

After graduation from the U.S. Military Academy in 1959, General

McInerney was commissioned a second lieutenant in the U.S. Army before transferring to the Air Force and training as a fighter pilot. He flew escort missions in the Berlin Corridor and reconnaissance over Cuba in the Berlin and Cuban crises of 1962. He completed four tours of duty in Southeast Asia. Subsequently the General served with NATO's defense program, PACAF, USAFE, and Alaskan Air Command.

David R. Mets

Dr. Mets is professor, School of Advanced Airpower Studies, at the Air Command and Staff College, Air University, Maxwell AFB, Alabama. Before joining the faculty there, he served in the Air Force as a navigator and pilot; was a professor at both the USAF Academy and West Point; and was editor of the *Air University Review.* Dave Mets is author of several books, notably *Master of Airpower: General Carl A. Spaatz.* His most recent monograph is *The Air Campaign: John Warden and the Classical Airpower Theorists.*

Roger G. Miller

Roger Miller is a historian with the Air Force History Support Office. His familiarity with the Air Force also comes from his service as an Air Force officer and a field historian with the history program. He has published articles on aviation history in journals and magazines; edited the proceedings of a symposium, titled *Seeing Off the Bear: Anglo-american Air Power Cooperation During the Cold War;* and authored *To Save a City: The Berlin Airlift, 1948–1949.* Dr. Miller is currently at work on a history of Air Force logistics.

Vance O. Mitchell

A retired Air Force officer, Vance Mitchell spent his career mainly in reconnaissance and strategic airlift. Dr. Mitchell also earned his Ph.D. in history; his final assignment was with the Air Force history office. He is the author of *Air Force Officers: Personnel Policy Development, 1944–1974,* and of several published articles, and he is presently completing a classified two-volume history of Air Force intelligence from 1946 to 1991.

Walton S. Moody

Dr. Moody received his Ph.D. in history from Duke University and served on active duty in Vietnam. He was employed in the Air Force history program from 1970 through 1998 with assignments at SAC, in Europe, and with the history office in Washington, D.C. He is the author of *Building a Strategic Air Force* and is a contributor to the two-volume history of the Air Force, *Winged Shield, Winged Sword.*

Gen. Bryce Poe II

Gen. Bryce Poe II began his career with the U.S. Air Force as a graduate of West Point, whereupon he entered pilot training. Eventually the general pursued his academic interests by attaining master's degrees in both history and international affairs; in retirement, he headed the Air Force Historical Foundation for nine years. General Poe died November 20, 2000.

As a young pilot, General Poe joined one of the first jet-equipped units in the U.S. Air Force. He flew 90 combat reconnaissance missions in the Korean War before receiving assignment to the Allied Forces Northern Europe. Thereafter, he contributed to the development and deployment of missiles with the Air Force Western Development Division and SAC headquarters. He flew 213 combat missions in Vietnam, most in RF–4Cs. He completed his career as Commander of the Air Force Logistics Command.

Gen. Bernard A. Schriever

After graduation from Texas A&M, Gen. Bernard Schriever was commissioned in the Field Artillery. He immediately entered flight training at the newly constructed "West Point of the Air," Randolph Field, and joined the Army Air Corps Reserve in 1933. The general became a bomber pilot, flying training missions at March Field, California, and early in the war he joined the 19th Bombardment Group in the Southwest Pacific.

General Schriever's postwar career was dedicated to research and development of the ballistic missile program, the nation's highest priority weapons system during the Cold War. His innovative leadership in the field culminated in his final assignment as commander of the newly established Air Force Systems Command, from which he retired in 1966.

Gen. Jacob E. Smart

Gen. Jacob Smart graduated from West Point in 1931 to take up flight training with the Army Air Corps. At the outbreak of World War II, he became Chief of Flying Training. He saw combat duty with the 9th Bomber Command and the Fifteenth Air Force in the Mediterranean theater when, on his 29th mission, he was hit by antiaircraft fire, wounded, and made a prisoner of war for the next 11 months.

