

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Dissertations, Theses, & Student Research,
Department of History

History, Department of

12-2014

From Burma to Berlin: The Development of U.S. Air Transport 1938-1949

Benjamin J. Johnson

University of Nebraska-Lincoln

Follow this and additional works at: <http://digitalcommons.unl.edu/historydiss>



Part of the [History of Science, Technology, and Medicine Commons](#), and the [Military History Commons](#)

Johnson, Benjamin J., "From Burma to Berlin: The Development of U.S. Air Transport 1938-1949" (2014). *Dissertations, Theses, & Student Research, Department of History*. 79.

<http://digitalcommons.unl.edu/historydiss/79>

This Article is brought to you for free and open access by the History, Department of at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Dissertations, Theses, & Student Research, Department of History by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

FROM BURMA TO BERLIN:
THE DEVELOPMENT OF U.S. AIR TRANSPORT 1938-1949

by

Benjamin J. Johnson

A THESIS

Presented to the Faculty of
The Graduate College at the University of Nebraska
In Partial Fulfillment of Requirements
For the Degree of Master of Arts

Major: History

Under the Supervision of Professor Lloyd E. Ambrosius

Lincoln, Nebraska

December, 2014

FROM BURMA TO BERLIN:
THE DEVELOPMENT OF U.S. AIR TRANSPORT 1938-1949

Benjamin J. Johnson, M.A.

University of Nebraska, 2014

Advisor: Lloyd E. Ambrosius

This work examines the development of U.S. military airlift from unproven curiosity to a transformative system of technologies, tactics and logistical support which enabled the United States to engage diplomatic and military scenarios around the world. Through an examination of contemporary reports, technological advances and statistical analyses of airlift practices it is shown that the period of 1938-1949 witnessed a great leap in tactical and technological innovation within the U.S. air transport community. The capabilities utilized during air supply missions to China during World War II and the Berlin Airlift foreshadowed a transformative capability providing military and diplomatic solutions when none previously existed.

DEDICATION

This thesis is dedicated to my grandfather, Brigadier General Lloyd L. Johnson (USAF), who taught me always to look up at the sound of an aircraft overhead.

I am forever grateful.

TABLE OF CONTENTS

List of Illustrations.....	v
Introduction.....	1
1. A New Dawn: Airlift Origins in the Interwar Period	5
2. Over the Hump: Airlift Matures	26
3. Toward a Modern Air Force: Berlin Airlift	61
Conclusion.....	114
Bibliography.....	119

ILLUSTRATIONS

Figures

1.1	Ferrying and transport routes prior to December 1941	23
2.1	U.S. military transportation system in China-Burma-India 1942-1943	42
2.2	U.S. Army organization in CBI, December 1942	50
3.1	Berlin Airlift bases and flight corridors	71
3.2	1 st Airlift Task Force organizational chart	98

INTRODUCTION

It is clear to any casual observer that aviation and air warfare are hallmarks of the Western warfighting style in the 21st century. Whether one examines the tactics and strategy of the 8th Air Force raids during World War II, the air mobility utilized during both the Korean and Vietnam wars, or the forward deployment of nuclear bombers and air superiority fighters throughout the Cold War and beyond, it is nearly impossible to imagine a current or future conflict where various aircraft types are not vitally important to Western militaries, particularly the United States. Beyond the fighter and bomber combat aircraft first brought to battle, and the air refueling aircraft enabling them to operate the world over, a third aircraft type would come to symbolize the tactics behind a uniquely American strategic capability: the airlifter.

Though fighters and bomber aircraft have long captured the headlines and popular imaginations, it is a more mundane relative that truly enables the remainder of a global military and diplomatic establishment to function. As we now know it, American airlift took shape during the decade from 1938 to 1949 as the U.S. military grew to world prominence. This work will examine this critical period in military evolution, as well as the technological, tactical and strategic leaps made to enable the concept of air mobility – airlift – to function as it does. The airlifter helped shape a global American foreign policy in much the same way as the great battleships, freighters, and even the railroads of the 18th and 19th centuries. Even now, alongside its sealift and ground transportation

counterparts, U.S. airlift capacity remains a uniquely powerful and capable combination of technology and logistical expertise.

The airlifter provides the tactical means to support diplomatic, humanitarian and military strategies around the world. As such, much of modern American military strategy is contingent upon air mobility. Modern U.S. airlift capabilities are largely defined by large multipurpose aircraft whose designs feature four engines, high payload capacity, long range and the ability to operate from either prepared or unprepared airfields. These aircraft are part of a global logistics and mobility network wherein communications, navigation, weather forecasting and analysis, and a logistical supply chain merge into one comprehensive structure.

Throughout the Cold War and beyond, the United States and its Allies put their diplomatic goals to work through military and humanitarian assistance. This assistance frequently begins with the arrival of an aircraft carrier or the landing of a four-engine aircraft such as the *C-5 Galaxy* offloading relief supplies, troops, weapons or support personnel. What may not immediately strike the casual observer is the degree to which this evolution was not necessarily a foregone conclusion, even as late as World War II. Despite the many aviation advances prior to 1938, even the great aerial battles of World War I did not signal the overall transformation of Western militaries. Technological limitations proved central to the limited role aviation would play during the interwar period, despite the accepted understanding of the “importance of air power when used in

mass.”¹ The airplane remained an unproven technology through most of the interwar period, despite major advancements in tactics and technology.

A decade later, what began with several squadrons of war-weary twin engine C-46 *Commando* and C-47 *Skytrain* aircraft would expand into hundreds of massive four-engine behemoths such as the C-54, C-97 and C-74. The early days of the Lend-Lease ferrying operations led to the creation of a dedicated air transport framework later utilized to support U.S. and Chinese forces in the Pacific. As the men and machines involved in the various airlift operations continued to press for improved tactics and technologies, the hard-fought lessons of World War II would assist the newly created United States Air Force in its quest to support the besieged inhabitants of a divided Berlin. At the conclusion of the Berlin Airlift, both the U.S. Air Force and political officials in Washington thoroughly understood the strength of their newfound capability.

From its origins in the Ferrying Command, airlift tactics matured through the airlift operations into China during World War II, culminating with the Berlin Airlift from April 1948 to September 1949. Each step was distinct in both scope and capacity, but the Berlin Airlift was unique in the way it combined the logistical, organizational and technological developments of the previous three decades to usher in the era of a truly modern air force. Without precedent, the men and machines undertaking these missions developed a logistical and operational structure bit-by-bit, creating a tactical template forever etched into the American military psyche. Never again would geographical limitations alone restrict the ability of U.S. policymakers to direct influence where and

¹ John H. Morrow, Jr., “The War in the Air,” in *The Oxford Illustrated History of the First World War*, ed. Hew Strachan (Oxford: Oxford University Press, 1998), 276.

when they desired. Indeed, many of the lessons learned over the Himalayas and in the unforgiving weather of Germany would stretch far into the future, echoing in the hills of Vietnam, the mountain passes of Afghanistan, and the harsh deserts of the Middle East.

Chapter 1

A New Dawn: Airlift Origins in the Interwar Period

We of the Army Air Forces found ourselves faced with the necessity of creating an air transport organization...to extend to the four corners of the globe, delivering military aircraft, equipment, personnel, and cargo to near and far places...over air routes of which no man had heretofore dreamed.²

-General H.H. Arnold

From the time when Wilbur and Orville Wright first took flight from the dunes at Kitty Hawk, aviation design and technology has made considerable leaps forward in capability. Despite myriad advances, the essential concept of a singular air cargo branch of the U.S. military was not an idea born of the frustrations of World War II. Even with the radical progress made during the war, the roots of the U.S. air transport elements stretched back through the interwar period to World War I. As soldiers toiled away in the trenches of the Western Front, the first military aviators took their battles to the sky. Popularized by such names as Eddie Rickenbacker and Manfred von Richtofen, the great air battles of World War I proved the military significance of heavier-than-air craft. As technologies were pushed to the limit, a new generation of military leaders came to understand the promising capabilities of aviation. A few years later, several key figures (including Carl Spaatz, Ira Eaker and Henry H. “Hap” Arnold) took part in major Air Corps operations throughout 1924-1925 exploring the use and effectiveness of air

² General H.H. “Hap” Arnold as quoted in the Foreword of Oliver La Farge’s seminal work on air transport during World War II *The Eagle in the Egg*.

transport. The “essential” nature of the airplane to future military maneuvers was firmly impressed on the young officers.³

Yet the armistice of 1918 proved the end of more than the battles of war-torn Europe. Over the ensuing months and years, as a wave of demobilization and demilitarization swept across the U.S. Department of War, few imagined the ways aviation and other technological breakthroughs would alter the fundamental natures of both civil and military establishments. The end of the war saw the Air Service drastically reduce the overall numbers of postwar planes, returning approximately 2,000 airplanes and 1,000 engines from Europe. Of the nearly 6 million men in uniform by November 11, 1918, nearly 190,000 were members of the Air Service.⁴

One of these men, frustrated by a lack of wartime flying exploits and unsure of his future place in America’s air arm, was Henry H. “Hap” Arnold. The future commander of Allied Air Forces during World War II, Arnold’s early aviation career seemed destined for mediocrity. Rather than engaging in high flying exploits, Arnold instead found himself in Washington, DC “discharging officers and mustering out airmen.”⁵ In spite of this, the war years taught Arnold the value of technological advances such as “oxygen masks with communications devices all in one, air-to-ground radio communication sets, automatic cameras, armored pilot seats...and improved aeronautical medical research

³ Charles E. Miller, *Airlift Doctrine* (Maxwell AFB, Alabama: Air University Press, 1988), 9.

⁴ Mauer Maurer, *Aviation in the U.S. Army 1919-1939* (Washington DC: Office of Air Force History, 1987), 3.

⁵ Bill Yenne, *Hap Arnold: The General Who Invented the U.S. Air Force* (New York: Regnery, 2013), 37-38.

equipment.”⁶ Within the next few years, Arnold and other aviators such as Ira Eaker and Carl Spaatz, both destined for future greatness in World War II and beyond, found themselves in a battle over scarce resources and fleeting public attention. Throughout the immediate postwar period, aviation frequently took on the quality of a technological sideshow, wowing audiences with death-defying feats, exhibitions of cross-country aerial navigation, and (rather comically) racing carrier pigeons.⁷

After 1920 the U.S. defense establishment began devoting more money and resources to the fledgling Air Service. As General Billy Mitchell fought for the supremacy of aerial forces above all others, and men like Arnold and Claire Chennault pushed the development of bombardment and pursuit aircraft, it became clear to a select few that a new breed of aircraft would be necessary. Specifically designed for the purpose of moving large, unwieldy cargoes, soldiers, wounded troops or civilians, foodstuffs, as well as any or all items necessary for a military unit to function at peak efficiency, transport aircraft were an answer to a question few leaders were asking. Despite the high-flying exploits over war-torn Europe, the vast majority of resources invested into aviation came from a small cadre of businessmen who looked to aviation and air travel as the next great step in cross-country and international travel. The Boeing Company, for example, viewed its early successes with passenger air travel as foreshadowing of future profits and began development of a series of trimotor aircraft

⁶ Dik Daso, *Architects of American Air Supremacy: General Hap Arnold and Dr. Theodore von Karman* (Maxwell Air Force Base, Alabama: Air University Press, 1997), 33.

⁷ Yenne, 39.

including the Model 80, introduced during the first half of 1928.⁸ Where some saw the speed, convenience, and profits of commercial travel, others viewed the new designs as precursors of military modernization.

Though the Air Service served dutifully during World War I, its place within the postwar military hierarchy was far from certain. When Brigadier General Mason Patrick took command of the Air Service in 1921 (a post he had held once before during the war), he found it in a state of disorganized confusion.⁹ The disarray stemmed from many different causes, yet ultimately came down to a matter of identity: no one within the Army, Air Service or War Department had yet put in place a sound institutional footing or provided the doctrinal framework upon which an institution such as the Air Service could grow. Over the next several years the debates continued as those within the aviation community pressed for continued support. In March 1924 the U.S. government began the process of reviewing national air policy under the direction of Representative Florian Lampert. The Lampert Committee's was charged with making a

sweeping investigation of the United States Army Air Service, the Naval Bureau of Aeronautics, the United States contract air mail service, and 'any corporations, firms or individuals or agencies having any transactions with or being in any manner associated with or controlled or regulated by the said air services.'¹⁰

This broad approach allowed the committee to interview 150 key figures over an eleven month period, covering such diverse topics as public-private partnerships, maintaining a

⁸ Peter M. Bowers, *Boeing Aircraft Since 1916* 3rd ed. (London: Putnam Aeronautical Books, 1989), 136-137.

⁹ Mason M. Patrick *The United States in the Air* (Garden City, NY: Doubleday, Doran and Co., 1928), 89.

¹⁰ Robert Frank Futrell, *Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force 1907-1964* (Maxwell AFB, Alabama: Air University, 1974), 44.

ready “nucleus of aircraft manufacturers,” and the possible creation of an independent Air Corps.¹¹

In addition to the Lampert committee, several members of the Army and Navy pressed President Calvin Coolidge to create “a board to study the best means of developing and applying aircraft in national defense.”¹² The board, later referred to as the Morrow Board, was led by Dwight W. Morrow and began hearings in September 1925. Many of the same individuals and arguments were present, and a clear rift within the War Department (primarily between the Army and Navy), was made clear once again. Though most conceded the utility of aviation, few saw the need for increased expenditures at requested levels or the need for an independent Air Service. The board and Congress stopped short of recommending a wholly independent air arm of U.S. military, it endorsed an expansion of resources. The subsequent Air Corps Act of 1926 changed the name of the Air Service, added an assistant secretary of to oversee the Air Corps, and instituted a five year program of expansion and procurement.¹³

This did not, however, mark the end of the Air Corps’ period of flux during the interwar period. The Air Corps Act authorized an increase to 1,800 “serviceable” aircraft by the end of the 5 year expansion plan, though others (including Patrick himself) continued to push for a larger number.¹⁴ The majority of the aircraft in service were dedicated to offensive roles such as pursuit (later fighter), bombardment, reconnaissance,

¹¹ Ibid., 44-45.

¹² Ibid., 46-48.

¹³ Ibid., 50-51.

¹⁴ Maurer, 210-211.

and even balloon detachments. Air cargo, on the other hand, was largely relegated to a limited support status and utilized available planes deemed obsolete for other purposes.

By the late 1920s and early 1930s, civilian air carriers had made great strides in safety and efficiency. Air travel, though still a luxury, was far more commonplace and civilian carriers routinely served as air cargo contractors for the U.S. military. As many soon saw, though, a defense posture supported by civilian airlines was not the most effective means of establishing a solid logistical base. Contrary to the recommendations of the panel led by former Secretary of War Newton Baker, there were some within the aviation establishment who understood the subtle yet powerful distinctions between civilian and military aviation.¹⁵ Despite technological and logistical similarities, the needs of military and civilian operators were fundamentally different in terms of practical use, comfort of cargo and passengers, design rigors, and various other redundant features. Major General Benjamin Foulois, Chief of the Air Corps, in a letter to his superiors rejected much of the contemporary thinking regarding the use of civilian designs for military purposes. Although the letter outlined the necessity of government-sponsored designs intended for use as *military* airlifters, Foulois stated that the debate was similar to that between a passenger car and a truck. Whereas the passenger automobile could carry a certain amount of freight, “true economy demands the use of a cargo truck for such

¹⁵ The “Baker Board,” and many of its contemporaries, were focused on the development of aviation throughout the U.S. civilian and military worlds, and would eventually lead to the development of an independent air-arm of the U.S. Army.

purposes.”¹⁶ Foulois urged the continued research and experimentation with air cargo transports specifically designed or modified for military purposes.

During the 1920s the Air Service undertook several small-scale transport experiments, such as using a converted De Havilland DH-4 for transporting passengers and equipment. Originally designed as a light bomber and artillery spotter, the DH-4 was eventually transformed into more than sixty different variants. As no requirements existed for the movement of goods and personnel by air, these early measures were primarily experimental. By the midpoint of the decade, preliminary plans were in place to include air cargo elements as “the Air Corps figured an air force associated with a field army of a million men needed a wing of 210 cargo planes, each one capable of carrying three thousand pounds.”¹⁷ Each aviation section was tied to its corresponding ‘air depot,’ with each depot commander commanding a squadron of transport planes for use in support roles; serving as the precursor to the Air Service Command squadrons of the late 1930s and 1940s. Once the surplus DH-4s were decommissioned in 1931, the Air Corps’ transport squadrons gained access to C-27s, and the larger Douglas DC-2.¹⁸

Also during the ensuing decade a gradual escalation in both the size and power of aviation engines, as well as the aerodynamic design and the use of metal rather than wood and fabric, enabled aircraft manufacturers to develop new and higher-performing aircraft for both civilian and military use. One of the primary factors enabling greater funding

¹⁶ Maj Gen Benjamin Foulois, chief of the Air Corps, to the adjutant general, War Department, letter, subject: “1st Indorsement [sic] Recommendation of Special Committee, Air Corps” November 30, 1934, reproduced and cited in Miller, *Airlift Doctrine*, 7-8.

¹⁷ Maurer, 367.

¹⁸ *Ibid.*, 368.

and resources to military air transport, and considered by General Foulois as one of three “most significant” dates in U.S. airpower history, was a contractual arrangement enabling the U.S. Army Air Corps to fly mail routes across the United States.¹⁹ However strange it may seem today to consider the use of military aircraft for such commercial purposes, at the time it was seen as a major political and technological achievement for the fledgling Air Corps. With the air mail mission came public interest, experience, and above all, increased funding. Even the Postmaster General, hardly an expert in aviation matters, told General Foulois the “Air Corps would undoubtedly benefit from carrying the mail. The nation and Congress would support the Corps better and see that it secured the best equipment to be had and sufficient money for pilots to get as much flying time as needed.”²⁰ But beyond increased funding, exposure, and flight experience, the utilization of Air Corps resources provided invaluable lessons in the art and science of cross-country aerial navigation, night flying, and flight procedures during inclement weather.

Despite nearly three decades of manned flight, the development of air navigation had progressed very little from the very first days on the dunes of Kitty Hawk. Prior to the development of more sophisticated instrumentation and navigational devices, aerial navigation differed only slightly from its more terrestrial counterparts. Prior to World War II, aviation was primarily a fair-weather, daytime affair. Aircraft themselves were limited in altitude and range, and many pilots traversed the U.S. by navigating via road maps, railroad lines, rivers, and other easily distinguishable landmarks. The majority of

¹⁹ Benjamin D. Foulois and Carroll V. Glines, *From the Wright Brothers to the Astronauts: The Memoirs of Major General Benjamin Foulois* (New York: McGraw-Hill, 1968), p. 235.

²⁰ Maurer, 317.

in-cockpit instrumentation on most early aircraft consisted of a series of rudimentary gauges monitoring engine performance, but technological advancements meant change was coming. As aircraft inevitably became more sophisticated and were tasked with more difficult assignments, the engineering division of the Air Service continued with plans for additional instrumentation including “driftmeters, compasses, airspeed indicators, altimeters, flight indicators, sextants and other instruments” to assist in the development of aerial navigation.²¹ Without a safe and reliable track record, aviation could not thrive in an age of decreased government funding.

None of these technologies was, however, altogether new in aviation circles. From the earliest days of manned flight, pilots and engineers imagined ways to more practically and accurately navigate in this new dimension of human travel. Early pilots used combinations of adapted ground-navigation equipment such as magnetic compasses and maps, as well as their own learned knowledge of visible landmarks such as rivers, mountains, towns, roads and railroad lines. These methods were of little help, though, when flying in adverse weather conditions, unknown territory, over large bodies of water, or at night. As early as 1924 a group of aviation enthusiasts from within the U.S. Army Air Service began experimenting with radio-navigation systems for aircraft. To use this system, a pilot would

tune in on a radio beacon [and hear] a dot-dash signal (a Morse code ‘A’) if he was to the right of the course, a dash-dot (“N”) if to the left, and a continues sound if on course... [Due to the complexity of interpreting

²¹ Maurer, 153.

these signals], engineers ran the signals to lights on the instrument board – white for on course, green to the right, and red to the left.²²

As more mature versions of these technologies found their way into U.S. inventories throughout the interwar years, truly effective aerial navigation became a reality.

Another major development of the interwar period was the design and development of a legendary aircraft which would provide a rugged, stable and forgiving aerial transport for the pilots and crew. Originally designated the Douglas Sleeper Transport (DST), the Douglas DC-3 would become one of the most successful and important airframes in aviation history and has “since performed for virtually all nations a vast array of duties ranging from news-making feats to unsung routine labours [sic], from luxury transcontinental passenger transport to tramp cargo, and from corporate flying office to night flying gun battery.”²³ From its earliest days the DC-3, and its military variant the C-47, distinguished itself by hauling anything, anywhere, anytime. Rugged and dependable, the DC-3 program began as a response to design specifications by American Airlines. Major General Benjamin Foulois would again reassert his opinion that aircraft designed specifically for passenger travel could not carry cargo as efficiently as required by the military. Despite originating as a purely civilian design, Douglas Aircraft would enter the DC-3 during the bid process for an aircraft that could haul 3,000

²² Maurer, *Aviation in the U.S. Army*, 155-156.

²³ Rene J Francillon *McDonnell Douglas Aircraft since 1920: Volume I* (Annapolis: Naval Institute Press, 1978), 217.

pounds, cruising at 125 mph, with a range of 500 miles, and a landing speed not to exceed 60 mph.²⁴ The DC-3 fit the bill nicely.

The selection of the DC-3 for military use had profound consequences not only for Douglas Aircraft, but for the U.S. military and its allies. The selection of a modified airliner allowed Donald Douglas and his competitors alike to push the design envelope in ways they had not previously considered. It provided for the financial security of a major industrial base at a time of limited funding. By selecting the DC-3, and later by appropriating the airliners and their design firms into military service, the USAAF began a nearly five decade relationship between the DC-3 and militaries around the world.

A low-wing monoplane powered by various versions of the Wright Cyclone 1820 radial engine, the DC-3 family of aircraft was produced in many different variants to suit the needs of wide assortment of customers. In a general sense, the success of the DC-3/C-47 rested on several key factors; among these were durability and simplicity. Though relatively slow, with limited payload capacity, and lacking significant range, the *Skytrain* proved suitable in every conceivable way. During the early 1930s, the primary thrust for aviation advancement came from the airline industry. The airlines wanted new aircraft that could transport more passengers, faster, safer, and with greater comfort than previous models. The DC-3 proved an immediate success for American Airlines, and a host of other companies that were finally able to parlay passenger air travel into a money-making venture.

²⁴ Carroll V. Glines and Wendell F. Mosely *The Legendary DC-3* (New York: Van Nostrand Reinhold Co, 1979), 54.

The DST program originally stemmed from a desire to expand upon the already successful DC-1 and DC-2 aircraft by providing a larger, more streamlined and longer range aircraft capable of transcontinental air service with fewer stops between New York and San Francisco.²⁵ Though the program originally intended to lean heavily on earlier designs for the DC-2, the DST would prove an entirely new airframe that was 2 feet wider, 2 ½ feet longer, with rounded sides, a redesigned nose, larger wing and tail sections, and a strengthened landing gear system to improve ground stability and handling.²⁶ By the end of the decade the DST, with the common nomenclature DC-3, had thoroughly overrun any competition. Prior to the start of America's involvement in World War II, nearly 80 percent of the "scheduled airliners" in the country were DC-3s.²⁷

U.S. military interest in the DC-3 was almost an afterthought. Having successfully utilized the DC-2 in a limited capacity throughout the 1930s, U.S. Army Air Corps personnel found much to like in the more capable aircraft, but "funding limitations" proved to be more bothersome to the military program than lack of interest.²⁸ As the C-47, the militarized versions of Donald Douglas' premier design would revolutionize military aviation for decades to come. It was the perfect combination of strength, speed, economy, and safety. With the onset of war, the DC-3 would fully establish itself as one of the greatest aircraft in history.

To best understand the later development of the Hump air operations, as well as those in Berlin a few years later, one must first examine the establishment of their

²⁵ Arthur Percy, *Douglas Prop liners: DC-1 to DC-7* (Shrewsbury, England: Airline Publishing, 1995), 56.

²⁶ Francillon, 219-220.

²⁷ Percy, 69.

²⁸ Francillon, 269.

operational forebears, the Ferrying Command and to a lesser degree, the Air Service Command. Without the lessons of this earlier period, and the incalculable first-hand benefits bestowed upon the men who would form the backbone of later operations, it is unlikely that these future operations could have succeeded. From the outset, the delivery of aircraft to forward operating locations was a cornerstone of the U.S. Lend-Lease commitment to the Allies via the production and delivery of war supplies. Whether fighters, bombers, or air transports, the delivery of aircraft from plants in the United States to bases around the world was nothing short of a logistical marvel.

Created by order of General H. H. “Hap” Arnold, the Air Corps Ferrying Command came into existence on May 29, 1941 with the expressed purpose to “move aircraft by air from factories to such terminals as may be directed by the Chief of Air Corps...[and] maintain such ferrying service as may be required to meet specific situations.”²⁹ It was during his time with the Ferrying Command that Major William Tunner would gain the knowledge and experience from which the framework of future Hump and Berlin Airlift operations would take root. Under the command of Major Robert Olds, Major Tunner undertook the reorganization and transformation of U.S. airlift resources.³⁰

What began in a single room with only two individuals at the helm would eventually grow into an organization responsible for delivering tens of thousands of

²⁹ The Adjutant General’s Office, War Department, to the commanding generals, all armies, GHQ Air Force Departments and corps areas et al., letter, subject: Constitution of the Air Corps Ferrying Command, 5 June 1941, as quoted by Miller, 27.

³⁰ Robert A. Slayton, *Master of the Air: William Tunner and the Success of Military Airlift* (Tuscaloosa, Alabama: The University of Alabama Press, 2010), 9.

aircraft and crew to forward bases around the world. The development of the Ferrying Division held several powerful legacies. For one, it would provide the logistical framework necessary for an expansion of American airlift resources, the foremost among these being an available pool of experienced transport pilots, as well as an evolution of best practices to be adapted for use around the world. Second, it provided a sufficiently successful model for political and military leaders to open their minds (and their coffers) to a broader air transport system. Lastly, and perhaps most importantly, it would provide the time and place one for a young Air Force officer, William Tunner, to gain the knowledge and experience necessary to become the preeminent authority on air transportation in the U.S. military, and perhaps the world.

From the outset, both Olds and Tunner understood the immense task at hand. The Ferrying Division, like the rest of the army's air arm, was "in a very unsettled state," during the immediate prewar period and required a significant investment in both manpower and equipment to maintain intensive operations.³¹ Rather than "simply" ferrying an aircraft from factory to field, an entire support infrastructure was needed to support the endeavor. It was, put simply, a "fantastic problem."³² Tunner and his small group of associates began the process of organizing their resources. Of prime importance was the establishment of bases, as well as finding a sufficient number of competent pilots and crew. The size and scope of the Air Corps during the interwar period was a shadow

³¹ United States Air Force Historical Division, *Organization of the Army Air Arm 1935-1945* (Maxwell AFB, Alabama, 1956), 19.

³² William H. Tunner *Over the Hump* 2nd ed (New York: Duell, Sloan and Pearce, 1964).

of its future self, with roughly 1,700 aircraft and 15,000 men.³³ Though this number had grown by 1941-1942, it was clear that a substantial number of the available pilots and crew, as well as the infrastructure, left much to be desired.

In Tunner's own words, the duty of the ferry pilot was not to be a hero, risking his life and his airplane for the war's goal, but simply to "do his job."³⁴ To this end, one of the earliest primary efforts was the initial development of a pilot recruiting, training, and classification system. Early in the process, many of the available pilots were recruited from the rear-echelon forces in the National Guard and Reserve force, as well as the civilian airlines. Many of these pilots, though, did not have the depth of experience necessary to operate all aircraft types. As a means of moving forward with the pilot training program, and beginning to ferry as many aircraft as possible, Tunner and his men devised a pilot classification system. Serving the dual purposes of training and delivery of aircraft, the classification system gave lesser-experienced pilots the opportunity to increase their overall flight experience, as well as expanding the ranks of flight instructors. As such, this on-the-job training enabled pilots to take part in the Command's tasks, while

at the same time they bettered their flying. Thus those at the bottom of the ladder would deliver the simplest forms of aircraft, such as artillery spotting planes and primary trainers. As they built up their flying time in these basic types, they would also be going to ground school and instrument-flying school, preparing themselves for the next step up. Gradually, step by step, they worked their way

³³ Bill Yenne *Hap Arnold: The General Who Invented the U.S. Air Force* (Washington, DC: Regnery Publishing, 2013), 51.

³⁴ Tunner, 27.

from short hops in trainers on clear days to delivering the largest aircraft all over the world.³⁵

But this combination of pilot training amidst ferrying operations was only one in a string of innovative approaches undertaken by the Ferrying Command's staff.

The Air Service Command, on the other hand, was created prior to the creation of the Ferry Command when its predecessor (the 50th Transport Wing of the Air Corps Maintenance Command) was organized. Originally established for operations within the continental United States, the Air Service Command was tasked with "transporting technical Air corps supplies between various air depots and subdepots scattered about the country; but it also furnished transport aircraft and pilots for use in training parachute troops and airborne infantry."³⁶ Immediately following the outbreak of war, the Air Service Command and Ferrying Command experienced very little overlap and confusion, but as wartime demands increased, and the Air Service Command extended beyond the boundaries of North America, significant overlaps developed and by "1942 the need arose for a clear division of responsibility."³⁷

As the movement of aircraft, men, and materiel escalated around the world, a sometimes "frantic" effort unfolded toward the development of new routes and airfields.³⁸ Though many simultaneous improvements were undertaken worldwide, the developments in the North Atlantic offer valuable insights into most concurrent aviation developments. Among the most important with regard to the successes in both the CBI

³⁵ Ibid., 27.

³⁶ Craven, Wesley Frank and James Lea Cate. *The Army Air Forces in World War II*, 7 Vols. (Chicago: University of Chicago Press, 1948-1959), 360.

³⁷ Ibid., 361.

³⁸ Ibid., 342.

and Berlin were the expansion of new air routes and airfields, and the associated weather reporting necessary for safe travels across the North Atlantic. Though not a direct corollary to later efforts, the process allowed for an expansion of knowledge and experience throughout aviation circles. However straightforward this problem may appear from a modern perspective, the development of new transatlantic lanes of operation was a major technological feat. And as Oliver La Farge notes in his contemporary analysis of the issue, an air route “is as complex, as definite, and as tangible as a railway.”³⁹ The significance of this distinction cannot be overstated. The establishment of safe and efficient air corridors was vital to any prolonged civil or military airlift service. Likewise, without the completion of suitable support infrastructure, long distance air transport would not have been possible until the advent of aerial refueling several decades later.

Prior to 1940, transatlantic air travel was extremely limited. Between the two, Pan American Airways and Trans World Airways (TWA) retained only 13 four-engine flying machines for this purpose – strictly for use during summer months.⁴⁰ In fact, the entirety of the War Department controlled only *twenty* long-range transports, while the majority of available civil transports were shorter range twin engine models.⁴¹ As the United States moved toward becoming a belligerent nation, the development of air routes for delivery of *all* types of aircraft and supplies to the British Isles (and other forward operating bases) proved vital. Although the continued delivery of larger multiengine

³⁹ Oliver La Farge *The Eagle in the Egg*. (Cambridge, Massachusetts: The Riverside Press, 1949), 142.

⁴⁰ Slayton, 7.

⁴¹ Miller, 31.

transport and bomber aircraft continued as before, an alternate “stepping stone” approach for smaller fighter and liaison aircraft was also needed. If a route were developed farther north, utilizing Newfoundland, Labrador, Greenland and Iceland, a far greater number of aircraft and materiel could be delivered safely and efficiently.⁴² Throughout the winter of 1941-1942, with an increasing pace after the attack on Pearl Harbor, construction work continued on the various runways, hardstands, hangars and support facilities needed along the route.⁴³ The improvement of runways and hardstands was an especially difficult matter given the weather and rudimentary conditions. In one instance, the U.S. and British contingents utilized a packed snow runway at Goose Bay, leased by the Canadian government, but were forced to abandon the structure for newly constructed facilities across the airfield as temperatures rose and the existing structures could not absorb the heavy punishment of landing freighters. Likewise, at similar locations throughout the archipelago of air stations across the North Atlantic, additional modifications began.

At BLUIE WEST 1 there had been completed by June one steel mat runway 5,000 feet long and another was under construction while [BLUIE WEST]-8 had one good 5,000-foot gravel and clay landing strip.⁴⁴ The Reykjavik airport in Iceland had three concrete runways, but two of these were capable of accommodating only the lighter types of airplanes and the third was less than 4,700 feet in length. Neither of the two American bases under construction in Iceland – Meeks and Patterson fields near Keflavik – were usable during 1942.⁴⁵ Throughout the region, few elements challenged the development of new airfields and associated support infrastructure more vigorously than the weather.

⁴² Craven and Cate, 342.

⁴³ In aviation terms, “hardstands” refers to concrete parking/maintenance areas for aircraft.

⁴⁴ The “Bluie” code designation signified the air base’s location in Greenland.

⁴⁵ Craven and Cate, 346.

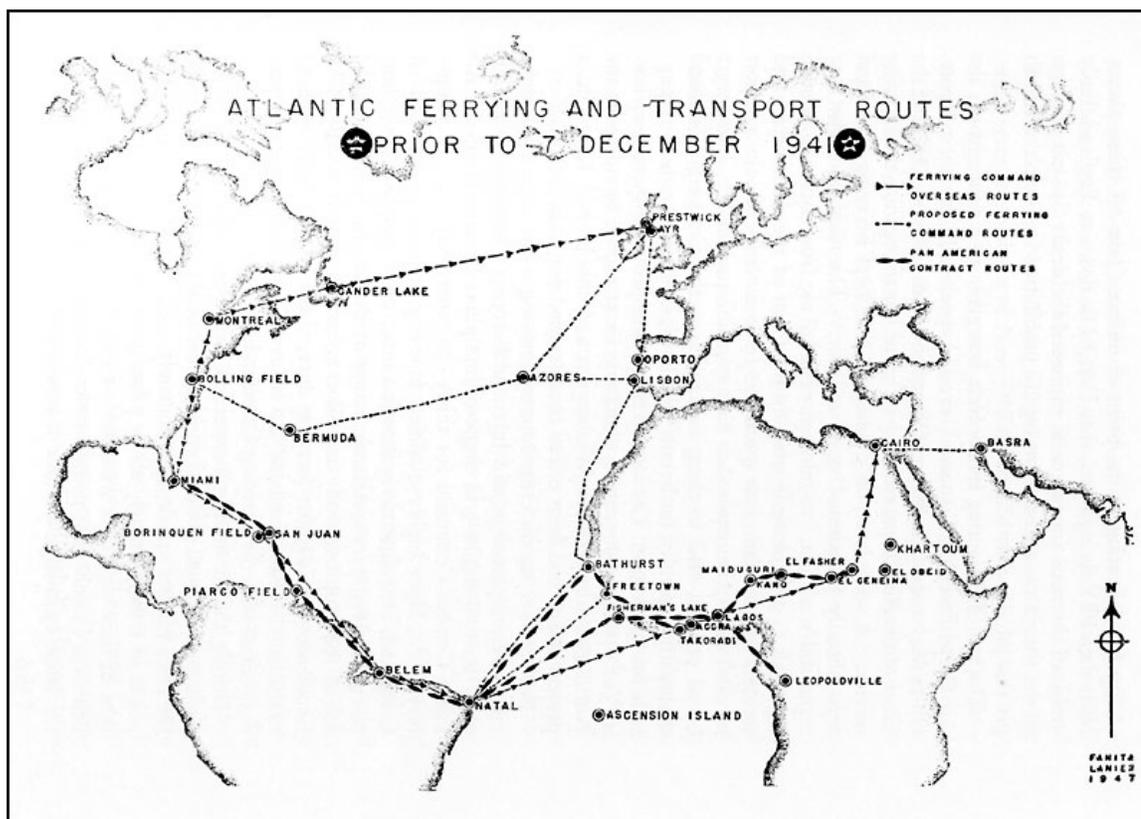


Figure 1.1 Ferrying and transport routes prior to December 1941

<http://www.ibiblio.org/hyperwar/AAF/I/maps/AAF-I-10.jpg> (accessed November 8, 2014)

With regard to air travel, a safe and uncomplicated trip starts with decent weather. But during the late interwar period, and early into World War II, long range communications and weather forecasting were in their infancy. As early as the 1930s, weather forecasting and aviation meteorology found significant funding and support from various elements within the Air Service. Frequently frustrated by a lack of independent weather data, the Air Service of the interwar period continued to push for an independent weather service, and “success came in 1937, when the War Department split the meteorological service among the branches of the Army. The Signal Corps continued to develop, buy, and

distribute equipment.”⁴⁶ No longer was the Air Corps required to wait its turn for accurate and reliable data. The split enabled each section (Field Artillery, Chemical Warfare Service, Air Corps and other branches) to run their own weather services “to meet their own peculiar needs.”⁴⁷ But despite these gains, pilots and crew still found considerable challenges as forecasting was limited and radio reception along the route was “often non-existent.”⁴⁸

By 1941-1942, significant progress had been made both by the military and civilian airlines in terms of the collection and use of meteorological data. But the usefulness of this data required communications between weather stations to a degree that had not occurred before. In the North Atlantic specifically, accurate weather forecasting was essential as dynamic climatic forces merged “with the southward movement of polar air masses from the Arctic and the movement north of warm air from the tropics” creating favorable conditions for aircraft icing, thunderstorms, and erratic winds.⁴⁹ The job of tracking and analyzing these weather patterns fell upon the men stationed along a series of interdependent weather stations from Maine to Iceland. What began with several weather technicians installing associated gear and communications equipment in a small tent was eventually comprised of many stations spread across thousands of miles. As new bases and support facilities sprang up along the North Atlantic Route, radio communication and meteorological teams followed suit.⁵⁰ The North Atlantic facilities

⁴⁶ Maurer, 396-397.

⁴⁷ *Ibid.*, 397.

⁴⁸ Jeffrey Davis “Atfero: The Atlantic Ferry Organization,” *Journal of Contemporary History* 20, no. 1 (Jan 1985), 76.

⁴⁹ Craven and Cate, 345.

⁵⁰ Craven and Cate, 345-346.

also served the dual purposes of providing communications and navigation stations along the route, and served as a basis from which further expansion of air bases and support infrastructure could grow.

Chapter 2 Over the Hump: Airlift Matures

This was all new. No other air operation, civilian or military, had ever before attempted to keep its fleet in continuous operation all around the clock, in all seasons, and in all weathers (sic)...The age of air transportation was born right there on the Hump.

– General William Tunner

In many ways, World War II served as a stepping stone to the modern era for the United States, particularly with regard to military technologies. Both civil and military aviation took advantage of countless technological leaps to expand capabilities and gain invaluable institutional knowledge and experience. From a logistical and organizational perspective, the United States' entry to the war found its air transport community without a clear direction or purpose. Enormous progress was made in both the development and utilization of available equipment and infrastructure, but significant challenges remained and change was coming.

Now that the United States was actively involved in combat operations, demands on the Ferrying Division were frequently at odds with the more urgent needs of theater commanders. Men and aircraft were often diverted by theater commanders for their own purposes, without consideration of their original orders. Likewise, due to various internal difficulties it “was in no position to expand its own military transport services.”⁵¹ The men of the Ferrying Command had done a more than commendable job of creating a basic aviation infrastructure, but war brought a significant escalation in both tempo and

⁵¹ Craven and Cate, 350.

scale. More would need to be done. As the movement of men and materiel increased worldwide, the increased need for experienced pilots and crew found much of the Ferrying Command lacking. No longer solely delivering aircraft to warring Allies, the Ferrying Command was tasked with the delivery of aircraft to active war zones by the very crews who would take them to battle. The first step of airlift consolidation, the creation of a more unified air transport system under the Air Transport Command, was soon to come.

Following the attack on Pearl Harbor, U.S. air transport units were primarily tasked with “establishing and maintaining air communications with those combat areas in which the tactical situation was most critical,” an often vague and misused mission.⁵² Up to this time, the primary purpose and focus of the Ferrying Command was international in scope, delivering aircraft and resources to forward locations around the world in support of the Lend Lease program. At home, the direct aerial supply needs of the Army were handled by the Air Service Command, a military organization whose charge was strictly domestic. The U.S. military soon learned a major logistical lesson that shaped all future military air transport: the separation of airlift resources and authority reduces the efficiency and capability.⁵³ In peacetime, a separation of aerial supply resources was overly complicated yet ultimately made possible by a considerably smaller scale of operations. By 1942 the redundancies and convoluted command structure were cause for

⁵² Craven and Cate, 350.

⁵³ Oliver La Farge, *The Eagle in the Egg* (Boston: Houghton Mifflin, 1949), 54-56.

alarm, and a series of meetings was held in March to outline a “temporary expedient to overcome the overlap.”⁵⁴

A principle impediment was the separation of aerial supply responsibilities across several competing groups. Confusion reigned as a result of the inevitable competition for men, resources, and a convoluted blend of mission objectives. Both the Ferrying Command and Air Service Command served the transport needs of the U.S. Army independently of one another, but how they served and under what conditions created systemic confusion. We have discussed the duties and relative effectiveness of the Ferrying Command. On the other hand, its airlift counterpart, the Air Service Command, acted as a collection of independent domestic air arms linked to specific units around the world, serving as a sort of “Quartermaster and Ordnance Corps” handling basic supply and maintenance services for its associated Air Force.⁵⁵ But rather than having a unified supply chain, each numbered Air Force employed its own acquisition and supply chain. Duplication and redundancy abounded, as well as jealousy and outright infighting. On a very basic level, the distinction between the two commands was as simple as domestic versus global, but in reality the distinction (and the problems they caused) were more organizational than geographic. As La Farge notes, the two cannot be “profitably separated”:

A number of articles are required urgently by various units in various foreign theaters. These articles are manufactured at points in the United States far from each other. If Air Service Command has the final say on domestic air transportation, it will determine which of these requirements shall be met by its limited air capacity, as far as delivering the articles to the ports of aerial

⁵⁴ Miller, 31.

⁵⁵ La Farge, 55.

embarkation is concerned. Its decision as to priority and as to the time and point of delivery may not have been co-ordinated (sic) with the foreign transport organization.⁵⁶

As such, what should be a matter of practical military necessity and logistics is compromised by interservice rivalry and political calculation. Complicating matters further were several unintended consequences of the new wartime footing, particularly the desire of theater commanders to commandeer “available” transport aircraft and supplies for use in whichever location it happened to be needed. For example, as aircraft and supplies traveled from the United States to bases in Great Britain via North Atlantic routes, they

might traverse the jurisdictional area of as many as five separate theater or base commands. In the early months of the war, the theater commanders... frequently diverted scheduled transport aircraft and crews operating under the control of the Ferrying Command to their own immediate tactical needs.... While such practices might have been justified in emergencies, if carried too far they would have led inevitably to a complete breakdown of the developing system of strategic air supply.⁵⁷

As such, the Ferrying Command and the rest of the U.S. aerial transport system was destined for transformation. Up to this time, both the Ferrying Command and the Air Services Command operated independently of each other, creating “a situation General Arnold came to describe as substantial duplication and confusing dual responsibility.”⁵⁸ The first of several reorganizations took place in March 1942, and split the responsibilities geographically giving the Air Service Command control of the Western hemisphere, while the Ferrying Command took the Eastern hemisphere. As one can readily imagine, the geographical distinctions meant little to these organizations, as

⁵⁶ Ibid., 55-56.

⁵⁷ Craven and Cate, 364-65.

⁵⁸ Miller, 33.

global transport missions frequently started and stopped in different hemispheres. Rather than simplifying matters, the separation simply resulted in more “waste, duplication, and hard feelings.”⁵⁹

The creation of a unified Air Transport Command (ATC) was the next major step in the evolution of American air transport. Per Air Force General Order Number 8 issued by General Arnold on June 12, 1942 the Air Transport Command was established to streamline the “effective use” of air transport within the U.S. Army Air Forces. In doing so, the new command’s responsibilities included the “air transportation of people, materiel, and mail for all War Department agencies (except for troop carrier operations); and the control, operation, and maintenance of bases on its air routes.”⁶⁰ This centralized command structure hampered the ability of theater commanders and others to appropriate airlift resources for their own limited needs.⁶¹

Though a new organization, ATC retained much of the existing structural issues that plagued its forebears. Geographical distinctions and an unclear organizational template were remedied, in theory by Arnold’s memorandum, but much was expected in terms of practical application. Though operational control of all aerial transportation was key to centralizing control both inside the United States and abroad, perhaps the most powerful element of this transformation didn’t concern itself with the aircraft, pilots or

⁵⁹ La Farge, 58.

⁶⁰ Administrative History, Ferrying Command, 29 May 1941-30 June 1942, 142-143.