During the Korean War General Smart was again wounded while flying combat missions. Subsequently he commanded the Twelfth Air Force, was Commander-in-Chief of Pacific Air Forces, and retired as Deputy Commander of U.S. European Command. In his post–Air Force career, the General joined NASA to aid in directing the newly established civilian space agency.

Rick W. Sturdevant

Dr. Sturdevant is a staff historian with the United States Air Force Space Command in Colorado Springs, Colorado. He has served on the history committee of the American Astronautical Society and is a frequent contributor on the subject of space to *Air Power History* and NASA's *Space Times*. Recent articles were published in the *Journal of the British Interplanetary Society* and the *Journal of the West*.

William W. Suit

William Suit is a historian at Headquarters, Air Force Materiel Command, Wright-Patterson AFB, Ohio. Among his writings in the fields of air power logistics and technology are "The Logistics of Air Power Projection," "Anglo-American Amity: Transferring B–29s to the Royal Air Force," and "Utilitarian War Horse: Modifying the B–52 for Conventional War," articles that appeared in *Air Power History*. He has also contributed "Sustaining the War Machine: U.S. Air Force Logistics Support during the Gulf War," a chapter in *The Eagle in the Desert: Looking Back on U.S. Involvement in the Persian Gulf War*. Dr. Suit earned his Ph.D. at Kent State University.

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Dr. Thompson is a historian with the Air Force History Support Office, with expertise in Air Force operations in conflicts from Korea to the current engagement in Kosovo. He was a major contributor to the *Gulf War Air Power Survey*, a definitive accounting of the role air power played in the Persian Gulf War of 1990–1991. His forthcoming volume is titled *To Hanoi and Back: The United States Air Force and North Vietnam, 1966–1973.*

George M. Watson, Jr.

After serving with the 101st Airborne Division in Vietnam, George Watson completed his Ph.D. and joined the Air Force history program. He is currently chief of the Special Projects Team at the Air Force Historical Support Office. Dr. Watson has contributed to a number of edited volumes and journals, conducted many oral history interviews, and is the author of *The Office of the Secretary of the Air Force, 1947–1965.*

Maj. Robert P. White

In 1997 Major Robert White served as the senior military historian, Air Force History Support Office. For the previous three years he was Chief of the Air Staff history office in the Pentagon. Before joining the history office, Major White spent twelve years in signals intelligence. Maj. Gen. Mason M. Patrick was the subject of his Ph.D. dissertation.

Herman S. Wolk

As senior historian and acting chief of the Air Force History Support Office, Herman Wolk has long served as an Air Force historian. He began his career as a historian at the headquarters of the Strategic Air Command, from 1959–1966. Mr. Wolk is the author of *Planning and Organizing the Postwar Air Force, 1943–1947,* and *Strategic Bombing: The American Experience.* He has contributed to several edited volumes; among his most recent is an essay titled "General Arnold, the Atomic Bomb and the Surrender of Japan."

William T. Y'Blood

Before becoming a historian, Tom Y'Blood was a B–47 Air Force pilot and a Boeing 727 commercial pilot. Though a historian in the Air Force History Support Office, he has published widely on naval history for the Naval Institute Press, most notably *The Little Giants,* his account of escort carriers. Mr. Y'Blood has written two of the classified monographs on Desert Shield operations in the Gulf War and edited *The Three Wars of Lt. Gen. George E. Stratemeyer: His Korean War Diary.* He is currently preparing a series of monographs on the Korean War.

The Honorable Eugene M. Zuckert

In January 1961 Eugene Zuckert was sworn in as Secretary of the Air Force. His expertise arose from the earliest days of the independent Air Force when he became Special Assistant and later Assistant Secretary of the Air Force under Stuart Symington, the first Secretary. During Mr. Zuckert's tenure he oversaw new programs such as the B–70 and Skybolt. He initiated Project Forecast, a study that explored promising technologies for future aerospace military operations.

After leaving office in September 1965, Mr. Zuckert returned to his law practice in Washington, D.C. He also served on governing boards of companies and organizations in the private sector, including defense contractors such as Martin Marietta, for whom he contributed expertise regarding the needs of the nation in military aerospace. Mr. Zuckert died on June 5, 2000.

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