⁶¹ It must also be noted that the creation of ATC necessitated a redesignation and reorganization of a previously existing command centered on troop transport. Previously known as the Air Transport Command, the newly-designated Troop Carrier Command (TCC) was responsible for the movement and distribution of soldiers, primarily paratroopers. For the remainder of the war troop carrier and supply airlift operations remained separated.

crew at all. Without control of the bases and support infrastructure, streamlining the process from point of origin to final destination, the ATC could not succeed within its given mandate. Prior attempts to restructure the Army's air transport network resulted in pushback.⁶² The new directives allowed for change, and within a short months ATC began to evolve from a combination of heretofore unaligned tactical units to an "agent not merely of the AAF but of the whole War Department."⁶³ With a unified command structure, and worldwide control of its air and ground assets, the true power and ability of the ATC began to take shape.⁶⁴

Both centralized control and economy of scale are vital to the manner in which modern U.S. military planners utilized air transport resources the world over. These lessons were no foregone conclusion, and would by necessity take "the categorical imperatives of war [to remove] the restrictions of financial considerations...[from which] a complex of bases, ground equipment, supply, communications, and meteorological service has been developed" and continued to expand around the world.⁶⁵ Part and parcel of this technological expansion was the continued development of new aircraft types. As previously stated, aircraft of various designations stemmed from the Douglas DC-3. Both the C-47 (primarily for bulk cargo) and the C-53 (personnel transport) served as the primary platform from 1939 through the end of WWII.

⁶² La Farge, 60.

⁶³ W.F. Craven and J.L. Cate, eds. *The Army Air Forces in World War II*, Vol VII, *Services Around the World* (Chicago: University of Chicago Press, 1948), 14.

⁶⁴ Troop carrier groups, another major air transport function, is not included under this discussion of the Air Transport Command unification. Troop Carrier groups were given the responsibility of providing transportation for parachute troops, airborne infantry, glider units, and for conducting local air transport services within the theaters of operations.

⁶⁵ Harold Lee George "The Air Transport Command, Army Air Forces," *Annals of the American Academy of Political and Social Science*, vol 230 (Nov. 1943), 91.

With the smashing success of Douglas Aircraft's DC-2 and DC-3 designs, engineers set their sights on higher performing aircraft with the ability to fly higher and faster while simultaneously carrying a greater number of paying customers. As early as 1935 discussions on the development of a four-engine aircraft with "twice the capacity of the DC-3 and a range of 2,200 miles" were held between Douglas and its primary customer, United Airlines. Work on an initial prototype, originally designated DC-4 (keeping with custom) but later designated the DC-4E for 'experimental,' took shape after receiving specifications from United Airlines and financial backing from several other large airlines to spread the cost, and the risk. The four engine aircraft would carry up to 42 passengers in traditional seating. Breaking from the design standards of the day, the prototype employed a tricycle-type landing gear configuration, doing away with the more conventional 'tail-dragger' look which defined most aircraft to this point, and incorporated the first 'nosewheel' to be used on such a large aircraft.⁶⁶ Compared to other aircraft of its day, the DC-4E was an engineering marvel.⁶⁷ Additional technological advancements included "power-boosted" controls for easier handling by the flight crew, auxiliary power units to provide DC electrical power while on the ground, and cabin pressurization.⁶⁸ In the end, however, the DC-4E was a victim of its own complexity and advanced features. With the war still several years off the new aircraft was "far too

⁶⁶ Francillon, 266. "Tail dragger" was a term used to describe many WWII aircraft whose designs incorporated two 'primary' landing gear and a third tail-wheel supporting the aft section of the aircraft. This style is differentiated from more modern designs (such as the DC-4E) incorporating a tricycle type landing gear of two primary gear alongside a 'nose wheel' supporting the main fuselage and which also provided a steering capability.

⁶⁷ Ibid., 267.

⁶⁸ Percy, 105.

ambitions, too complex and too large, as well as too costly for U.S. domestic operation and current demand.”⁶⁹

Though an outgrowth of the DC-4E would become the backbone of both civilian and military airlift by the end of World War II, other aircraft types would play key roles in supporting U.S. forces around the world during the initial hectic days of World War II. Both the United States and its British allies relied heavily upon converted airliners, flying boats, and a few bombers adapted for cargo transport prior to World War II, but few of these early options were ideal for wartime use. Like the DC-3/C-47 listed above, converted B-24 bombers played a valuable role in the early days of World War II airlift, but served only in a limited role as a “stopgap” due to several limitations.⁷⁰ The B-24 *Liberator*, known as the C-87 in its cargo configuration, was a four-engine high-wing monoplane designed by Consolidated Aircraft as one of the first ‘heavy’ bombers in the U.S. inventory. The location of its wings enabled easy loading and offloading, while the high power-to-weight ratio allowed it to carry anything that could fit into the fuselage. Despite these positive attributes, it was attempting to serve a purpose for which it was not intended. Design complications limited the C-87’s usefulness as “its fuselage, bomber-style, was too small in diameter. The plane was actually capable of lifting more cargo than there was room to put on board.”⁷¹ Beyond technical considerations, military leaders also wrestled with the opportunity cost of utilizing bomber airframes for transport use.⁷²

⁶⁹ Ibid, 106.

⁷⁰ Plating, 66.

⁷¹ La Farge, 80.

⁷² “Opportunity cost” is an economic term referencing the possible benefit given up to achieve something else. In this sense, using a bomber aircraft for transport purposes gives up the benefit of any offensive missions or bombs dropped against the enemy.

Every aircraft they converted for transport use was one fewer aircraft available to bomb Germany or Japan. The C-87 would continue to support AAF personnel around the globe throughout the war, but in the end it simply could not provide enough cargo capacity, nor were there enough aircraft to make up the difference.

One of the civilian world's most prolific long-range transports also proved unsuitable for full-time military use, and provided a great example of a superior civilian transport unfit for a traditional military application. Upon completion in 1939, the Boeing *Clipper* series of aircraft were the largest production aircraft in "regular airline service" anywhere in the world.⁷³ The *Clipper* flying boats were massive aircraft for their day, capable of transporting a maximum of 74 passengers and 10 crew to an effective range of approximately 3,500 miles at a cruising speed of 183 mph. Later adaptations included more fuel capacity, redesigned passenger accommodations, and new engines with greater takeoff power.⁷⁴ They were one of the few aircraft capable of traversing vast stretches of the Pacific Ocean during the halcyon days of prewar transcontinental air travel. Yet for all of their groundbreaking capabilities, the *Clippers* were not designed for heavy military use, and were found to be too slow, too underpowered, and too few in number. As seaplanes, they were also of limited use for land-based resupply efforts. For the duration of the war, Boeing *Clippers* served in various capacities with both the U.S. and British navies, while also serving under contract for their original owners, Pan American Airways.

⁷³ Peter M. Bowers, *Boeing Aircraft Since 1916* (London: Putnam, 1989), 238.

⁷⁴ *Ibid.*, 241.

Another aircraft pressed into emergency wartime service, and whose lineage stretched to the 1930s, was the Boeing Model 307 *Stratoliner*. Based on the legendary B-17 *Flying Fortress*, the preeminent heavy bomber of the 1930s and early 1940s, the Model 307 was a civilian-minded outgrowth whose stated goal was high-altitude comfort for transcontinental travel. The *Stratoliner* retained much of the B-17's structural framework (wings, engines, nacelles and control surfaces), while incorporating an "entirely new fuselage of greatly enlarged and completely circular cross-section."⁷⁵ The circular cross-section was vital for aircraft pressurization, one of the most important technological advances of the period. By pressurizing the 307 and other subsequent passenger airliners, Boeing enabled the crew to fly higher and more comfortably without the need for supplemental oxygen.⁷⁶ Later *Stratoliners*, designated C-75 once under U.S. Army control, included upgraded wings, more powerful engines, and updated control surfaces.⁷⁷ Like the *Clipper*, the *Stratoliner* was a fine aircraft for its intended purpose, but was severely limited in payload capacity and altitude.⁷⁸ Fewer than twenty *Stratoliners* of all types were built before production was stopped and the remaining aircraft were returned to civilian service. Across the board, technological limitations hampered airlift worldwide, and the evolution of aircraft and navigation technologies continued throughout the early stages of World War II and beyond.

⁷⁵ Bowers, 230. The 'nacelles' are the housings, apart from the fuselage, that surrounds the engine.

⁷⁶ Pressurization would not be found in U.S. military aircraft until introduced in the B-29 *Superfortress*, a technological wonder of its day.

⁷⁷ Bowers, 234-235.

⁷⁸ La Farge, 75.

As Europe dissolved into armed conflict, the British government realized that only through cooperation with the United States and other Allied nations could it survive a protracted battle against the Germans. As such, the most “urgent need” of the United Kingdom was war material.⁷⁹ American planners as well saw the urgent need for the growth and development of an enlarged defense establishment, and air transport was seen as vital for the war effort. During an initial assessment, army planners “now wanted 11,802 transports to support the nation’s expanding military organization,” but few of these were readily available.⁸⁰ Over the next five years, various versions of the military DC-3 flew thousands of missions, saved countless lives, and were instrumental to the Allied victory. But one area, above any other, held the most powerful operational legacy for the Berlin Airlift just three short years later. By “flying the Hump” over the Himalayas and supplying Chinese forces against the Japanese throughout eastern Asia, the U.S. Army Air Corps gained the experience and doctrinal foundation necessary to create an operational template for an open-ended airlift mission. What was originally viewed by strategic planners as a way to divert Japanese resources and placate a vocal and stubborn ally in Chiang Kai-Shek, the Hump operations in China-Burma-India (CBI) Theater altogether altered the capabilities, and more importantly, the *perception* of airlift.

While ferrying efforts and the international airlift of military supplies increased, U.S. commanders turned their attention toward Europe. Per President Franklin D. Roosevelt’s personal directive, official U.S. policy outlined a “Europe First” strategy

⁷⁹ R.A.C. Parker *The Second World War: A Short History* (Oxford: Oxford University Press, 1989), 57.

⁸⁰ Glines and Mosely, 59.

focused on the defeat of Germany, while peripherally continuing an ongoing assault against Japanese expansion in the Pacific Theater.⁸¹ While the U.S. and its Allies initially turned away from the Pacific, a crucial ally remained as a bulwark against further Japanese expansion: Generalissimo Chiang Kai-shek and the Chinese army. American support of China against the Japanese was longstanding, however limited and unfocused. Even prior to December 1941 U.S. support in the form of loans and military equipment enabled China to withstand intense Japanese pressure and reinforced the American belief that keeping China involved in the fight against Japan served as an “obstacle to Japanese expansion.”⁸²

Despite President Roosevelt’s vocal support of more aid to the Chinese, it soon became clear that the “Europe First” global strategy would fundamentally limit the allocation of existing airlift resources toward the Pacific. To this end, several non-military ventures succeeded in lessening the growing pains that would undoubtedly arise. Both Pan American Airways and the China National Aviation Company (CNAC) had a great deal of experience hauling passengers and cargo throughout the region. Partially owned by Pan American Airways, and partially by the Chinese Government, CNAC in particular would serve as a de facto air transport arm of the U.S. military during the crucial early months of the campaign.⁸³ Prior to direct U.S. intervention, CNAC served as the quasi-military link between the U.S. military and Chinese forces in the region and

⁸¹ Ibid., 122.

⁸² William Koenig, *Over the Hump: Airlift to China* (New York: Ballantine, 1972), 18-19.

⁸³ Miller, 49.

supplemented the early work of the U.S. 10th Air Force which was “activated” on February 12, 1942.⁸⁴

In the meantime, despite “definite assurances” by President Roosevelt and others within the U.S. administration that the supply route to China would remain open, it soon became clear to men like General Lewis Brereton (Commander of the 10th AF) that a significant lack of resources and organization plagued the China mission and threatened the theater’s viability as a whole.⁸⁵ Early analysis of the planned airlift to China found myriad reasons why the airlift should *not* succeed. Among these were the lack of sufficient numbers of aircraft, competent pilots and crew, a shortage of bases and support infrastructure, insufficient weather forecasting, limited topographical information regarding the proposed routes and again, the weather. Initial plans divided airlift resources across military and the quasi-military CNAC. General Arnold recommended an immediate dispatch of 100 aircraft to the region, 75 for the 10th AF and 25 for CNAC, but this was not to be.⁸⁶

The India-China airlift started in much the same way as earlier stateside ferrying operations. Early control of the mission was given to the newly minted Tenth Air Force which was, as of early March 1942, “largely an organization existing on paper.”⁸⁷ It was charged with both flying the supply routes and protecting its means to do so, but “had neither the planes nor personnel” to accomplish its goal.⁸⁸ Organizational conflicts

⁸⁴ Craven and Cate, 484.

⁸⁵ U.S. Department of State, *FRUS Diplomatic Papers, 1942, China*, p. 13.

⁸⁶ Miller, 49.

⁸⁷ Craven and Cate, 493.

⁸⁸ Plating, 75.

hampered early airlift operations almost from the beginning as few lessons were learned from earlier airlift operations. Rather than immediately shifting supplies and logistical expertise from domestic ferrying and resupply operations, the Army chose instead to *create* an institution (the Tenth Air Force) from whole cloth, lay out immense expectations, and fail to supply it with necessary equipment and manpower. Some early limitations were undoubtedly caused by the lack of a coherent organizational structure which existed prior to the inception of Air Transport Command, while others were caused by the aforementioned ‘Europe First’ strategy and the subsequent failure to adequately supply U.S. and CNAC squadrons. This shortcoming was represented both by the number of aircraft and support personnel in theater, as well as overall expenditures, because

the Americans fixed overseas expenditures for the war in Europe over the war in Asia at a ratio of twelve-to-one, meaning operations like “Bolero,” the preparatory supply of Great Britain in advance of a cross-channel invasion, was preferred over the competing demand to resupply the Chinese by air across North Burma and India.⁸⁹

Likewise, the overall percentage of air transports initially assigned to the China-Burma-India (CBI) Theater of operations was significantly less than its counterparts, with 43% assigned to Europe, 18% to the Far Eastern Air Forces (FEAF), and only 15% to CBI.⁹⁰

Initial planning for the start of air operations from India picked up from March 1942 as General Arnold outlined a general set of expectations for the 75 planes expected in-theater: roughly 7,500 tons of cargo per month from India to China via the new airway system.⁹¹ This would not occur, at least not at that early stage. Preliminary plans called

⁸⁹ Ibid., 73.

⁹⁰ USAAF, Office of Statistical Control, *Army Air Forces Statistical Digest*, p. 183.

⁹¹ Plating, 78-79.

for the establishment of three major air bases across India and Burma.⁹² By early May 1942 the Japanese push into Burma had cut off the air base at Myitkyina, from which the majority of flights were intended to originate, and left “a 550-mile flight path across mountains at least 16,000 feet high, through some of the worst weather faced in the Second World War.”⁹³ As a result, General Brereton ordered the establishment of several sub-commands of the Tenth AF to service the bifurcated supply lines from Burma/India into China. Both the Trans-India and Assam-Burma-China Ferry Commands operated under one bureaucratic umbrella, but were tasked with moving cargo and personnel within different sections of the Hump routes.⁹⁴ As one can imagine, the complications inherent in operating two distinct transport groups from one base (or even a combination of bases) led to confusion and redundancy. This redundancy and separation was soon found to “run counter to the arguments of experience” found by CBI leaders and crew alike.⁹⁵

Both groups, and the joint command they soon formed, would base their early operations from an Indian airfield at Dinjan, as no other suitable locations existed. Original plans called on the Royal Air Force to provide three airfields, including one at Chabua built with “native labor using the most primitive tools and methods,” and intended to house roughly 75 transports for both CNAC and the 10th AF.⁹⁶ These plans were scrapped as monsoon rains delayed construction and enlargement of additional facilities while severely hampering the quality of life for the initial cadre of pilots, crew,

⁹² Frequently referred to as ‘airdromes’ in period writings.

⁹³ Miller, 49.

⁹⁴ Koenig, 33.

⁹⁵ Craven and Cate, *The U.S. Army Air Forces* 1: 14, 507.

⁹⁶ Craven and Cate, *The U.S. Army Air Forces* 7: 5, 118.

maintenance teams and other administrative personnel.⁹⁷ As seen months later by the Hump's future commanding officer General Tunner, these early conditions lessened the effectiveness of the 10th AF by crushing the morale of its people. As Tunner explained:

Living conditions were generally bad...Men lived crowded in tents or bamboo huts known as *bashas*, which frequently had dirt floors and insect-ridden thatched roofs. This in a land of heat, high humidity, almost constant rain, and mud everywhere. Supplies of just about everything were short – plumbing fixtures, lumber, water pumps, and wiring....Supplies of proper clothing, scouring powder, and fly-screening for the kitchens thwarted all efforts to maintain standards of sanitation and living.⁹⁸

Despite the inhospitable conditions, flight operations continued for the C-47 aircraft and crew as they pushed to assist retreating American, British and Chinese forces in Burma. From April to June 1942 the ABC Ferry Command transported thousands of passengers and over 900 tons of cargo as the Japanese continued their push into Burma.⁹⁹ Despite these challenges, a functional airlift had begun to take shape (however roughly), and supplies continued to make their way into China. In reality, however, these numbers were hardly considered suitable. Fundamental flaws existed which would, if left unresolved, lead to a collapse of the China resupply efforts and undermine prosecution of the war against both Germany and Japan.

By July 1942 over one third of the available C-47 aircraft were grounded for lack of parts, and the number rose to 19 out of 54 aircraft in September, by which time engines destined for P-66 fighter-bombers were diverted for use in C-47s.¹⁰⁰ Making matters worse, the CBI mission was hampered by unrelenting weather extremes with

⁹⁷ Plating, 79 and Koenig, 33.

⁹⁸ Tunner, *Over the Hump*, 55-56.

⁹⁹ Koenig, 34.

¹⁰⁰ Plating, 85-86; Craven and Cate, *Army Air Forces*, 6:347-48.

little ability to forecast local weather changes from day-to-day, let alone region-to-region. Across the thousands of miles covered by Hump transports, both pilots and ground crews faced winds, rain, heat and humidity without end. Mountain peaks, highland deserts and thick jungle canopies served as backdrop for the resupply efforts, and would claim one American life for every 340 tons of cargo transported into China.¹⁰¹

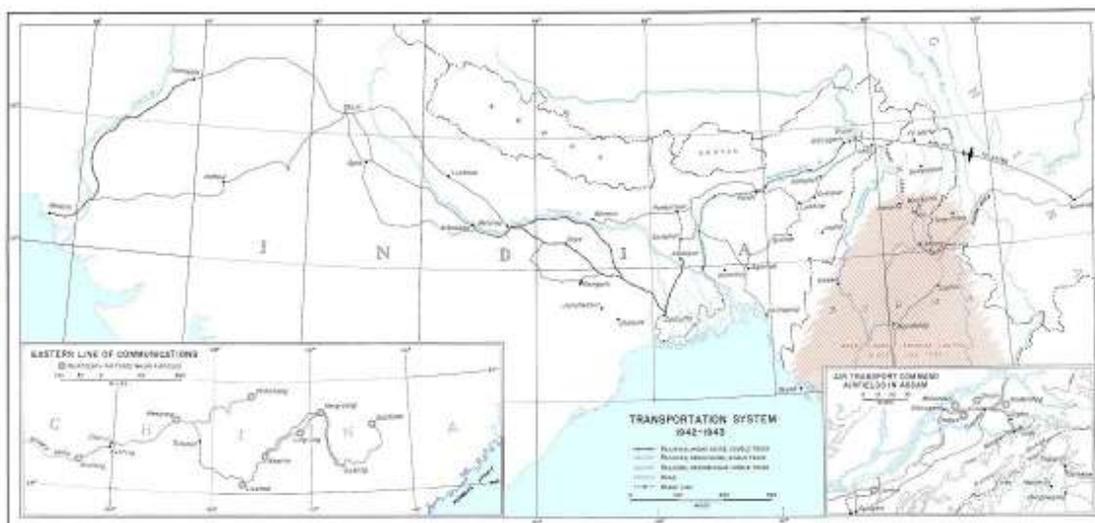


Figure 2.1 U.S. Military Transportation System in China-Burma-India 1942-1943
<http://www.ibiblio.org/hyperwar/USA/USA-CBI-Mission/maps/USA-CBI-Mission-6.jpg>
 (Accessed November 8, 2014)

For pilots, the weather was especially treacherous as “low pressure masses moving from the west along the main ridges of the Himalayas, highs from the Bay of Bengal, and Siberian lows all clashed in furious conflict at the Hump.”¹⁰² Weather forecasting was extremely limited, and often relied on incomplete or inaccurate data supplied by poorly trained operators with lackluster equipment, while formal weather

¹⁰¹ La Farge, 125.

¹⁰² Koenig, 51.

forecasting was not a permanent fixture on Hump operations until 1944.¹⁰³ Older aircraft types, such as the C-47, were designed without advancements such as deicing boots and accurate radio navigation equipment, without which the transports relied on equal measures of skill and luck to arrive at their destinations.

Few considerations were as important to the long-term success of the China airlift (and the AAF in general) as the recruitment and training of pilots and crew. Prewar aerial missions to China and around the globe were largely manned by an influx of experienced civilian crews appropriated by the U.S. military. These crews had thousands of hours in the cockpit, were experienced navigators, and understood the role proper planning and discipline played in air transport. But prewar methods of recruitment and training fell frustratingly short during the early days of the war. It soon became clear that the established protocols for flight training were “lamentable,” and an overhaul in this program would undoubtedly improve the quantity and quality of Army pilots. Existing training was flawed, and did not fit the needs of a modern military. The problem was not simply the quantity of flight training, but the quality and type as well. Instrument flight experience was almost nonexistent, and flying in poor weather conditions was rarely attempted. As La Farge describes:

Flying may be divided into two types, contact and instrument. In pure contact flying the flyer depends upon his view of the ground or water beneath him and of the horizon to tell him where he is and what position his plane is in. In practice, pure contact flying is practically never attempted; if no other instruments, the pilot uses his compass to check his direction and his altimeter to give him his

¹⁰³ Ibid., 55, and Plating, 46.

altitude...Experienced flyers fly instruments even when they could fly contact. It is safer.¹⁰⁴

Experience with instrument flight rules and inclement weather were paramount in CBI, where pilots frequently flew several instrument-only flights per day, “seeing the ground only at departure and destination.”¹⁰⁵ Where previous ferrying and transport operations could lean heavily on the commercial airline industry for both pilots and crew, combat deliveries by ferry pilots and early airlift missions were left to newly minted aviators whose cockpit experience was rudimentary at best. Changes would be made, but it would take the influence and experience of the ATC to make them happen.

Aside from training, the aircraft themselves posed serious challenges for even the most experienced pilots. While the bulk of transport missions during the first year were flown by the rugged and dependable C-47, a new aircraft entered service that would eventually become the backbone of Hump operations. The twin-engine C-46 *Commando* holds a unique place in aviation history as an aircraft whose eventual usefulness and durability was overshadowed by a dark early operational history. While the C-47 was a “forgiving” aircraft, the C-46’s more complicated and untested design made it difficult to handle for inexperienced and inadequately trained pilots, often resulting in an “alarming” early accident rate.¹⁰⁶ Plain and simple, early models of the C-46 were wrought with design flaws and complicated new technologies, resulting in an unstable and often deadly aircraft.

¹⁰⁴ La Farge, 36.

¹⁰⁵ Koenig, 51.

¹⁰⁶ Tunner, *Over the Hump*, 55.

Curtiss began work on the C-46's predecessor, the MW-20 passenger airliner, as a means of competing with Douglas' DC-3. The MW-20 design offered a larger passenger and cargo capacity with increased range, while still operating on only two engines. Several new technologies were also included into the design as a means of improving the comfort of both passengers and crew, "adding the latest Sperry autopilot, a pressurized cabin, and hydraulic flight controls (replacing the cable, bell-crank, and pulley system of moving flight control surfaces)."¹⁰⁷ As a military system, the chief improvement of the C-46 was an increased cargo capacity (nearly double the C-47) and greater range without a vastly larger four-engine platform.¹⁰⁸ Like many aviation firms, Curtiss placed early C-46 test frames into full-scale production "before the model was ready or the engineers trained. The first seventy-five [aircraft] were so unsafe that they had to be sent back to the factory for major modifications."¹⁰⁹ Once several major alterations were made at the behest of General Arnold himself, the aircraft would play an instrumental role in the future success of the Hump operations. But regardless of future successes "it was never a completely dependable plane. And in the meantime, C-46's were killing crews."¹¹⁰ Despite these lethal challenges, the C-46 proved to be an invaluable asset by flying higher, faster, and with nearly double the cargo capacity. It would take nearly a year before many of the C-46's problems were put to rest, but the aircraft remained difficult to fly in the hands of a novice. It would be several more years before larger, more dependable, four-engine aircraft were made available to the ATC. Despite these

¹⁰⁷ Plating, 68.

¹⁰⁸ John M. Davis, Harold G. Martin and John A. Whittle, *The Curtiss C-46 Commando*. (Essex, England: Air-Britain, 1978), 17.

¹⁰⁹ La Farge, 78.

¹¹⁰ Tunner, *Over the Hump*, 62.

challenges, the *Commando* eventually overtook the C-47 in CBI operations with an impressive 3,144 delivered to the USAAF.¹¹¹

Throughout the first year of CBI supply operations, both the Tenth Air Force and CNAC encountered many of the same problems that had plagued earlier air transport efforts. Aside from the logistical challenges inherent in operating a large airlift over rough terrain, far from existing supply lines, and through some of the worst flying weather imaginable, the early days of the Hump operation were hampered by myriad technological limitations. A lack of progress in the creation of new navigational technologies, weather forecasting, communications and flight instrumentation were persistent obstructions to progress. By autumn 1942 it was clear that the combination of Tenth AF and CNAC was not succeeding. Previous estimates of 10,000 tons per month to China were frustratingly short, as their combined efforts produced only 2,200 tons between May and November. Later that year a report was compiled by Frank Sinclair, technical advisor for China Defense Supplies, Inc., which roughly detailed the limitations witnessed under the 10th AF, among these were the many ways “how not to run an airlift.”¹¹²

Broadly defined, the airlift limitations Sinclair described were both functional and institutional in nature. The functional limitations were (generally) self-imposed by improper planning, misallocation of resources, and a misunderstanding of how to *efficiently* operate an “airline” on such a large scale. The report outlined a lack of spare parts (most importantly engines), few available repair and restoration facilities (both for

¹¹¹ Koenig, 59.

¹¹² Miller, 50.

aircraft and engines), lack of an effective training program, poor communications, poor living conditions, and a lack of accurate weather forecasting.¹¹³ But Sinclair's report also outlined significant institutional challenges which limited the already stifled effectiveness of the 10th AF. Primary among these was a strongly "defeatist" attitude of the commanding officers and a general lack of respect for the job at hand. Sinclair was supported by Clair Chennault (commander of the American Volunteer Group or "Flying Tigers"), who

felt strongly that the failure of the hump was due not only to the technical problems of air supply but also to the 'contempt' of [Commanding Generals] Stilwell and Bissell for this method of supply. Stilwell was an old-line infantry officer and his ignorance of the potential of air supply was understandable to Chennault but Bissell was a career air force officer and pilot. For him to persist in labeling the hump 'impractical' was inexplicable and incompetent.¹¹⁴

The combination of this report and the limited production by the 10th AF led to a directive on October 9, 1942, recommending responsibility for the CBI airlift to be given to the Air Transport Command.¹¹⁵

The first year following ATC's takeover brought several significant technological and doctrinal changes that would shape all future airlift operations. From the outset, the aerial resupply of China was a mission wrought with contradictions and hamstrung by the inability of political and military leaders to read from the same page. It was a goal without a defined plan of actualization. Part and parcel of this issue was the lack of a

¹¹³ Frank Sinclair, aviation technical adviser, China Defense Supplies, Inc., Memorandum re Air Transport System, Dinjan-Kunming, China, n.d., 51-52, attached to Willauer to Harris, letter, 23 September 1942, quoted in Miller, 50-51.

¹¹⁴ Koenig, 45-46.

¹¹⁵ Frank H. Heck, "Airline to China" in *Army Air Forces in World War II*, Vol 7, eds. Wesley Frank Craven and James Lea Cate, 120.

defined *organizational* structure from which a more defined *operational* methodology might grow. Regional weather, lack of sufficient transports, recruitment and training of suitable pilots and crew, and the establishment of a basing and communications infrastructure were vital to any future successes. In fact, much of the basis for ATC's success in the region was structured before its official takeover, as its commanders outlined ATC's mission by stating

that all aircraft, maintenance facilities, spare parts, and personnel sent out for the project would be assigned to ATC and that ATC would have full control of the operation under the supervision of General Arnold, "to work in close harmony with the theater commander but not to be under his control so far as the conduct of the operation is concerned." This offer was based ostensibly on the thesis that the 1st Ferrying Group had been handicapped in its primary mission by the frequent diversions of its resources to other tasks that seemed more urgent to the theater commander.¹¹⁶

The eventual progression toward more streamlined operations had the added benefit of a doctrinal shift for the pilots, crew, and ground support staff already in-theater. Rather than simply existing at the end of a far-flung supply chain with little or no thought to their place in the larger war effort, ATC's leaders brought about a change in leadership effectively creating a renewed "singleness of purpose."¹¹⁷ This new purpose, centralizing all airlift and ferrying operations under one roof, and the improved operating conditions it spawned, would increase both the operational efficiency and general morale of those assigned to CBI.

As a means of streamlining the Hump airlift, ATC commanders created a new wing specifically designated for CBI operations. When General Edward Alexander took

¹¹⁶ Ibid.

¹¹⁷ Plating, 103.

command of the ATC's India-China Wing (ICW), the wing had at its disposal roughly seventy-five aircraft (60 C-47s and 12-15 C-87s) disbursed across three British airfields in the Assam region of India. Early progress came in fits and starts, and began with General Arnold's initial goals of 4,000 tons per month, a goal not achieved until August 1943.¹¹⁸ Crucial to the increased productivity was the establishment of radio guidance and weather forecasting stations throughout the CBI. Beyond simply improving flight safety, navigational aids served the dual purpose of allowing for an expansion of operations by enabling flight operations at night or in bad weather. General Alexander's goal of increasing total tonnage over the Hump could only be met if ATC expanded operations, and night flying became a reality as the 10th Army Airways Communications Service (AACS) Squadron "succeeded in linking the transport airfields with a growing radio network," enabling truly global communications.¹¹⁹ The region also saw increased use of radar technologies for use in air traffic control and early-warning aids. Each of these technologies helped increase ATC's efficiency as the unit increased its aircraft numbers as well as an ever-deepening pool of new pilots and crew.

¹¹⁸ Craven and Cate, *The Army Air Forces in World War II*, 7:121-22.

¹¹⁹ Plating, 107-09.

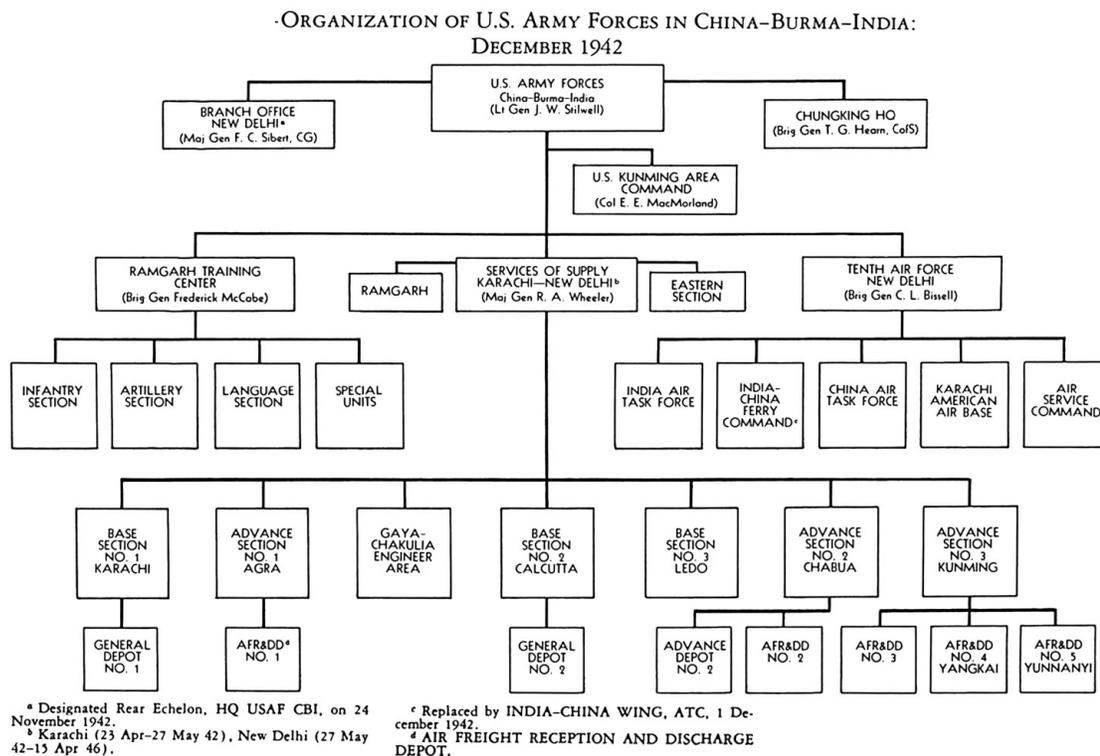


Figure 2.2 U.S. Army organization in CBI, December 1942

<http://www.ibiblio.org/hyperwar/USA/USA-CBI-Mission/charts/USA-CBI-Mission-2.jpg> (Accessed November 8, 2014)

The expanded radio communications network, navigation and training aids for the ICW were not enough to push them over their assigned goals. As tonnage lagged and morale slumped, General Alexander continued to push for more aircraft, larger airfields, and an increased operational tempo. Late spring and summer 1943 brought renewed efforts to push through 4,000, 5,000, and eventually 10,000 tons per month.¹²⁰ December 1943 proved to be a tipping point in the Hump's history as the more than 12,000 tons of cargo delivered to China served as an important political tool for Roosevelt. But some within the military establishment saw a "saturation point" coming soon. Likewise, the push for more production had an extremely dark correlating factor: more accidents and

¹²⁰ La Farge, 116-17.

lost crews. The increased drive for productivity found an increasing number of pilots pushing beyond what was considered a 'healthy' level of flight hours. When we consider the combination of subpar recruitment and training of pilots, a high operational tempo, and the physically and emotionally fatiguing nature of Hump flight operations, a pattern of psychological exhaustion known as "Humpitis" (among other names) began to emerge.¹²¹ Airlift crews in CBI routinely flew as many missions and flight hours as required in some of the most treacherous flying conditions in the world. Hump crews were being pushed to the breaking point, and the result was poor overall performance and high accident rates with a general "dose of fatalism thrown in."¹²² Something had to change. Even General Alexander, himself an honest man with sincere intentions, understood the severe limitations of his organization and outlined a detailed evaluation of his command.¹²³ Change was needed, and fast, were the airlift to progress any further.

A proper analogy for General Alexander's role as the first commanding officer of ICW-ATC would be the trauma nurse. He examined the wounded and failing body of the Hump airlift and patched enough holes to stanch the bleeding and provide time for the surgeon to arrive. He had the extremely "dirty" end of the job, and by the time he handed over control of the Hump, "he turned over a route on which the necessary construction was well advanced, many items of radio equipment had been installed, and the crews were trained."¹²⁴ The patient was stabilized, but more was needed. In operational and doctrinal terms, General William Tunner served as the specialist needed to piece together

¹²¹ Plating, 117.

¹²² Slayton, 50.

¹²³ Significant portions of this account are included in La Farge's ATC History, p. 118-123.

¹²⁴ La Farge, 124.

a functional, living organism from the pieces that remained. When General Tunner, a veteran and founding father of the Ferrying Corps and Air Transport Command, was first approached with the possibility of running the Hump airlift operations he balked at the offer. India held no special standing in his mind, and the existing circumstances were wanting in every conceivable way. As he saw it, India was “the end of the line.” Rather than the next step in an illustrious career, Tunner saw the assignment to CBI as a step-down. Conventional wisdom saw India as the destination for hard-luck cases and “bad boys,” offering up that “anybody who goofed in the Ferrying Division was on the roster to go to India.”¹²⁵

Aside from the abysmal safety record, poor operating conditions and a general lack of purpose, the immediate impact upon General Tunner was the “fantastic confusion” of the operation he was inheriting.¹²⁶ Military structure and discipline were in short supply. One of the first and most important decisions Tunner made was the reestablishment of military order. He understood that the preeminent issue affecting operational efficiency was a complete lack of morale, and it was his duty to “shake up the entire division.”¹²⁷ The preexisting ‘end of the line’ mentality of both pilots and crew was confronted by major changes to their operating routine. Tunner reestablished ‘norms’ taken for granted in any other theater: regular inspections, clean uniforms, shaving and personal hygiene requirements, saluting, and even parades.¹²⁸ Though undoubtedly questioned by staff at the time, a return to military normalcy and increased sense of duty seemingly paid

¹²⁵ W. Tunner, Interview by James Hasdorff, 38.

¹²⁶ Tunner, *Over the Hump*, 53.

¹²⁷ *Ibid.*, 64.

¹²⁸ *Ibid.*, 91.

dividends for the men under Tunner's command. Daily staff meetings were required, and "every officer was expected to be prepared, even if he had to devote the entire night to the preparation."¹²⁹ Under the circumstances, Tunner saw the improved morale of aircrews as the primary means of both improving the accident rate and increasing tonnage over the Hump. The first decision in their favor was a requirement seemingly contrary to their stated goals of more flights and tonnage delivered: no longer were aircrews permitted to continue flying into abnormally harsh weather conditions.¹³⁰ Tunner's response to the issue of weather, and its relationship to flight safety, ran counter to all previous directives. What Tunner understood, however, from his days operating the Ferrying Command was that flight safety was vital to maintaining morale, and morale was essential to the increased overall success of the group. He was a realist, and saw that no civilian airline

would permit flight under the conditions we worked under – poor communications, practically no radio beacons, planes loaded to the maximum, usually bad weather over one end of the route or another and sometimes both, icing, extremely high mountains with little chance of clearance if an engine conked out, and, of course, the inhospitable terrain below.¹³¹

Whereas previously the aircrew were to push ahead, they were given a clear (and appreciated) directive ordering them to turn back should they reach severe weather, holding aircraft on the ground and waiting it out. A corollary to this change of operating parameters was the total amount of flight time pilots were accruing. Prior to Tunner's arrival, rotation policies were structured around total flight hours: 650 total flight hours

¹²⁹ Ibid., 72.

¹³⁰ Slayton, 53.

¹³¹ Tunner, *Over the Hump*, 113.

equaled rotation back home.¹³² Tunner altered the rotation schedule for fairly obvious reasons; rather than pushing for increased tonnage and mission success, Hump pilots were simply flying as much and as often as they could, resulting in fatigue, sickness, accidents, and death.¹³³ It was hoped that by altering the policies governing rotation back to the U.S., aircrews would not force themselves into unsafe operating conditions simply out of a desire to accrue more flight time and a ticket home. From then on, theater rotations started with a one-year tour, and would only then be determined by flight hours.

“Tonnage” was no longer the overarching goal, as Tunner and his select group of subordinates undertook a program of statistical analysis that analyzed every conceivable variable so as to eliminate unnecessary risk, expenditure, and (eventually) loss of life.¹³⁴ In terms of flight safety, Tunner and his men analyzed every aspect of flight operations. From this he created mandatory flight safety committees, which “had to check not only the pilot’s activities, but also anyone who had come in contact with the plane for the two days prior to [an] accident, from the base’s operations officer to the lowliest mechanic who cleaned the windshields.”¹³⁵ Beyond merely evaluating the root causes of accidents in-theater, the ICW began assessing the strengths and weaknesses of existing pilots and crew and used increased training and rotation schedules to get the most out of these resources.

Perhaps the most lasting of Tunner’s changes was the introduction of a Production Line Maintenance (PLM) program borrowed from civilian airlines, and from which a

¹³² Plating, 206.

¹³³ Slayton, 53.

¹³⁴ Heck, 140.

¹³⁵ Slayton, 53.

greater percentage of aircraft availability would spring. As late as August 1943 roughly 100 aircraft were grounded on a daily basis for “maintenance” reasons, “long a sore spot in India-China operations.”¹³⁶ Tunner’s team seized upon an invaluable opportunity to increase production and efficiency by streamlining the maintenance process, eliminating wasted time and resources, thus replacing “a complete mishmash of maintenance organizations and policies.”¹³⁷ Prior to the institution of PLM procedures, aircraft maintenance procedures throughout ATC differed from base-to-base, and the resulting lack of consistency generated a lack of uniform quality across the fleet. At the heart of PLM was the belief that the old system, whereby a crew chief and his crew were responsible for the maintenance and production of a single dedicated aircraft, brought an unnecessary level of wasted time and energy. Whereas one aircraft’s crew may be finished with an inspection or routine maintenance and left with no work to accomplish, another aircraft could sit idle for lack of enough trained mechanics to finish the job. This created a backlog with uneven results across the board. PLM techniques, on the other hand, removed the bond of crew and aircraft while instituting a production-line approach where each station specialized in a particular facet of inspection or repair. From station 1 through station 7, an aircraft could work through the inspection process in under 24 hours, and after some “experimenting and growing pains,” the system worked superbly. Operational ready rates climbed to 85 percent, while inspection downtime dropped 25 percent.¹³⁸

¹³⁶ Heck, 140.

¹³⁷ Miller, 55.

¹³⁸ Tunner, *Over the Hump*, 94-95; and Miller *Airlift Doctrine*, 55.

As stated previously, the airlift framework of CBI was largely in place by the time Tunner arrived as commander. His predecessors had increased tonnage over the Hump from 4,600 tons in September 1943 to 23,675 tons in August 1944.¹³⁹ It was here that Tunner's greatest operational legacy began to take root. What General Alexander had experienced the year before confirmed the degree to which efficient global airlift is more than the sum of its parts. Where Tunner fundamentally altered the direction of U.S. airlift doctrine was a reliance upon increasing safety and efficiency. Rather than simply adding more planes, bases, pilots and supplies, the future of U.S. airlift was the marriage of technology, materiel, manpower and efficient use of resources. Pieced together, Tunner and his men merged the individual assets into a more effective whole. Efficiency was the watchword, and many proclaimed the era of "Big Business" had hit the USAAF. Tunner's legacy proved to be the methods he introduced to utilize the power and efficiency of the U.S. airlifter force while simultaneously lowering accident rates and improving morale. Few could contend that Tunner alone was responsible for the overall success of the Hump airlift, but it is without doubt that he utilized available resources to their greatest extent possible, and in so doing enabled ATC's China wing to increase production above and beyond earlier estimates. Others may have built the Leviathan, but he gave it a purpose and direction.

Alongside a more capable maintenance program was the enhanced utilization of a new breed of aircraft capable of hauling more cargo, more efficiently, and with a greater degree of safety than existing aircraft. Even by late 1944 and the spring 1945, aircraft

¹³⁹ Koenig, 143.

accidents due to pilot error (especially while flying the C-46) were on the rise, and Tunner called for increased deliveries of the four-engine C-54. Though it had been in design and development throughout World War II, the DC-4/C-54 *Skymaster* didn't enter true operational status until the final year of the Hump airlift. By 1939-1940, Douglas Aircraft began to reevaluate the strengths of the previously designed DC-4E prototype, and saw a need "for an aircraft similar in capacity to the experimental DC-4 but of a lighter and somewhat simpler structure."¹⁴⁰ Likewise, the Army too saw a need for a larger aircraft for transcontinental air transport, and saw the C-54 as a possible fit. Earlier attempts to find a replacement for both the C-47 (and later) the C-46 proved unsuitable as both the converted bomber C-87 and civilian *Stratoliner* were limited in carrying capacity and overall number.

By June 1942 an initial passenger version DC-4 was delivered and began evaluations by both Pan American airways and the U.S. military (who would designate the aircraft C-54). Capable of transporting 9,600 pounds when fueled for a 2,500 mile flight, the original *Skymaster* had a proposed gross weight of 50,000 pounds, nearly 15,000 pounds less than the experimental DC-4E.¹⁴¹ The aircraft were powered by four 1,450 hp Pratt & Whitney Twin Wasp R-2000 engines, was unpressurized, and could carry approximately forty-two passengers. Production of a true cargo-carrying version of the DC-4 (C-54A) began in late 1942, with an initial flight in February 1943. The 'A' model C-54 utilized bucket seats across the exterior walls, and a strengthened floor. It also showcased "various minor improvements ...and the gross takeoff weight was raised

¹⁴⁰ Francillon, 313.

¹⁴¹ Percy, 107.

to 68,000 pounds, giving it a payload of 9,000 pounds at extreme range and 10,900 for a 2,400-mile trip.”¹⁴² Overall it was a bigger, stronger, more effective aircraft for the ATC. Though it was one of the last military transports originally designed for civilian use, the C-54 series aircraft brought U.S. military aviation into the modern era and would serve in multiple roles throughout the early decades of the Cold War, specifically making a name for itself during the next great showcase for U.S. airlift: the Berlin Blockade and Airlift.

Between the increased efficiencies created by PLM, and an increased reliance upon the larger C-54 aircraft, Tunner saw no limit to the overall amount of tonnage delivered. Once the accident rate began to plummet and morale improved, Tunner created several competitive challenges to increase production even further. Across the CBI men read newspapers such as *Hump Express* where they could read about their latest accomplishments, while also comparing themselves to “competing” wings. Throughout the process Tunner “delighted in pitting one unit against another to gain the laurels of the top hauler,” a tactic he would utilize to great effect several years later in Berlin.¹⁴³

By 1945 the India-China Division comprised nearly 750 aircraft and 4,400 pilots. As U.S. forces continued their advance against the Japanese, the newly transitioned Twentieth (XX) Bomber Command undertook operations from CBI as part of Operation Matterhorn, the use of B-29 *Superfortress* heavy bombers against the Japanese beginning in 1944. The establishment of the XX Bomber Command increased requirements for both fuel and munitions, gasoline and oil accounting for over 65% of the net tonnage

¹⁴² Craven and Cate, *Army Air Forces* 7:1, 27.

¹⁴³ Slayton, 57.

delivered, with other munitions accounting for 15%.¹⁴⁴ On August 1, 1945 Tunner and the CBI commanders challenged the division to see how much it could carry. The resulting surge delivered 5,327 tons in a single 24-hour period, “exceeding half of Roosevelt’s *monthly* goal of 1943 in a *single day*.”¹⁴⁵ For Tunner, the most “heartwarming” result of the day was the accident rate: zero. By the end of the war several weeks later, Tunner had proven his methods worked and had completely transformed the way many in the U.S. military perceived airlift capabilities. Their actions over the Hump, and several years later in Berlin, would forever link airlift to the success of future U.S. military operations. As he noted in his memoirs, “the war was over, but large scale airlift...was just beginning.”¹⁴⁶

From 1939 to 1945 U.S. military’s air transport components expanded from a limited national and continental transport of goods and aircraft to a global air transport network in support of U.S. air, sea and ground operations. By the end of the war, Air Transport Command and its counterparts had hauled men and machines around the world, and transported over 650,000 tons of supplies to China. Though questions remain regarding the military necessity of these supplies to the Chinese government, what cannot be questioned is the degree to which the support of military and diplomatic missions by air was proven possible. When compared to the possible cargo capacity of sealift or road/rail transportation, the numbers are somewhat staggering. The same supply total, enabled by a massive airlift effort to China, could have been accomplished by 70 Liberty

¹⁴⁴ Craven and Cate, *Army Air Forces* 7:5, 146.

¹⁴⁵ Plating, 227.

¹⁴⁶ Tunner, *Over the Hump*, 134.

ships or 6,500 American freight cars.¹⁴⁷ But as Craven and Cate outlined, airlift at such a scale is often a matter of necessity and can be achieved at great cost “even under the most unfavorable circumstances, if only the men who controlled the aircraft, the terminals, and the needed materiel were willing to pay the price in money and in men.”¹⁴⁸ The aircraft grew larger and more powerful, and the technologies and procedures for their utilization improved with each passing day. The men of CBI proved that such a difficult task was surmountable, and the knowledge they gained would be put to use several years later in the skies of Berlin.

¹⁴⁷ Craven and Cate, 151.

¹⁴⁸ *Ibid.*, 151.

Chapter 3

Toward a Modern Air Force: Berlin Airlift

The United States Air Force has benefitted enormously from the training this operation has afforded...It has convinced us, moreover, that we can fly anything, anywhere, anytime, and that the future of military air transport is in big aircraft.

– General. Hoyt S. Vandenberg

During the final months of World War II the Allied leaders of Great Britain, the United States and the Soviet Union met for the final time at Yalta in the Crimea. It was here they hoped to settle the postwar European order and bring peace to a continent ravaged by war twice since 1914. At the center of this great confluence of power was the notion that Germany must be dealt with strongly, effectively, and in a fashion where “Nazism and militarism were to be utterly purged and defeated and that Germany’s future would lie entirely with the Allied victors.”¹⁴⁹ The German nation would be divided among the victorious Allies, each managing a portion of the war-torn state, and governing under the authority of the four-party Control Council. Early American plans had called for a harsh treatment of the German nation, but as occupation eventually turned toward rebuilding and growth, it soon became clear that the United States could not continually punish the Germans if it wished to foster peace and prosperity. The Soviet authorities understood the political value of a weakened Germany and “did little to evolve practices or build institutions that promised Germans within their zone...a stake in

¹⁴⁹ William I. Hitchcock, *The Struggle for Europe: The Turbulent History of a Divided Continent, 1945 to Present* (New York: Anchor Books, 2003), 22.

their success.”¹⁵⁰ Over the next several years the Americans and the Soviets began creating “spheres of influence,” radiating outward from Berlin, and would begin to probe each other’s strengths and weaknesses.¹⁵¹

Among the victorious nations several important questions set in motion the events culminating in the Berlin Airlift, and such as the Cold War itself. In light of the previous six years of armed conflict, millions of lives lost, and untold destruction across Europe, what was the proper response to Germany by the victorious powers? As tensions between the occupational authorities began to rise in 1947 it was soon clear that the once great alliance had begun to crumble under the weight of competing geopolitical aspirations and socioeconomic systems. The Soviets, continually weary of yet another future war with a powerful Germany, wished to bleed the vanquished nation to the bone. Although technically bound by a quadripartite agreement, the Soviet controlled sectors of Germany during the immediate postwar period were brutally and ruthlessly savaged by a wave of Red Army soldiers bent on extracting revenge.¹⁵² The physical segregation of the German state had been decided by the Allied powers some time earlier, and still even “the briefest look at a map shows that these arrangements held not only the seeds but the buds and even the blooms of discord and crisis.”¹⁵³

Over the following months and years, German citizens found themselves at the root of a constant battle of will between conflicting economic and political ideologies.

¹⁵⁰ Gaddis, 44-45.

¹⁵¹ Thomas G. Paterson, *On Every Front: The Making and Unmaking of the Cold War*. Rev. ed. (New York: W.W. Norton, 1992), 43.

¹⁵² Ann and John Tusa, *The Berlin Airlift* (New York: Sarpedon, 1998), 41.

¹⁵³ Thomas Parrish, *Berlin in the Balance: The Blockade, The Airlift, The First Major Battle of the Cold War* (Reading, Massachusetts: Addison-Wesley, 1998), 25.

Where there once was hope of a lasting Allied cooperation, there existed a rash of continued bureaucratic quibbling and inaction. All the while the citizens of occupied western Germany risked starvation if further problems arose. Only through cooperation by the Allied Control Council could these issues be resolved, but it was quite clear that cooperation was not the order of the day, and for all intents and purposes, “the four zones operated in isolation from each other and withered.”¹⁵⁴ It was this environment that set the stage for the events of the spring of 1948. The Western sectors, growing tired of continued stonewalling by their Soviet counterparts began a coordinated plan of coordination and cooperation in the hopes that unification would enable their sectors to more quickly rebound from the harsh postwar economic environment. Key to the economic and political reconstruction of the Western-controlled portions of Germany was a unified currency under which a more efficient trade system could be established.¹⁵⁵

As April approached and further talks broke down, the Soviets issued orders on March 30, stating that any passengers would be required to show identification papers, and that Soviet troops would be required to inspect the cargos of any trains or trucks traveling through the Soviet Zone of Occupation into Berlin. Upon hearing this news the initial response from General Lucius Clay and others was indignation and anger, and he immediately requested permission to resist by force any attempts to interfere with American trains, but this request was made in vain. By the next morning his reply had been received, and the foundation of the airlift had been laid. Travel by train and truck

¹⁵⁴ Tusa, 66-67.

¹⁵⁵ Robert Jackson, *The Berlin Airlift* (Wellingborough, Northamptonshire: Patrick Stephens, 1988), 27.

was at a standstill, and General Clay had decided that since “he could not force the trains through the illegal Soviet controls, he would stop using them altogether.”¹⁵⁶ The so-called “April Crisis” prompted the initial ad hoc stages of the Berlin Airlift, although not even the commanders of the lift process had any inkling of what lay ahead.

The end of the war brought about major changes for the U.S. military. Following a pattern established from the early years of the republic, America’s fighting men and women returned home in droves and the machines of war were laid to rest. Throughout the military, units downsized, men left the service, and the once fierce “Arsenal of Democracy” began to fade away into what many *hoped* would be a long-deserved peace. For his part, President Harry Truman pressed the aggressive drawdown of forces as a means of reducing overall government expenditures by limiting the defense spending to “no more than 20-24 percent of the peacetime budget.”¹⁵⁷ The War Department began a series of studies as early as 1943 to shape the establishment of a new postwar military structure, but entrenched military and political forces within the Army and Navy fought against the rapid demobilization as each viewed its own capabilities as indispensable to national security. The matter was further complicated by a lack of direction provided by a ‘defined adversary’ as both Germany and Japan lay in ruins and the Soviet Union was still considered an ally, however chilly the relationship had become.¹⁵⁸ As the service chiefs jockeyed for political favor and their “fair” share of the dwindling economic resources, the Army Air Forces were poised to play a major role in any postwar force

¹⁵⁶ Michael D. Haydock, *City Under Siege: The Berlin Blockade and Airlift, 1948-1949* (Washington: Brassey’s, 1999), 126.

¹⁵⁷ Michael J. Hogan, *A Cross of Iron: Harry S. Truman and the Origins of the National Security State 1945-1954* (Cambridge: Cambridge University Press, 1998), 73.

¹⁵⁸ Futrell, 214.

posture. Without a doubt, the two major World Wars of the previous thirty years showed the importance of air superiority, and planners saw the need to retain a significant and capable air force. The true question of the period was not if, but how and under whose authority the new aerial contingent would operate in the postwar era.

With an eye toward Europe, the Joint Chiefs of Staff (JCS) authored a study on postwar airlift needs in and around Western Europe, highlighting aviation's role in the rebuilding process. The JCS imagined an abundance of aviation resources, both civilian and military, that would operate throughout the zone of occupation. Each zone would create much of its own infrastructure, manage aviation related communications and weather forecasting, and enable civilian airlines to do the same.¹⁵⁹ To this end, an Air Safety Center was created to ensure safe and equitable use of German air space among the Allies.¹⁶⁰

As the Army and Navy competed for resources, civilian leaders outlined a need for improved service coordination and a streamlined procurement system. World War II showed the necessity of an integrated defense establishment combining previously independent services under one umbrella organization. On one hand, James Forrestal "envisioned a postwar Navy of approximately five hundred thousand sailors, fifty-eight thousand officers, and more than one hundred thousand marines."¹⁶¹ On the other, some Army Air Force planners called for a total postwar strength of 105 groups, to be kept at

¹⁵⁹ Synopsis of Joint Chiefs of Staff Paper 1151/3, February 21, 1945, "European Air Transport in the Transitional Period."

¹⁶⁰ Lucius D. Clay, *Decision in Germany* (New York: Doubleday, 1950), 115.

¹⁶¹ Hogan, 74.

maximum readiness and “ready for immediate combat.”¹⁶² Each service viewed itself as *the* most vital component to a robust national defense. One of the earliest and most detailed analyses of the postwar AAF framework was constructed by Brig. General Orvil A. Anderson, Assistant Chief of the Air Staff for operational plans, and foresaw a military structure centered on aerial resources, including roughly 7,000 cargo aircraft.¹⁶³ Central to U.S. foreign policy of the era was the deployment and utilization of the U.S. nuclear weapons arsenal. Both AAF and Navy leaders pushed for central control, each offering to lead the nation’s armed forces into the new era of U.S. global leadership.

In order to consolidate defense priorities, the National Security Act of 1947 unified the U.S. military, while creating an independent and coequal U.S. Air Force. The debate was not complete, however, as both the U.S. Navy and Air Force retained significant operational redundancies and continued to press each other and the rest of the defense establishment over roles and mission. To quell further dissension, President Truman also issued a clarifying Executive Order defining the function and role of each uniformed service. As such, the Air Force was given authority to

organize, train, and equip air forces for air operations including joint operations; to gain and maintain general air superiority; to establish local air superiority where and as required; to develop a strategic air force and conduct strategic air reconnaissance operations; to provide airlift and support for airborne operations; to furnish air support to land and naval forces including support of occupation forces; and to provide air transport for the armed forces except as provided by the Navy for its own use.¹⁶⁴

¹⁶² *Ibid.*, 102.

¹⁶³ Herman S. Wolk, *Planning and Organizing the Postwar Air Force 1943-1947* (Washington, D.C.: Office of Air Force History, 1984), 47.

¹⁶⁴ Futrell, 196.

As such, both the functional and organizational structure of U.S. air transport resources had fundamentally shifted toward the new U.S. Air Force. Both Army and Navy units alike would be required to utilize Air Force transports for their support needs, with a few general exceptions. As shown above, the army and navy operated independent air transport divisions, of which the Army's Air Transport Command greatly outnumbered its naval cousin the Naval Air Transport Service. Despite the service unification of 1947, it was not until 1948 that Secretary of Defense James Forrestal ordered the consolidation of ATC and NATS into the Military Air Transport Service (MATS). As the next evolutionary step of U.S. air transport, MATS was the first 'unified' command combining personnel from both services under one roof and "directed...to transport personnel and cargo for all agencies of the National Military Establishment and also for other governmental agencies, as authorized."¹⁶⁵ From the Ferrying Division to ATC, and now MATS, U.S. military air transport had evolved into a worldwide force, unified under a singular command structure supporting all U.S. diplomatic and military missions around the world. By August 1, 1948 the unified force included an insufficient total of 766 aircraft, the majority of which were C-47s and C-54s.¹⁶⁶ Both Air Force and Navy leaders knew a significant adjustment period would be required, but few could have seen the nation's next great geopolitical struggle just over the horizon.

As tensions between the occupational authorities began to rise in 1947, the once great alliance began to crumble under the weight of competing geopolitical aspirations

¹⁶⁵ Wolk, 220-21.

¹⁶⁶ United States Air Force History Office, *A History of the United States Air Force 1907-1957*, ed. Alfred Goldberg (New York: D. Von Nostrand Co., 1957), 150.

and socioeconomic systems. Continually weary of yet another future war with a powerful Germany, the Soviets wished to bleed the vanquished nation to the bone. Although technically bound by a quadripartite agreement, the Soviet-controlled sectors of Germany were brutally savaged by a wave of Red Army soldiers bent on extracting revenge.¹⁶⁷ The physical segregation of the German state had been decided by the Allied powers some time earlier, and still even “the briefest look at a map shows that these arrangements held not only the seeds but the buds and even the blooms of discord and crisis.”¹⁶⁸

Even during the ‘peaceful’ days of the postwar German occupation, Soviet forces routinely showed their willingness to hamper the movement of U.S. and British forces. Despite earlier assurances by Marshall Georgi Zhukov that the United States and other Allied nations would retain access to Berlin by road and rail, no contractual obligation existed *in writing*.¹⁶⁹ When agitated, the Soviets could restrict the flow of men and materiel into the sector by slowing road and rail traffic throughout the region. Complicating matters further was the communist-inspired coup in Czechoslovakia, and a civil war in Greece, which gave American political and military leaders many reasons to suspect further Soviet aggression.¹⁷⁰ Military authorities soon began to propose alternate methods for the short-term supply of the military garrisons in Berlin should the Soviet intransigence escalate. As early as April 1948, the Office of Military Government, United States (OMGUS) began planning for the utilization of airlift as the western occupying

¹⁶⁷ Ann and John Tusa, *The Berlin Airlift* (New York: Sarpedon, 1998), 41.

¹⁶⁸ Thomas Parrish, *Berlin in the Balance: The Blockade, The Airlift, The First Major Battle of the Cold War* (Reading, Massachusetts: Addison-Wesley, 1998), 25.

¹⁶⁹ Roger D. Launius and Coy F. Cross II, *MAC and the Legacy of the Berlin Airlift* (Scott AFB, Illinois: Military Airlift Command, 1989), 3.

¹⁷⁰ Paterson, 71-72.

forces refused Soviet inspections of trains bound for Berlin. Initially restricted only to perishable items and mail, the “April Crisis” began the process of reorganization within the U.S. Air Forces in Europe (USAFE), moving the 53rd Troop Carrier Squadron from Tempelhof Air Base to Rhein-Main.¹⁷¹ When the call came for airlifting resources into Berlin beginning April 4, 1948, C-47’s from the 61st Troop Carrier Group were ordered to carry 80 tons daily “exclusive of passengers and mail,” comprised primarily of fresh milk, vegetables, commissary items, and other materials deemed necessary for the continued support of the U.S. garrisons.¹⁷²

The reorganization and subsequent (limited) airlift began what would be later become known as the “Little Lift,” running from April 1948 to the beginning of the full-blown “Operation Vittles” in June. The Little Lift missions were much more limited in terms of their overall objectives as well as the focus of their attention. Rather than looking to supply the city’s entire population, Little Lift missions were concerned with the support and supply of the city’s military garrisons. Few could have anticipated the increased provocations on the horizon. Even the Soviets saw little use in hampering these early airlift missions as “it was unlikely, in their estimate, that an airlift could succeed.”¹⁷³

The political mechanism enabling this early stockpiling by air was the creation of three air corridors into Berlin for use by Allied forces. Early recommendations called for

¹⁷¹ “USAFE and the Berlin Airlift, 1948: Supply and Operational Aspects,” April 1, 1949, Box 809, RG341, 5; and Daily Summary Number 1, OMGUS, April 5, 1948.

¹⁷² “USAFE and the Berlin Airlift, 1948: Supply and Operational Aspects,” 3.

¹⁷³ Roger G. Miller, *To Save a City: The Berlin Airlift, 1948-1949* (College Station: Texas A&M University Press, 2000), 26

a total of six twenty-mile wide air corridors between Berlin and the cities of Hamburg, Hanover (Buckeberg), Frankfurt, Warsaw, Prague, and Copenhagen. Yet later, “during subsequent negotiations, the Soviet Union argued that only three, those with Hamburg, Buckeberg, and Frankfurt were actually necessary.”¹⁷⁴ Whereas the Soviets readily blocked road and rail traffic, so too did they hint at possible interferences of both commercial and military air traffic. Early attempts to interfere with free and open use of the air corridors occurred as early as March 17, 1948 when several proposals were submitted to the Combined Services Directive. Intended to limit aerial access, the proposals stated:

1. Proficiency training flights were to be prohibited in the corridors
2. Aircraft would be restricted from Instrument Flight Rules (IFR) when operating “in clouds” except during descent operations at Tempelhof
3. No local IFR flying would be permitted
4. Night flying in the corridor would be permitted
5. Information would have to be submitted to Soviet authorities on all proposed operations in the corridors and in the Berlin zone twenty-four hours before the start of such flights¹⁷⁵

In the end, no such interference materialized, particularly due to the difficult nature of enforcing the requirements of the proposals. The air corridors remained open, should the western powers need them, in the event of an increasingly tense political situation at the Control Council.

¹⁷⁴ Ibid., 7.

¹⁷⁵ “USAFE and the Berlin Airlift, 1949: Supply and Operational Aspects,” 1-2.

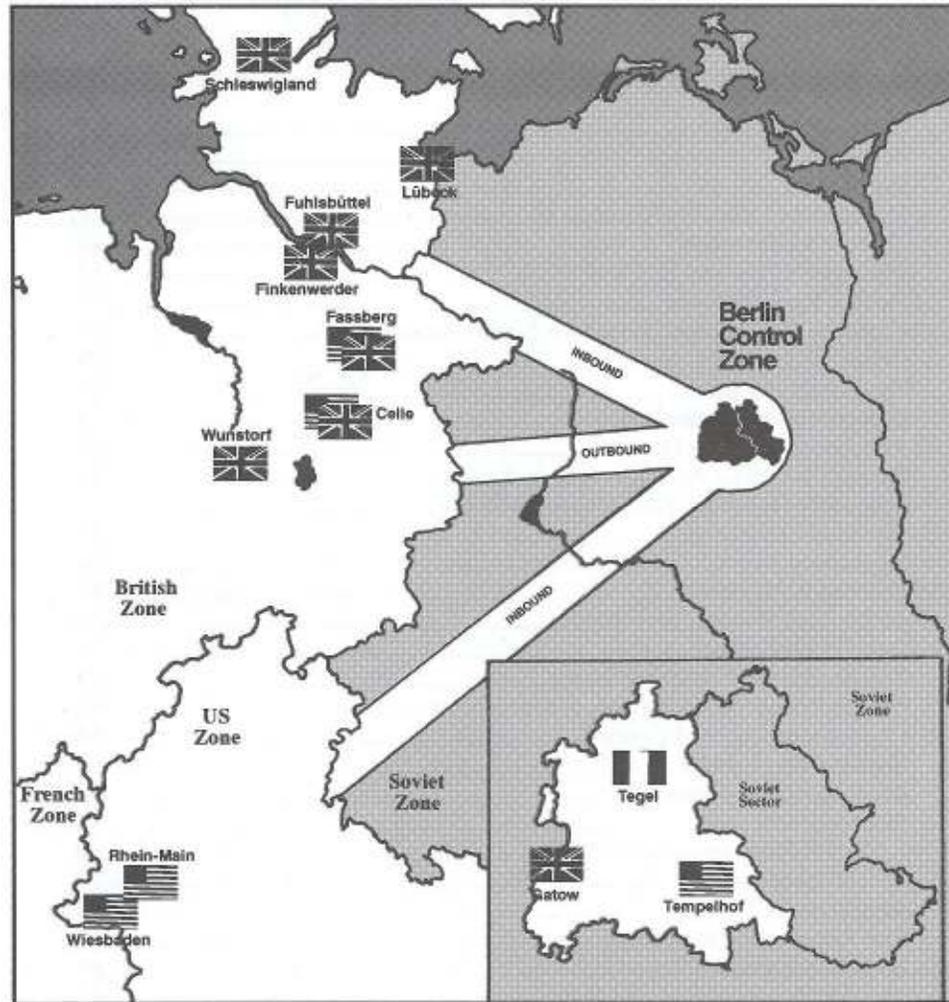


Figure 3.1 Berlin Airlift bases and flight corridors

<http://www.afhso.af.mil/shared/media/photodb/photos/110302-D-LN615-011.jpg>

(Accessed November 8, 2014)

Due to the last minute nature of the Little Lift missions, aircraft, spare pilots and crews were drafted from throughout the theater, many of whom had long since been given other non-flying duty. Many 'priority' cargoes were set on a flight-by-flight basis as no system was in place to streamline cargo selection and loading, much of which was undertaken by German civilians, mostly displaced persons or DP's, under the supervision

of the U.S. military.¹⁷⁶ The shortage of qualified personnel did not end with pilots and aircrew, as ground crew, mechanics, and logistical personnel arrived late as well. Rather than arriving prior to the establishment of air operations, many involved in the “housekeeping” operations arrived the same day that operations were scheduled to begin.¹⁷⁷

Alongside their American cousins, HQ British Army of the Rhine (BAOR) made a request as early as April 4, 1948 of the British Air Forces of Occupation (BAFO) to supply the Berlin garrison in the event of a full blockade. Subsequently, a conference was held April 15 to discuss the requirements for the sustainability of British garrisons in Berlin, should it become necessary. For a long-term blockade, it was thought

the airlift would have to deliver 87 tons a day, [although] for a short period the garrison could manage on 65 tons; the chances were the operation would last a month. The plan must envisage the evacuation of 2,000 dependents, each with 65lbs of luggage....BAFO and Transport Command would provide a small operating HQ, a serving echelon, and two air movement sections of six officers and fifteen men with sixteen aircraft, eight of which would put in three daily return flights each from Wunstorf in the zone to Gatow in the sector.¹⁷⁸

Utilizing what splintered air assets remained in theater, the British contingent would rely on several squadrons of C-47 Dakotas from 46 group of RAF Waterbeach, for an estimated daily lift of 130,000 pounds. Upon receiving final orders on June 24, 1948, 46 Group was to leave Waterbeach and be operational within 48 hours under the codename

¹⁷⁶ Miller, 21.

¹⁷⁷ “USAFE and the Berlin Airlift, 1948: Supply and Operational Aspects,” 107.

¹⁷⁸ Tusa, 115.

Operation ‘Knicker.’¹⁷⁹ The British, like the Americans, relied heavily on the C-47 as the backbone of their airlift and transportation force. First seeing military action in 1941, most of these Dakotas had thousands of flight hours in every theater of World War II. In the case of the American fleet, many of the C-47 aircraft initially used in the airlift to Berlin still wore faded remnants of their pre-invasion stripes from D-Day.¹⁸⁰ The Americans could muster roughly 102 C-47s for use in airlifting supplies into Berlin for use by the military garrisons, and out-lifting dependents and other unnecessary items and equipment. In addition to these, the RAF was operating roughly 150 aircraft of varying types, the majority also being C-47s, but included nearly forty of the larger four-engine AVRO *York* transports.¹⁸¹ The *York* was a larger and more capable airlifter derived from the Lancaster bomber. Though able to carry significantly more overall tonnage than the C-47, the *York* was far fewer in number and had significant maintenance issues. Several *York* aircraft converted for tanker use were particularly useful for the transport of liquid petroleum-oil-lubricant (POL) loads.¹⁸² On average they were capable of carrying up to 5.5 tons of liquid cargo per trip, and accomplished the task more efficiently than other aircraft.

Before long, events on the ground proved these preparations worthwhile when Marshall Vassily Sokolovsky, Soviet representative and that month’s chair of the Control Council, called a meeting for March 20, 1948. What then transpired was less unusual for the substance of the meeting than for the manner in which it ended. As the repetitive and

¹⁷⁹ Jackson, 45.

¹⁸⁰ *Ibid.*

¹⁸¹ Aviation Operations Magazine, *A Special Study of Operation Vittles*, 8.

¹⁸² “USAFE and the Berlin Airlift, 1948: Supply and Operational Aspects,” 192-193.

predictable arguments reached their crescendo, “suddenly there was a nasty shock” as Marshall Sokolovsky unilaterally declared the meeting adjourned and left the hall, with the entire Soviet delegation in tow.¹⁸³ The Soviets had been increasingly insistent upon inspecting the papers and even the cargo of inbound Western trains for some time, but it had been merely a nuisance item rarely enforced after considerable delay and protestations by the U.S. military. Soon thereafter what had begun with train inspections and roadblocks quickly became an all-out blockade.

It was unknown whether the disruptions would amount to anything more than a repeated irritation capable of resolution through diplomatic means or a serious blow to the political aims of the United States and its Allies.¹⁸⁴ As members of the Allied Control Council continued to seek common ground, USAFE began ramping up planning efforts to aid the stockpiling of resources within Berlin in preparations for what was to come. Available airlift resources in 1948 were far below previous wartime strength as USAFE controlled only two troop carrier groups of C-47s, not the larger and more capable C-54s used to great effect during the last year of Hump operations. Both the 60th and 61st Troop Carrier Groups began “small scale” operations under the authority of Brigadier General Joseph Smith by June 26, 1948.¹⁸⁵

On June 22, 1948 General Lucius Clay, military Governor of the U.S. sector in Germany, ordered General Curtis LeMay and USAFE to “utilize the maximum number of airplanes” to transport supplies into Berlin, putting into motion what would soon be

¹⁸³ Tusa, 102.

¹⁸⁴ Central Intelligence Agency, “Effect of Soviet Restrictions on The US Position in Berlin,” June 14, 1948.

¹⁸⁵ Interim Report, Berlin Air Lift Task Force, 30 June 1948 to 30 July 1948, 1.

deemed the Berlin Airlift or more colloquially, “Operation Vittles.”¹⁸⁶ Initial operational command of the airlift went to General LeMay, Commanding General USAFE, and he had at his disposal roughly 107 war-weary C-47 *Skytrain* transport aircraft of the 60th and 61st Troop Carrier Groups already in Germany. In addition to the C-47s, General LeMay immediately requested “approximately” thirty C-54s to support the air operation.¹⁸⁷ Along with their Royal Air Force counterparts, LeMay and his deputy commander Brig. Gen. Smith increased the rudimentary airlift system to the blockaded zones, stockpiling supplies and out-lifting dependents and nonessential personnel.

For all his wartime gifts, the establishment and operation of an efficient airlift machine was not within General LeMay’s experience. He understood the challenges inherent in such an undertaking, and made steps to correct perceived shortcomings. Shortly after operations began, LeMay issued a statement outlining estimated airlift totals of approximately 225 tons daily, and a maximum daily output of 500 tons if he were given the larger C-54 aircraft.¹⁸⁸ Though 39 C-54s were ordered from bases around the world, it would be some time before significant numbers arrived.¹⁸⁹ Later estimates by General Smith’s staff pushed the estimates to nearly 1500 tons daily by July 10.¹⁹⁰ These numbers, however, were significantly inflated based on a lack of airlift experience and general naiveté in relation to the establishment of airline protocols. As LeMay and Smith

¹⁸⁶ *Ibid.*, 11.

¹⁸⁷ “USAFE and the Berlin Airlift: Supply and Operational Aspects, 1948,” 12.

¹⁸⁸ *Ibid.*, and Chief of Staff, AF to USAFE, 28 June 1948. Message USAFE in number 12936, in June 1948 Cable file, Air Force Historical Research Agency (AFHRA).

¹⁸⁹ Chief of Staff, USAF, to USAFE, June 26, 1948.

¹⁹⁰ Daily Log of Operation Vittles 30 July 1948, 8.

would discover, the effective utilization of these resources required a knowledge base not learned in combat commands.

As stated above, the U.S. military establishment of 1948-1949 was still reeling from the unification battles following the National Security Act of 1947. During this period, the independent branches of the service, particularly the Navy and the Air Force, felt as though their unique needs and technical qualifications were so drastically different as to retain separate air transport elements. But the existence of a unified air transport organization such as MATS was not altogether welcomed in Berlin. Many within the defense establishment viewed MATS and the Berlin crisis as existing along divergent paths as “the separation of tactical and strategic airlift continued, a point validated at the highest levels of the new defense decision-making process.”¹⁹¹ Due to functional limitations of the airlift community, a significant portion of airlift resources were dedicated to the support of strategic nuclear forces around the world. This shift kept MATS and Berlin apart, as commanders in the United States were reluctant to relinquish control of strategic airlift capability to Germany in light of a possible Russian counter-attack, despite General Tunner’s recommendation that MATS should take over as it was specifically organized for sustained heavy airlift.¹⁹² In the end, however, MATS aircraft would be allotted to the airlift, but under the authority first of USAFE, and later of the Combined Airlift Task Force (Provisional) (CALTF).

¹⁹¹ Charles E. Miller, *Airlift Doctrine* (Maxwell Air Force Base, Alabama: Air University Press, 1988), 175.

¹⁹² *Ibid.*, 177.

From the very beginning, General Smith's headquarters was separated into two main complementary divisions: Supply and Maintenance, and Operations.¹⁹³ Only later would a Personnel section be added, once it was understood that the temporary duty (TDY) would be inevitably prolonged for so many men. It is significant to note that at this early juncture in U.S. military aviation history little can be said in terms of forward-deployment of parts and supplies away from the continental United States. Even the creation of the MATS in June 1948 "excluded the responsibility for tactical air transportation of airborne troops and their equipment, as well as the initial supply and resupply of units in forward combat areas," a division that would stifle early airlift progress by complicating supply chain efficiency with unnecessary bureaucratic wrangling.¹⁹⁴ Though some significant stockpiles had once been stationed globally during wartime, little of what one could recognize as a universal presence of men and materiel was available, let alone logistically accessible. As such, it is not surprising to discover early analysis of the situation in Germany by contemporary staffers placed "proper servicing and maintenance of the airlift planes [as] the second most serious problem" confronting the men of the Berlin Airlift, second only to flying under instrument conditions during the foul German weather.¹⁹⁵ Maintenance teams simply did not have the necessary access to tools and spare parts necessary for the operation of a large-scale mission.

¹⁹³ "USAFE and the Berlin Airlift: Supply and Operational Aspects 1948," 45-46.

¹⁹⁴ Miller, *Airlift Doctrine*, 174.

¹⁹⁵ "USAFE and the Berlin Airlift, 1948: Supply and Operational Aspects," 90.

Despite being in command only four weeks, General Smith's headquarters oversaw a significant increase in airlift resources, as well as the expansion of the operation throughout the region. By the end of July, 307 pilots had reported for duty on the airlift (of the 320 slots available per early quotas), and each available aircraft was rushed into operation as quickly as possible.¹⁹⁶ Like all other operational structures during the initial months of the Little Lift and Operation Vittles missions, supply and maintenance procedures largely fell upon the operational unit from which a particular aircraft or unit arrived.¹⁹⁷ As newer, larger aircraft such as the C-54 arrived in theater, a more rigid supply and maintenance structure began to emerge as the ad hoc nature of existing resources could not meet demand since "USAFE had no supply plans or channels for C-54's at the inauguration of the airlift."¹⁹⁸ Accordingly, the establishment of a base set of maintenance procedures was one key development during Smith's short stint as commander of the Berlin Airlift. Drawing upon his experience as an airmail pilot for the Army Air Corps during the early 1930s, General Smith set up a duty and maintenance schedule whose goal was a minimum 65 percent operational rate.¹⁹⁹ As a means of easing congestion and centralizing logistical chains, General Smith ordered all C-54 maintenance and inspections be undertaken at Rhein-Main as this facility retained facilities appropriate for aircraft of that size, and the first five C-54 aircraft arrived in theater by July 2, 1948.²⁰⁰ In contrast, the airfields at Tempelhof and Wiesbaden (among

¹⁹⁶ HQ Berlin Airlift Task Force, *Interim Report 'Operation Vittles'* "Log of Operation Vittles," July 30, 1948, 3.

¹⁹⁷ The origin of

¹⁹⁸ "USAFE and the Berlin Airlift, 1948: Supply and Operational Aspects," 91.

¹⁹⁹ Launius, 11.

²⁰⁰ "Log of Operation Vittles 30 July 1948," 7; Daily Log of Operation Vittles 2 July 1948.

others) were significantly less capable of handling the influx of traffic, both due to the number of takeoffs and landings as well as the overall size and weight of aircraft utilized.

Unlike the majority of airfields within CBI, postwar Germany still retained a significant amount of rudimentary infrastructure from which a military air operation could commence. In a similar fashion to extant facilities in British-governed India, the facilities in Eastern Germany (particularly Berlin's Tempelhof and Gatow), were in dire need of improvement and modernization in order to cope with the massive daily stresses incurred by the American cargo aircraft. As one contemporary account notes, at the beginning of the Airlift, Tempelhof air base remained largely "a grass field, with one sodded runway, and had been used only for comparatively small aircraft and fighter planes during the latter part of the war."²⁰¹ Early attempts at runway and taxiway upkeep proved somewhat futile, despite the comparatively lighter weight of aircraft such as the C-47 used at this point of the airlift. The makeshift nature of USAFE's logistical support structure manifested itself frequently. During this period, repair crews laden with buckets, picks, shovels, and other equipment would hurriedly run out onto the runway after the successful landing, patching and repairing as quickly and professionally as possible until a loud whistle alerted them to the impending arrival of yet another aircraft, at which time they scurried off to the side once again. Over and over this ritual was repeated until larger more permanent repairs were completed.²⁰²

²⁰¹ Aviation Operations Magazine, *A Special Study of Operation Vittles* (New York: Conover Mast Publications, 1949), 58.

²⁰² Miller, *To Save a City*, 108.

Located at the very heart of Berlin, Tempelhof was once the very pride of Germany's aviation community, and stood at the center of the U.S. distributional hub for most supplies into the city. By July 1, 1948 General LeMay recognized the "critical" nature of the runway problem, and issued orders to Lt. Colonel M. Falco of the Air Engineer Division to begin runway surveys and make recommendations. Falco soon thereafter "recommended that a second asphalt-PSP [Pierced Steel Plank] runway 5,500 feet in length, be built. His views were approved and work began on July 8, 1948."²⁰³ Manual labor for the demolition and construction projects at Tempelhof and other facilities throughout the Airlift Task Force area of operations was generally provided by the Germans. Given the general level of devastation inflicted upon the population during the immediate postwar period, multiplied greatly by the ever-crumbling local economies, increasing political tensions and lack of standardized currency, any amount of work found countless workers eager for a small wage and a meal.

Manual construction on what would be designated the south runway was performed by German contractors, with the vast majority of materials, supplies, POL products, heavy machinery, steel, and aluminum being shipped via air into the zone of occupation. One of the only indigenous supplies readily available in abundant quantities was rubble from broken bricks and stone created by Allied air raids, which eventually took the place of crushed limestone. Heavy rains during this period, which were feared to weaken the foundation of the remaining center runway, also necessitated the delegation of some remaining sod runways for the sole use of C-47 aircraft during July and August

²⁰³ "USAFE and the Berlin Airlift 1948: Supply and Operational Aspects," 209. Clarification in original text.

1948.²⁰⁴ Significant progress had been made by August, but it was clear to many that even more capacity would be needed should the airlift continue beyond its very limited existing operational bases. On August 20 LeMay ordered construction to begin on yet another (third) runway at Tempelhof.²⁰⁵

The British airfield at Gatow was not altogether different from Tempelhof in that its resources were limited and rudimentary, yet quite suitable for postwar operations of the type most frequently carried out by RAF detachments. Unlike its more expansive cousin, Gatow had only one runway 1,500 feet in length with PSP laid directly upon the ground. Although RAF planners had always intended to fortify the earlier steel runway, no true attempts were made until after the onset of the blockade and airlift in 1948.²⁰⁶ In addition to this utilitarian approach, a more expansive and complex new runway system comprising some 2,000 yards of concrete runway with attached taxiways and hardstands began construction in 1947, but by the onset of the airlift was only three-quarters complete. One key difference was the manner in which Gatow was left without connection to a railway spur. But, in what would prove to be a fortuitous turn of chance,

there was the Havel Lake just to the east with waters connecting to the River Spree and the network of canals which covered Berlin. The blockade of June 24 had trapped forty barges on the Havel; on 28 June ten more slipped into the city. One tug could pull 3,000 tons for twenty-four hours while consuming only a ton of coal; diesel [trucks] needed 5 tons of fuel to do the same work; petrol-driven vehicles 15 tons. The Russians had provided the Western sectors of Berlin with one asset.²⁰⁷

²⁰⁴ Ibid., 209-11.

²⁰⁵ Miller, *To Save a City*, 109.

²⁰⁶ Parrish, 223.

²⁰⁷ Tusa, 147-48.

After considerable effort, Gatow's existing and improved surfaces continued to provide functional support for inbound airlift services until such time as the additional resources were allocated, and the airfield at Tegel was fully functional.

Of all the infrastructure expansions during the airlift period, Tegel most closely influenced the future air expeditionary force template by completely *creating* an aviation infrastructure where none previously existed. Significant remodeling and construction efforts at Rhein-Main and Wiesbaden limited U.S. airlift capacity during the summer of 1948. To alleviate the problem, General LeMay ordered the development of a new airfield in the French sector of Berlin. A site was selected in August 1948, with a completion deadline set for six months later. Similar to improvements and additions at Tempelhof, the airfield at Tegel was largely supported by crushed brick and other masonry material from buildings destroyed by Allied bombing.

Initial plans called for "a runway 5,500 feet in length and 120 feet in width, as well as for necessary taxi-ways, parking aprons and access roads."²⁰⁸ Heavy construction equipment, like building supplies, was a significant challenge as few pieces were available in Berlin, and the available equipment was too large and unwieldy for transport via even the largest aircraft such as the C-74. To deal with the problem, American engineers simply cut the equipment into pieces, flew the pieces to Berlin, and reassembled them on site.²⁰⁹ The scope and importance of the airfield led General Tunner to provide significant input on the design and orientation of the Tegel airfield. He viewed Tegel, alongside Gatow and Tempelhof, as one piece of a single airfield system and not

²⁰⁸ "USAFE and the Berlin Airlift 1948: Supply and Operational Aspects," 218.

²⁰⁹ Tunner, *Over the Hump*, 211-12; and *A Special Study of Operation Vittles*, 60-62.

multiple independent airfields. He oriented the Tegel field to align parallel with other airfields as a means of eliminating unnecessary cross-traffic in Berlin skies.²¹⁰ After several months of intense construction, USAFE personnel took control of Tegel on November 18, 1948 and the first C-54s landed one month later. Though the airfield's infrastructure (landing lights and communications) were not completed until January, and heavier runways capable of handling C-74s sometime later, the completion of Tegel highlighted the value of purpose-built installations over adapted airfields.²¹¹

In comparison to its American counterpart, the British Area of Occupation, from which the RAF supplied its share of resources, was relatively well off in terms of airfields and other facilities. British fields including Celle, Lübeck, Fuhlsbüttel, Finkenwerder (a seaplane base), and Wunstorf were primarily Luftwaffe (German AF) fighter bases free of serious battle damage, and had been subsequently improved and updated with more suitable navigation and communications equipment by the RAF.²¹² Unlike Gatow, Wunstorf had the advantage of being situated near a railway, but its relatively small size and lack of additional infrastructure for support personnel and vehicles made it less adequate for heavy transport purposes.²¹³ These bases would, however, prove invaluable for the myriad specialized transportation aircraft utilized by private contractors and the RAF alike throughout the Berlin Airlift, and would nonetheless prove their worth beyond that as a home for large four-engine heavy transports.

²¹⁰ Slayton, 144.

²¹¹ Interview of Dr. William Sprague with First Lieutenant L.E. Stockton, USAF, Tegel Airfield February 16, 1949. Reproduced and cited in "USAFE and the Berlin Airlift 1948: Supply and Operational Aspects," 218-19.

²¹² Miller, *To Save a City*, 50.

²¹³ Tusa, 146.

The role of civilian transports during the Berlin Airlift is an often forgotten component that enabled the British contingent a greater degree of flexibility and overall success. As Robert Jackson notes in his analysis of the British side of the airlift, “as the daily Airlift (sic) tonnage requirement grew, it was soon realized that sufficient military aircraft could not be spared to provide the necessary lifting capacity.”²¹⁴ In order to increase capacity, the RAF contracted several civilian firms specializing in the transportation of special cargoes (particularly fuel and oils) via aircraft such as the *Lancastrian*, a transport version of the legendary *Lancaster* bomber, Bristol freighters, Handley Page *Halifax*, and of course the DC-3. These firms provided a small yet valuable contribution to the overall British effort by transporting nearly 147,000 tons of freight over 22,000 flights.²¹⁵

The American zone of occupation, on the other hand, was much more limited in terms of available aviation resources, having but two major airports suitable for outbound airlift use: Wiesbaden and Rhein-Main. From early on, Rhein-Main air base would be utilized as the central traffic control point for the U.S. airlift. Located seven miles southwest of Frankfurt, Rhein-Main began its life servicing Germany’s lighter-than-air craft such as the Hindenburg. During World War II the base served as a home to Luftwaffe fighters, and later to American fighters after April 1945 when, although much of the base’s infrastructure was thoroughly destroyed due to massive bombing raids, U.S. Army engineers began the monumental task of clearing and rebuilding runways, parking

²¹⁴ Robert Jackson *The Berlin Airlift* (Patrick Stephens: Wellingborough, Northamptonshire, 1988), 97.

²¹⁵ Jackson, 122-124.

ramps, hangars, and other facilities. Within several months, by the fall of 1945, “Rhein-Main as Europe’s ‘Gateway’ again began to emerge from the rubble of war.”²¹⁶ But despite this early reemergence, much work was needed to enhance the utility of Rhein-Main as a major hub for Air Force activities, and particularly for its use in support of major heavy lift operations to and from Berlin.

For the duration of the independently operated Little Lift and Knicker operations, C-47s of both the U.S. Air Force and Royal Air Force did their part to sustain the needs of their assigned military garrisons and aid in the initial build-up of supplies in preparation for future blockades by Soviet Forces. It was clear to all, however, that a more concerted and cooperative effort would need to be made should a more permanent and large-scale airlift be deemed necessary. On its own, neither force possessed the technological or logistical capability to successfully execute a large-scale airlift. Valuable cargoes such as coal were stockpiled at a considerable pace, with nearly 15,000 tons delivered between April and June, but these limited reserves would do little during a prolonged conflict.²¹⁷ Likewise, should the need arise for the Americans and British to continue operating for an extended period of time, existing infrastructure and logistical support was insufficient. Along all fronts, supply lines, radio and navigational aids, weather services, and aircraft were unsatisfactory for this purpose,

Tactically, Smith’s headquarters relied on an expanded version of the Block System to increase tonnage delivered. Within this block system, modeled on World War II CBI tactics, aircraft were dispatched in 6-hour blocks with an aircraft taking off every

²¹⁶ *A Special Study of Operation Vittles*, 57.

²¹⁷ Miller, 23.

three to five minutes during peak operations. Complicating matters was the mix of aircraft with varying levels of performance, as C-54 cruise speeds were set at 180 mph indicated air speed (IAS), while C-47s operated at 150 mph IAS.²¹⁸ As the various blocks were slowed by weather or ground delays, the entire system could grind to a halt. Technical difficulties could also hamper smooth operations as engine malfunctions and faulty speed gauges frequently disrupted the spacing of aircraft within a given block, and limited availability of navigation beacons and Ground Control Approach (GCA) units rendered timely landing sequences extremely difficult.²¹⁹

Despite Smith's best efforts to enhance the GCA capabilities in and around Berlin through more training and resources, the air traffic control and weather forecasting elements of the Airlift Task Force (ATF) was severely limited.²²⁰ Whereas weather drastically impacted flight operations throughout World War II, it did so on a very grand scale across thousands of feet of vertical altitude and thousands of square miles. In Berlin, though, the situation was drastically different as "operations demanded knowledge of the exact ceiling and visibility, for 50 feet of visibility or ¼ mile of visibility either way could open or close an airfield."²²¹ Likewise, the American and British pilots were forced to keep strict adherence to air corridors, spacing between aircraft, communications with ground control, and flight conditions throughout the route. Smith's team had meticulously created redundant procedures to enhance safety and

²¹⁸ HQ Berlin Air Lift task Force, "Traffic Rules and Procedures for Operations Vittles," Camp Lindsey, 27 July 1948.

²¹⁹ "USAFE and the Berlin Airlift 1948: Supply and Operational Aspects," 175-76.

²²⁰ "USAFE and the Berlin Airlift 1948: Supply and Operational Aspects, 36.

²²¹ *Berlin Airlift: A USAFE Summary, 26 June 1948-30 September 1949*, 51.

improve efficiency. As stated in a memorandum titled “Traffic Rules and Procedures for Operations,” air discipline was of paramount importance:

The continuous flow, at short intervals, of aircraft engaged in Operations Vittles demands exacting air discipline on the part of all crews. Except in emergencies pilots must follow the route patterns, rules and procedures set forth....Failure to do so will sooner or later lead to disaster.²²²

When it came to the instruments of air transport, the C-47's continued to hold the line, but their “limited cargo capacity frustrated those concerned with the buildup of supplies, and their age and worn condition hindered the maintenance and supply personnel who had to keep them in the air. In one example, intergranular corrosion and cracks in the fittings of the landing-gear bracing strut attachment grounded many C-47s at a cost of some 850 hours in inspection and maintenance.”²²³ Though General LeMay and his British counterpart had both requested reserve forces of larger aircraft, it would be some time before their arrival from other locations around the world.

Over the course of May and June the situation in Germany continued to deteriorate. Intelligence Division (ID) officers in Germany began worrying as to whether Russian provocations, such as stopping coal trains and possibly halting traffic over the Elbe River bridge, would lead to yet another more complete blockade. A key communication during this period questioned Soviet intentions to this effect and wondered whether “air transport

²²² Headquarters Berlin Air Lift Task Force “Traffic rules and Procedures for Operations Vittles,” 27 July 1948, Appendix Tab F “USAFE and the Berlin Airlift 1948.”

²²³ Roger Miller, 41-42.

facilities exist for supplying German population in Western Sectors of Berlin (estimated 2 million) in addition to Western Allied Forces in Berlin.”²²⁴

Soon thereafter, General Clarence Heubner (Commanding General EUCOM), issued orders stipulating that USAFE would utilize the maximum number of flights and aircraft possible to transport supplies into Tempelhof Air Field in Berlin, officially beginning flights to be christened Operation Vittles by the United States forces.²²⁵ Still considering all potential options, General Lucius Clay remained unconvinced of the potential for airlift alone to supply the food, fuel, and other necessities for the civilian population of western Berlin. He understood full well the implications, both political and military, of failure in this new mission. Throughout the month of June, Clay pushed back and forth against his superiors in Washington toward what would become the ultimate strategy.

It was unclear at the time what, if any, additional assistance his command would receive from the American military establishment in the continental United States or from MATS outposts around the world. It was also unclear whether the British contingent could supply sufficient aircraft, men and resources to positively impact any future airlift.²²⁶ In response to queries by Clay, whom General LeMay described as “not being in the airplane business” and “obviously not [realizing] that when he talked tonnages of such prodigious amount, it was far beyond our capacity to operate,” on June 26, 1948 General LeMay put forth a preliminary analysis of continuing USAFE airlift capabilities.

²²⁴ European Command (EUCOM) headquarters to Chief of Staff, United States Army, 14 June, 1948, quoted in “USAFE and the Berlin Airlift, 1948: Supply and Operational Aspects,” April 1, 1949, p. 8.

²²⁵ EUCOM, signed Huebner, to USAFE, 22 June 1948. Quoted in “USAFE and the Berlin Airlift, 1948: Supply and Operational Aspects,” April 1, 1949, p. 11.

²²⁶ Haydock, 144-45.

²²⁷ Stating that an initial sustained lift of 225 tons daily would be possible in good weather months, but for a maximum sustained airlift of 500 tons daily as requested he advised that “in addition to present units, approximately thirty C-54 aircraft would be necessary if this command were committed to such an operation.”²²⁸ LeMay’s estimates were extremely generous given the limited support structure and challenging flight conditions, and in retrospect it is clear that General LeMay’s judgment was tainted by a lack of transport experience.

Prior to his assignment as Commander of the United States Air Forces in Europe in 1947, Lt. General Curtis LeMay’s reputation as one of the greatest air combat commanders of World War II was well established. Less well-established, and soon to be tested, was his ability to manage the frustratingly different variables inherent in diplomatic issues. His situation was made particularly worse given the political rather than military situation with the Soviets, as he would readily admit “diplomacy was an art in which no one had ever accused him of displaying talent.”²²⁹ Complicating matters further, USAFE and the ground forces supporting it were mere shadows of their former selves. Prior to and throughout the Little Lift operations, General LeMay set about the process of organizing USAFE forces, both combat and transport units, into a functional state whereby they could more adeptly respond to any and all forthcoming circumstances.

²²⁷ LeMay, *Mission with LeMay*, 415.

²²⁸ General LeMay to the Chief of Staff, USAF, 26 June 1948. Message Number UAX 8552. Quoted in USAFE and the Berlin Airlift, 1948: Supply and Operational Aspects,” April 1, 1949, p. 13.

²²⁹ Thomas Coffey, *Iron Eagle: The Turbulent Life of General Curtis LeMay* (New York: Crown Publishers, 1986), 258.

Without significant combat forces at his disposal, one of the most critical elements of LeMay's early strategy was an element of force protection contingent upon deterrence rather than numerical strength. In many ways this combination of tactical defense and strategic deterrence would become the doctrinal backdrop for all future U.S. forward air operating bases, particularly in hostile nations during wartime. Central to LeMay's strategy was the use of the American nuclear monopoly to deter Soviet intervention against the airlift forces. To this end, LeMay ordered the forward deployment of U.S. strategic bombers to bases in Great Britain and the European mainland. Almost as soon as the Soviets began interfering with ground transportation, military officials understood the need to project at least a moderate capacity for war, despite the general imbalance of forces.

During these immediate postwar years, the B-29 *Superfortress* strategic bomber represented the "pre-eminent symbol of American air power."²³⁰ As the only aircraft to have dropped atomic weapons in anger, the B-29 carried a great symbolic weight wherever it traveled, and as such it was the mainstay of the newly created Strategic Air Command. In June 1948, the 301st Bombardment Group, based at Salina Air Force Base, Kansas was already on training duty at Furstenfeldbruck air base near Munich. An estimation of overall support strength, requested by Secretary James Forrestal via Secretary of the Air Force Stuart Symington, highlighted the availability of some "three Medium Bomber Groups, with thirty B-29s each, which could depart twelve hours after notification, [and] three additional Medium Bomber Groups, also with thirty B-29s each,

²³⁰ Walton S. Moody, *Building a Strategic Air Force*. (Washington, D.C.: Air Force History and Museums Program, 1996), 94.

[which] could begin departure within ten days.”²³¹ The arrival of B-29s in Europe, signaling a firm American commitment to the stabilization of a free and democratic Germany, was further solidified when the Clement Attlee government formally acknowledged an earlier basing agreement, at which time a joint agreement was made on July 16, 1948, regarding the basing and logistical concerns for B-29 aircraft, crew, and support personnel.²³²

The true ruse, and what was not known at the time, was the nature of the deployed force. Despite being one of the most advanced aircraft in the world, all B-29s deployed to Europe in support of Berlin Airlift operations were entirely conventional. While several units within the U.S. Air Force had begun converting earlier B-29s to a nuclear-capable configuration under Project *Silverplate*, and later Project *Saddletree*, none of the aircraft available in Europe had this capability.²³³ It is unknown whether the Russians were aware of this critical fact.

Regardless of the political backdrop, a fundamental fact remained: the Allied Airlift in support of Berlin was falling short of expectations. If the United States, Great Britain and France did not wish to cede control of Berlin, a larger and more efficient program was necessary. As with Ferrying Division efforts into China, few airlift professionals were involved in the initial ‘barnstorming’ days of the Berlin Airlift.

²³¹ Avi Shlaim, *The United States and the Berlin Blockade, 1948-1949: A Study in Crisis Decisionmaking*. (Berkeley: University of California Press, 1983), 204-205. It must also be noted that the classification of the B-29 as a ‘medium’ bomber occurred only after the arrival of the B-36 *Peacemaker* after the end of World War II. Prior to the *Peacemaker*, the B-29 was classified as a ‘heavy bomber.’

²³² Jackson, 70.

²³³ Alwyn T. Lloyd, *A Cold War Legacy: A Tribute to Strategic Air Command – 1946-1992*. (Missoula, Montana: Pictorial Histories Publishing Company, 1999), 90.

Though the usefulness of airlift had been proven in China during a wartime scenario, the situation in Berlin was unique, and “in air transport everything is different – rules, methods, attitudes, procedures, results.”²³⁴ By June and July, tonnage into Berlin had risen sharply to more than 2000 tons, but it was far from an efficient operation as the city needed 3800 tons per day in the summer and more than 4500 in the winter.²³⁵

Despite the significant challenges ahead, General Smith had laid the groundwork for a continued effort. Throughout the summer USAFE increased the supply of pilots and crew, installed and expanded rudimentary air traffic control and navigation beacons, established the weather evaluation and forecasting procedures, and formed a rough logistical base as a means to maintain a “semblance of order and avoidance of risks.”²³⁶ As in China, however, true efficiency required a level of professionalism not found within USAFE or the early leaders of the provisional airlift task force. From the earliest days of the Berlin crisis, General Tunner and other airlift veterans looked from afar and understood the value of their experience. As he explained,

The first thing I did was encourage my new commander [General Lawrence Kuter] to get himself involved in this, because I said, ‘You have just been organized as the air transport forces of the Department of Defense.... We have the trained people, not only the crews but the airplanes; we’ve got the technicians behind the crews; we’ve got the traffic people...and we have a very experienced staff who understands the business of air transportation, which is not flying bombers or fighters or something else.’²³⁷

He was soon proven correct. The introduction of General Tunner as Commanding General of the Combined Airlift Task Force several months later provided a much needed

²³⁴ Tunner, *Over the Hump*, 160.

²³⁵ Charles Miller, 177.

²³⁶ “USAFE and the Berlin Airlift: Supply and Operational Aspects, 1948,” 36.

²³⁷ William Tunner, interview with James Hasdorff, 82.

infusion of both professional knowledge and logistical competency. Understood as the preeminent authority on airlift within the U.S. military, and possibly the world at the time, General Tunner was supremely qualified and more than eager to prove his theories would work within the geographical and political constraints of postwar Germany. Moreover, as a veteran commander of the Hump operations and a highly qualified pilot, Tunner understood firsthand the intricacies such an endeavor required.

General Orders Number 61 granted Tunner the authority to organize preexisting airlift bases under his command, including Rhein-Main, Wiesbaden, and Tempelhof, and set up the 7499th Air Division as the Airlift Task Force (Provisional) under the Headquarters (USAFE).²³⁸ In addition to this assignment, Tunner was also given control over the newly designated Combined Airlift Task Force (CALTF). Intended to streamline the process, CALTF combined U.S. and British airlift resources into one unified group “in order that the resources of each participating service may be utilised (sic) in the most advantageous manner.”²³⁹ Initial objectives of Tunner’s command were establishment of basic command and control procedures, and the creation and establishment of an institutional hierarchy that could work as efficiently as possible while also limiting unnecessary bureaucracy. His early changes included the implementation and widespread adoption of a systematized method for dealing with all manner of possible needs including depot supply and maintenance, technological support, weather operations, intelligence, logistics, personnel, and many others. Daily staff meetings, crucial to the development of Hump operations, became the norm in Germany as well. During the

²³⁸ “USAFE and the Berlin Airlift: Supply and Operational Aspects, 1948,” 50.

²³⁹ General William Tunner, Letter Directive for a Combined USAF-RAF Airlift Task Force (no date).

operational planning and development stages, staff of HQ Airlift Task Force (Provisional) “met virtually every normal work day during the month of August. One of the most important of these staff conferences was the one of 9 August, 1948. At this meeting the following [policy was] adopted....The dissemination of pertinent information to wing, groups and squadrons by use of bulletin boards, and by announcement at staff meetings of lower echelons.”²⁴⁰ This process ensured thorough understanding, at all levels, of command expectations and virtually eliminated the radical “end of the line” morale issues witnessed during Hump operations in China and India.

From the outset, General Tunner assembled an operational team with a significant understanding of airlift. He hoped to lean on the experience of these previous airlift operations to streamline the Berlin effort and eliminate some of the growing pains already experienced by the combat commanders currently in charge. Like the early days of the China ferry operation, U.S. military commitments in the region were formed by *combat* units, with little knowledge of dedicated air transport. LeMay, Smith and the men who flew under their command understood the routine operation of air transport on a limited scale, but did not have the knowledge to restructure the resources into an efficient machine.²⁴¹

A preeminent example of the confusion and disorganized nature of the lift took place on what would become known as Black Friday. On Friday August 13, 1948, General Tunner and several subordinates took off from Wiesbaden, destined to deliver their cargo in Berlin some time later. What transpired was a “date many of us who served

²⁴⁰ “USAFE AND THE Berlin Airlift 1948: Supply and Operational Aspects,” 53-54.

²⁴¹ Tunner, Interview by James Hasdorff, 83.

on the Berlin Airlift wish we could forget.”²⁴² Severe weather had dropped the operational ceiling to rooftop levels, several C-54s crashed, and the inadequate air traffic control radar was overwhelmed by the ever increasing number of inbound aircraft. As Tunner related:

With all that confusion on the ground, the traffic-control people began stacking up the planes coming in... God knows why there were no collisions. As their planes bucked around like gray monsters in the murk, the pilots filled the air with chatter, calling in constantly in near panic to find out what was going on.²⁴³

In Tunner’s eyes, the seemingly efficient operation was far from perfect, both on the ground and in the air. He instructed a complete review of airlift operations, from which a significant number of operational issues were found. General training and briefing of pilots was spotty at best, shortages of tools and equipment hampered routine and scheduled maintenance for the aircraft, and Task Force Headquarters “was a warren of empty rooms silted with debris, lit only by naked bulbs, innocent of desks and chairs.”²⁴⁴ Aside from a lack of resources, airlift headquarters was hampered by several logistical problems. A lack of accurate data and information “rendered ‘exceedingly difficult’ the accomplishment of accurate planning as to personnel requirements,” and an unclear organizational structure all served to limit the general effectiveness of ATF headquarters.²⁴⁵ In Tunner’s eyes, it could survive a month of intense operations, maybe

²⁴² Tunner, *Over the Hump*, 152.

²⁴³ *Ibid.*, 153.

²⁴⁴ Richard Collier, *Bridge Across the Sky: The Berlin Blockade and Airlift 1948-1949* (New York: McGraw Hill, 1978), 100-101.

²⁴⁵ “USAFE and the Berlin Airlift 1948: Supply and Operation Aspects,” 64.

more, but “it couldn’t have lasted much longer....They were working like hell,” yet little progress was being made.²⁴⁶

The fundamental problems witnessed from April to July 1948 were organizational and technological in nature. Logistically, the U.S. Air Force had not shifted to its eventual Cold War norms. The postwar Air Force was severely limited in support infrastructure, as the American military had little experience maintaining a large standing, combat-ready force in waiting. What they had in droves, however, were men with combat experience. Pilots, aircrew, mechanics, and support personnel were rushed into emergency action once the Berlin Crisis arose, but with little direction and no available supply of aircraft, tools, and spare parts. Technologically, the impact of an aging airlifter force combined with a lack of support infrastructure multiplied the lack of resources by several order of magnitude. The newly unified military still exhibited the growing pains of a freshly minted superpower, and both money and resources were not yet allocated to support future levels of U.S. commitment to its allies. Unlike the modern U.S. defense posture, forward bases on friendly (and not so friendly) soil were not yet the operational norm and few high-quality forward bases existed. Likewise, “modern” aviation support technologies were not in place. Although great strides had been made to develop and distribute radio navigation equipment, weather forecasting and other technologies, they were not yet in place worldwide. Aircraft technologies also made great strides, as large four-engine cargo planes and other specialized aircraft such as the C-82 came into wider use, but remained limited in their availability. As in any endeavor,

²⁴⁶ Tunner, Interview by James Hasdorff, 87.

technology and a support base will never reach true efficiency without an organizational structure to manage and utilize the resources at hand.

One of Tunner's immediate organizational concerns was the establishment of a functional unified command and control structure that eliminated the duplication and confusion that existed during the initial months in Berlin. By unifying British and American airlift resources, Tunner and CALTF could more adequately control not only the effective utilization of resources, but the means through which information filtered throughout the command. Expanding upon General Smith's Operations and Supply/Maintenance Divisions, several other key organizational elements were added including an Air Comptroller, Personnel, Traffic, and Communications Divisions. By mid-August, the Plans and Projects Division, Staff Surgeon and Public Relations segments were also added.²⁴⁷ Continuing a practice he had started in CBI, Tunner and his headquarters staff, comprised of each department head, met daily to discuss operational and planning issues. Each department head, therefore, was tasked with "[maintaining] a continuous contact with the division of the Air Force that provides the service...that he represents" as a means of meeting the daily needs and requirements of each section.²⁴⁸ Though the structural changes of August and September greatly improved the efficiency of command and control within the airlift task force, it was an evolutionary process that continued throughout the remainder of 1948 and early 1949 as a means of managing the bureaucracy.

²⁴⁷ "USAFE and the Berlin Airlift 1948: Supply and Operation Aspects," 51-52.

²⁴⁸ *A Special Study of Operation Vittles*, 29.

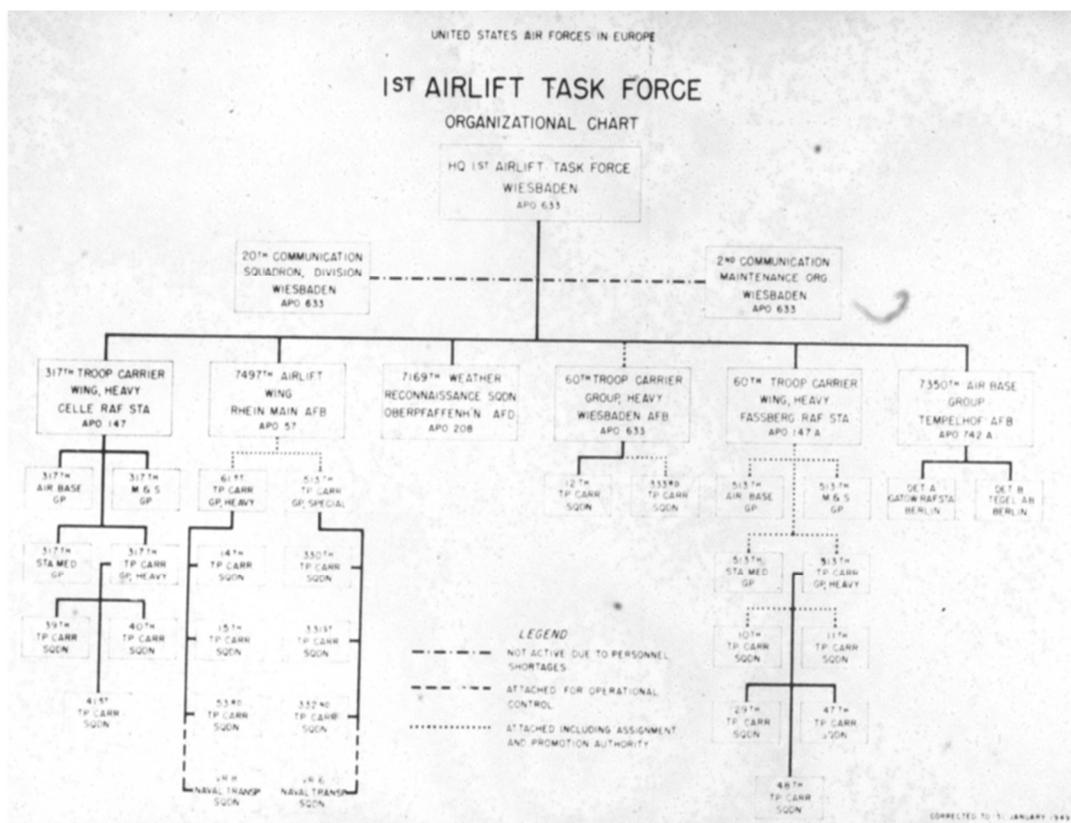


Figure 3.2 1st Airlift Task Force Organizational Chart

“USAFE and the Berlin Airlift, 1949: Supply and Operational Aspects,” (HQ USAFE, April 1, 1950. Air Force Historical Research Agency, microfilm reel #C5055), Appendix A.

One byproduct of the restructured operational chain of command, largely resulting from a statistical analysis of aircraft usage, was the reallocation of resources across British and American zones. Once a unified command had taken control, USAFE and CALTF could use *all* resources to the fullest.²⁴⁹ Among these were the planes themselves and the support facilities (air bases and support personnel) which took part. From the beginning, both the USAF and RAF incorporated C-47 and other aircraft types as

²⁴⁹ HQ BAFO and USAFE, “Letter Directive for a combined USAF-RAF Airlift Task Force” to Major General William Tunner, USAF (no date).

efficiently as possible, but it was clear that many efforts were redundant and each available airfield was not used as completely as possible. A case in point was the British airfield at Fassberg, which was originally constructed as a Luftwaffe bombing school, and was later operated as a RAF support facility. By mid-1948 an expansion program had commenced, including

the complete renovation of twelve barrack blocks and the former technical school, the conversion of two hangar annexes and two office buildings into domestic accommodation, the clearance of some five acres of forest, and the laying of about 180,000 square yards of PSP hardstanding and five miles of railway sidings.²⁵⁰

Preparations for USAFE/CALTF use of Fassberg began on August 4, 1948 when a planning group established a twenty-three point plan outlining an organization and use arrangement between USAF and RAF. The plan generally outlined current and future infrastructure improvements, outlined the support and supply functions of the base (with significant details down to food and laundry service), and broadly defined the command and control basis for C-54 operations.²⁵¹ Fassberg was considerably closer to Berlin than the airfields near Frankfurt, enabling more frequent trips with each aircraft requiring far less on-board fuel. Shorter flight times and less fuel consumption would enable higher payload capacities and increased tonnage. Per the assessments of the period, each C-54 aircraft stationed at Fassberg equaled roughly 1.6 aircraft stationed in and around Frankfurt. In addition to the geographical advantages, Fassberg also “enjoyed weather

²⁵⁰ Jackson, 55.

²⁵¹ “USAFE and the Berlin Airlift 1948: Supply and Operation Aspects” Appendix, “Minutes of a conference held at RAF Station Fassberg on August 6, 1948 to discuss the Operation of American Skymasters from R.A.F Station Fassberg,” signed by Wing Commander J.M. Thompson, RAF.

satisfactory for flights when the two fields in the Frankfurt area were ‘closed in.’²⁵²

Similar arrangements were made for additional British bases at Celle, Fuhlsbüttel, Lübeck, Schleswigland, Wunstorf, and Bückeberg.²⁵³ Simply put, organizational efficiency improved airlift output, and every effort was made to streamline their efforts for the duration of airlift operations.

Alongside a reorganization of airlift personnel and resources, Tunner’s tenure in Berlin witnessed several significant technological developments that would forever alter the landscape of military airlift. The development of larger more capable airlifters, and the support infrastructure to accompany them, completed the evolution of airlift from an unproven adjunct to a fully proven professional service. From its origins in Burma, until Tunner’s arrival in Berlin over five years later, U.S. airlift capacity came into its own, adopting technologies that would define all future air mobility specifications. Though a complete analysis of the design, construction and implementation of these technologies would comprise hundreds of pages, they can broadly be defined within a few distinct categories. From August 1948 until the end of the blockade, USAF personnel improved both the accuracy and reliability of weather forecasting, expanded the communications and navigation network in the region, and employed newer and more capable aircraft. Despite the significant challenges that remained, USAFE continued its progression toward a new ‘modern’ air force structure capable of sustained high-intensity air operations. Where the early decades of professional aviation relied heavily on pilot skill and a fair measure of luck, the future airpower era took advantage of technological

²⁵² “USAFE and the Berlin Airlift 1948: Supply and Operation Aspects,” 55-56.

²⁵³ Tunner, *Over the Hump*, 209-11.

proWess rather than brute strength to achieve its goals. Though not uniquely American, the reliance upon technology to increase safety, survivability and efficiency proved to be a hallmark of American military tactics and strategy.

Without a doubt, weather exists as the most direct challenge to safe aviation operations. Few elements impact safe and efficient aviation more than weather, and the period of 1938-1949 saw U.S. airmen operating within some of the most challenging meteorological conditions known to man. From the mountain peaks and jungles of CBI, to the foggy and rain-soaked German airfields, American pilots fought the elements with deadly consequences. Complicating matters further, aircrew inexperience exacerbated the situation as green pilots took to the crowded skies in unfamiliar aircraft.²⁵⁴ At the onset of airlift missions the responsibility for theater weather operations fell to the 18th Weather Squadron. The 18th WS, alongside several support elements, compiled a wide range of meteorological information from the previous fifteen years, creating an almanac of sorts from which an estimate of suitable flight operations was compiled.²⁵⁵ It was soon found, however, that airlift pilots were operating under conditions unseen in aviation history.

Existing weather stations at Rhein-Main, Wiesbaden and Tempelhof provided sufficient reports for the limited air operations into postwar Berlin, but were inadequate for the round-the-clock operations dictated by present events. In addition to increased traffic, weather stations were tasked with the compilation and dissemination of highly detailed information that simply did not exist in 1948. If useful information for such tight operating tolerances was needed, “special observations would have to be taken, special

²⁵⁴ “Log of Operations (sic) Vittles 30 July 1948,” 5.

²⁵⁵ *A Special Study of Operation Vittles*, 50.

charts and maps drawn, and special forecasts made.”²⁵⁶ Early on, pilots submitted weather reports every six hours. These reports tasked several aircraft within the ‘block system’ then in use to give the status and location of several meteorological data points.²⁵⁷ This practice was a holdover from wartime flight operations throughout Europe and CBI, but proved unsuitable for the heavy sustained operations in and around Berlin. Additional high-level reports were compiled through the use of weather balloons, though these were few and far between, and proved to be increasingly delinquent during the onset of winter weather in November 1948. These balloon facilities, however useful, were “entirely too scattered in the Low Countries and northern France, and few or none were being made in the [English] Channel and the North Sea.”²⁵⁸ In the end, however, some of the most valuable coping mechanisms were operational, rather than technological. Tunner and his team organized ‘diversion’ routes enabling pilots to continue along established flight paths to secondary landing zones.²⁵⁹

Despite operational changes enabling faster turnaround times during optimal flight conditions, a more wide-ranging weather establishment was needed to support the 18th WS which was frequently undermanned due to personnel shortages. The creation of the 7169th Weather Reconnaissance Squadron was one step toward alleviating stresses of existing weather reporting stations, while taking a multidimensional approach to report weather and in-flight conditions. The stated role of the 7169th was “to ascertain icing levels and levels of severe turbulence” as a means of providing “guides for assigning

²⁵⁶ *Berlin Airlift: A USAFE Summary*, 52.

²⁵⁷ “USAFE and the Berlin Airlift 1948: Supply and Operation Aspects,” 66; and Minutes of Operational Staff Meeting August 6, 1948, Airlift Task Force (Provisional).

²⁵⁸ *Berlin Airlift: A USAFE Summary*, 54-55.

²⁵⁹ “USAFE and the Berlin Airlift 1948: Supply and Operation Aspects,” 110.

altitudes and intervals for dispatching air lift planes.”²⁶⁰ Perhaps the greatest improvement throughout the weather services in Berlin was the establishment of constant, and routine, dissemination of weather data. Contemporary accounts note the increased frequency of weather briefings, “presented at practically any time or place they were needed.”²⁶¹ Despite the vast improvements, it was clear that the meteorological data in 1948-1949 was constrained by available technology. Though the Air Weather Services continued to implement new and more accurate methods, few of these methods alone proved game-changing. Pilots were frequently aided by other technologies such as Very High Frequency (VHF) navigation beacons and high-capacity landing lights, as well as adjusting flight paths and shifting operations away from the worst weather.²⁶² Regardless of the difficulties experienced, USAFE took several major steps toward becoming a truly all-weather air force.

In conjunction with the weather service, USAFE and the airlift task force adopted similar technological advances in the realm of aerial navigation and communications technology. From the beginning of powered flight, aerial navigation and communication equipment were limiting factors in the growth and development of efficient aviation networks. Much like everywhere else within USAFE, communications personnel and infrastructure were severely limited during the postwar period, with only one GCA set in and around Berlin, one radar unit for traffic control, and limited use of radio navigation

²⁶⁰ *Berlin Airlift: A USAFE Summary*, 204-205; and General Orders Number 104, HQ USAFE, 26 November 1948.

²⁶¹ *Ibid.*, 58.

²⁶² “USAFE and the Berlin Airlift 1948: Supply and Operation Aspects,” 205-206.

beacons.²⁶³ Planners soon realized the inherent technological limitations within Berlin's air traffic control center. However limited the postwar systems were, they were suitable for the low-intensity operations prior to 1948 when the air corridors were far less crowded.

Early USAF concerns centered on the possibility of a Soviet attempt to jam radio communications throughout the region; this never occurred, despite contingency plans.²⁶⁴ To avoid "international incidents" prior to a unified air traffic control system, 200/400 Kcs band beacons were installed to keep aircraft within the 20-mile wide corridors.²⁶⁵ Once large scale operations commenced, USAFE rushed to train greater numbers of communications personnel to man the radio and radar terminals. By late 1948, the Task Force had worked to alleviate many of the preliminary logistical and operational issues that plagued air operations, but the lack of accuracy and efficiency of radio/radar installations was a continued nuisance.

The introduction of the AN/CPS-5 radar and communications network, in conjunction with the existing waypoint beacons, proved to be a decisive and groundbreaking development in the history of USAF and the Berlin Airlift. It provided centralized control over every aircraft within the Berlin area of operations and enabled U.S. and British controllers to manage airlift traffic without need for 'stacking' of aircraft. A February 1949 report on its operation showed that it was "out of commission" only .5% of the time and "could provide complete control of all air traffic of the Western

²⁶³ *Berlin Airlift: A USAFE Summary*, 40.

²⁶⁴ Notes on Operational Staff Meeting, 20 August 1948.

²⁶⁵ *Berlin Airlift: A USAFE Summary*, 42.

Powers in the Berlin area.”²⁶⁶ By March of that year, the CPS-5 had expanded to include three locations at Tempelhof, Gatow and Tegel Approach Control centers. Each section

had a separate feeder scope with a complete set of radio frequencies. Each section, moreover, was staffed for complete coverage during every twenty-four hour period....The CPS-5 personnel endeavored to pick up and identify the aircraft as soon as possible prior to their reaching the Berlin area, so that proper separation, interval, altitude and landing patterns could be determined.²⁶⁷

This technology was not altogether without its faults. It was found that GCA units were not overhauled and repaired on a regular basis and that the CPS-5 needed additional non-radar inputs to make full use of the available information. Many new communications technologies continued to enter service throughout the Berlin Airlift, and many of these provided valuable lessons for both engineers and military tacticians. Alongside its ground-based counterparts, nearly three quarters of airlift C-54s were also equipped with airborne radars suitable for rudimentary navigation and collision-avoidance purposes.²⁶⁸ Regardless of these challenges, the use of radar equipment and new radio technologies to more effectively manage large-scale aerial maneuvers was a major evolutionary step in USAFE tactics, and assisted in roughly half of the 88,000 total GCA controlled landings during Operation Vittles.²⁶⁹ Though many analyses of the period highlight the importance of the Block System to overall airlift output, the yield and efficiency of this system would have been severely limited without increased use of radar tracking and GCA technologies. These methods, and the numbers they produced, were unthinkable only a few years before.

²⁶⁶ “History of the Operations Division for 1-31 January 1949,” HQ CALTF, 2 March 1949, 7; and “USAFE and the Berlin Airlift 1949: Supply and Operation Aspects,” 112-113.

²⁶⁷ *Ibid.*, 113.

²⁶⁸ *Ibid.*, 130.

²⁶⁹ *Berlin Airlift: A USAFE Summary*, 48-50.

In conjunction with increased use and efficiency of radar and radio communications equipment, USAFE proved the efficacy of a standardized fleet of larger transport aircraft. Though the superiority of the C-54 had been known since its introduction to service in CBI five years earlier, true standardization would not take place until late 1948 when the last of the C-47s operated by the 60th Troop Carrier Group were relieved of front-line airlift duty.²⁷⁰ From this point forward, the overwhelming majority of airlift flights were undertaken with the larger and more capable C-54, with a total of 203 aircraft assigned to the theater.²⁷¹ As a means of keeping this force operational, a system of routine ‘depot maintenance’ began through which the aircraft underwent scheduled inspections and overhauls both after 200 hours of service, and 1000 hours of service. As Tunner describes:

Airplanes require constant maintenance, and they also require periodic maintenance at every twenty-five hours of flight up to two hundred hours, when they undergo a major inspection. At one thousand hours, a comprehensive overhaul must be performed....There was a serious shortage of tools and spare parts in the theater, and it was just not possible to do everything at the same time.²⁷²

A major problem of the airlift was the creation and maintenance of an infrastructure capable of supporting routine depot maintenance as well as unplanned ‘as needed’ repairs. Pre-blockade stock levels of replacement parts and support personnel were no longer feasible, and available manpower was greatly enhanced. Increased manpower and resources of two airlift support bases at Burtonwood (England) and Erding (Germany) relieved some maintenance pressures, but it would take some time before the stated goal

²⁷⁰ “USAFE and the Berlin Airlift 1948: Supply and Operational Aspects,” 161; and Task Force Times (Wiesbaden, Germany), October 1, 1948.

²⁷¹ “USAFE and the Berlin Airlift 1949: Supply and Operational Aspects,” 26.

²⁷² Tunner, *Over the Hump*, 169.

of seven 200 hour inspections per day was reached.²⁷³ Despite the changes, the problems remained as routine scheduled maintenance was vital to the airlift effort, and the materiel sections continually pushed for supply chain efficiency and an increased proficiency of maintenance personnel.²⁷⁴ With increased support and professionalization of the maintenance teams, the C-54s proved an immense improvement over all other existing U.S. and British aircraft. Its combination of carrying capacity, speed, and ease of maintenance and operation enabled it to remain a key part of the USAFE airlifter fleet for years to come.

Despite its major improvements and usefulness, the C-54 remained a largely civilian-led design effort. It was not a purely military design, and required some significant alterations throughout World War II and beyond to remain relevant. For example, the aircraft was not routinely loaded to maximum gross weight due to the limitations of its braking system originally designed under specifications for civilian transport use.²⁷⁵ As such, Air Force leaders continued to push for more capable aircraft designed for military use from the start. Several of these designs made their operational debut, however limited, during the latter half of the Berlin Airlift. The first of these was the C-82 *Packet* produced by Fairchild Aircraft, which was introduced to the airlift in September 1948. The C-82 was a relatively small twin-engine aircraft whose key design feature was a clamshell-type loading door at the rear of the aircraft. Located between twin tail booms, the clamshell door allowed easy load/offload and provided a superior

²⁷³ Ibid., 47-49.

²⁷⁴ "USAFE and the Berlin Airlift 1949: Supply and Operational Aspects," 113-17.

²⁷⁵ Interview with Capt. Cecil L. Reynolds and Dr. William F. Sprague, with Master Sgt P.H. Dortch, Rhein Main Air Force Base, July 15, 1948. Reproduced and cited in appendix to "USAFE and the Berlin Airlift 1949: Supply and Operational Aspects," 167-168.

means of transporting large and unwieldy pieces of equipment. Their rear-cargo loading enabled the rather diminutive aircraft (as compared to the C-74) to easily load cars, trucks and construction equipment.²⁷⁶ Though Tunner had planned only to use the C-82 for a limited time, their “particular value changed his mind,” remaining in service for several months and leading to the larger and more capable C-119 *Flying Boxcar* that would go on to serve throughout the next several decades.²⁷⁷

Another seminal aircraft to see action in Berlin was the enormous C-74 *Globemaster I*, which transported its first flight into Berlin on August 17, 1948. The *Globemaster* originated from a wartime design requirement for a truly “worldwide” transport. Though the war ended before full-scale production could begin, fourteen C-74s were produced by the end of 1945. In comparison to its counterparts, the C-74 was a massive aircraft. At the time of its first flight

the 86-ton C-74 was the largest transport landplane yet produced in quantity.... The *Globemaster I* had a maximum range of 7,250 miles, sufficient to navigate the globe with only two stops.... Its capacious fuselage could accommodate either 125 troops, 115 stretchers and medical attendants, or up to 48,150 lb of cargo.²⁷⁸

In terms of sheer performance, the C-74 outperformed the C-54 in both speed and cargo capacity. Some in theater recommended the complete replacement of the C-54 fleet with C-74s, but the aircraft was available in such limited numbers that this was not possible. Likewise, only the most robust and enhanced airfields (such as Tegel and Rhein-Main) could handle the gross weights and pressure of operating such a large aircraft. Despite the

²⁷⁶ “USAFE and the Berlin Airlift 1948: Supply and Operational Aspects,” 169-170; and “Air Lift Task Force Period Ending 1200, 21 September 1948,” narrative section in appendix, 26.

²⁷⁷ Miller, *To Save a City*, 112-13.

²⁷⁸ Francillon, 392-393.

shortcomings of existing infrastructure and supply chain to support such a large aircraft, it laid the groundwork for future USAFE airlift doctrine: larger aircraft meant fewer aircraft and trips, less fuel consumed, and a “greater margin for safety.”²⁷⁹ The great success of the C-74 platform led Douglas and the Air Force to adapt one of the original airframes into an even more capable aircraft: the C-124 *Globemaster II*. The C-124 retained much of the C-74’s internal structural components, while “externally the new aircraft was characterized by its double-deck fuselage...and by its impressive rounded nose which incorporated clamshell loading doors and a built-in double ramp.” Though it would not serve in the Berlin Airlift, and was produced for only five years, the C-124 remained in active service until the introduction of the truly massive Lockheed C-5A in the 1970s.²⁸⁰

A smaller aircraft relying heavily upon a proven World War II design was the Boeing Model 367, later known as the C-97 *Stratofreighter*. The 367 prototypes, which were ordered in the fall 1942 and took flight two years later, were a design that evolved from the B-29 *Superfortress* strategic bomber and its advanced cousin, the B-50. The bulk of the aircraft’s underlying structure remained identical to the B-29/B-50, but to gain the required cargo capacity “a double-lobe fuselage of two intersecting circular sections was developed.”²⁸¹ Cargo loading was enabled (again) by clamshell doors and an electro-mechanical hoist system. Equipped with four 3,500 horsepower Pratt and Whitney R-4360 engines, the C-97 had a gross operating weight of up to 175,000 pounds

²⁷⁹ “USAFE and the Berlin Airlift 1948: Supply and Operational Aspects,” 168.

²⁸⁰ Francillon, 436-40.

²⁸¹ Bowers, 353.

and a cargo capacity of 20 tons.²⁸² While operating in the Berlin Airlift, the C-97 was found to be entirely satisfactory in everyday operations. Its three loading doors increased the ease of loading and unloading, and the overall capacity was far greater than the C-54. But due to the limited experience in handling the C-97, as well as its limited support infrastructure, the *Stratofreighter* was hampered by several maintenance problems limiting its overall effectiveness to a modest 444 tons delivered over twenty-three flights.²⁸³ The C-97 series of aircraft continued in service as the KC-97 *Stratotanker* until the late 1950s, and was the first dedicated aerial refueling platform. An even more elaborately modified member of the family was the Boeing 377-PG *Pregnant Guppy* and *Super Guppy* aircraft designed to airlift large sections of rocket and spacecraft components for NASA and the U.S. space program.²⁸⁴

Despite their limited roles in the airlift, these aircraft and their technological descendants were tested in high tempo, high stress environment. This testing enabled engineers and military planners to improve designs based on real world experience. In evaluating the usefulness and utility of different design features, engines, and the functionality of aircraft-specific tactics, the USAF airlift community gained invaluable insights that would shape future airlift design and doctrine.

By 1949 the airlift was in full bloom, with tonnages steadily increasing as the Soviet hopes diminished for a complete withdrawal of Western forces from Berlin. As a show of force, CALTF forces (under Tunner's command) finally broke the will of the

²⁸² *Ibid.*, 364.

²⁸³ "USAFE and the Berlin Airlift 1949: Supply and Operational Aspects," 154-156.

²⁸⁴ Bowers, 371-74.

Soviets during their “Easter Parade” where over the course of 24 hours aircrews completed 1,398 flights for a combined delivery of 12,941 tons. As Tunner noted, “from then on we never fell below nine thousand tons a day; the land blockade was pointless.”²⁸⁵ The blockade itself ended on May 29, 1949, and on August 12 Tunner received orders regarding the deactivation of the Combined Airlift Task Force, effective September 1, 1949, including the commencement of “such action as is necessary to complete the deactivation on the effective date, including the reassignment of functions and personnel.”²⁸⁶

As the last few aircraft unloaded their precious cargoes within the city of Berlin it soon became clear that a new era had dawned in the age of geopolitical relations and technological progress. For nearly a year a population of 2.5 million people had been supplied, kept alive, by technologies and methods never before seen on such a scale. The age of manned, powered flight was less than a half-century old and yet it had enabled the United States Air Forces in Europe to rebuff the Soviet Union’s attempt to besiege the western sectors of Berlin and allowed for the continued survival of a democratic West Berlin. The successes of the Berlin Airlift, and of U.S. airpower during the immediate postwar era, exist as far more than the Cold War origin story many historians have made it out to be.²⁸⁷ Unlike previous military airlift operations, the Berlin Airlift was unique in both the scope of the project at hand, and in the manner in which the logistical and

²⁸⁵ Tunner, *Over the Hump*, 221-22.

²⁸⁶ General John Cannon HQ USAFE to Commanding General, Combined Airlift Task Force General William Tunner, “Deactivation of Headquarters, Combined Airlift Task Force,” August 12, 1949.

²⁸⁷ Usage of “airpower” as a one word term, conventional within Air Force circles, as described in Dik Daso, *Architects of American Air Supremacy: General Hap Arnold and Dr. Theodore von Karman* (Maxwell Air Force Base, Alabama: Air University Press, 1997), 5-6.

operational structure of U.S. air transport capabilities enabled the peaceful resolution of a major geopolitical confrontation. In Berlin, the existence of an aviation infrastructure enabled U.S. policymakers to avoid war and provided direct diplomatic choices where none previously existed. Even at the outset of World War II, less than a decade earlier, little thought had been given to American military airlift, and “airmen had neither special aircraft nor doctrine...[and] with the exception of transporting high value items, there had been no thought to airlifting troops or supplies.”²⁸⁸

As such, the requirements necessary to supply and maintain a major airlift, as well as the political requirements to aid cooperation between allied nations, were developed daily by the men taking part. In a role unique to its time and place in history, the Berlin Airlift would have a profound effect on entire sectors of aviation systems, while actually designing and testing new aircraft types and specialized design features that would assist future airlift tactics and strategy into the 21st Century. As proof of concept the Berlin Airlift, along with its World War II bomber brethren, effectively completed the geopolitical shift in the balance of power toward the United States. What Generals Billy Mitchell and Henry ‘Hap’ Arnold began several decades earlier triumphed when the Soviet Union ended the blockade in 1949.

For over a year, airpower and airpower alone had succeeded in maintaining a beachhead for democracy in a sea of Soviet aggression. Rather than abandon a city and its people, the British and Americans hauled over 2.3 million tons of supplies into the city. The United States undertook 189,963 total flights, while the British added 87,606,

²⁸⁸ Kenneth P. Werrell, “The Dark Ages of Strategic Airlift: The Propeller Era.” *Air Power History* (Fall 2003), 23.

with a total airlift cost of \$166,689,517.²⁸⁹ Beyond the monetary costs, 31 American servicemen lost their lives, most due to crashes and other accidents. The USAFE had forever changed the way American policymakers viewed the role and capabilities of airlift. The United States would heavily invest in new and more capable transports throughout the remainder of the Cold War and beyond. The evolutionary contributions of the Berlin Airlift, largely the result of General Tunner's philosophy, went beyond the logistical expertise learned through his time in the Ferrying Command and CBI airlift. The Americans took advantage of revolutionary methodological and technological advances that would forever shape the future of their military strategy. This strategy, based largely on mobility and the use of technology, was proven effective in the skies of Berlin.

²⁸⁹ *Berlin Airlift: A USAFE Summary*, 172-175.

CONCLUSION

The close of intensive air operations into Berlin signaled the end of one mission and the beginning of a transformative period within the U.S. defense establishment. By 1950, the U.S. military began the long process of Cold War mobilization that would see trillions of dollars devoted to the development of new weapons systems and the expansion of an increasingly capable and diverse U.S. Air Force inventory. American involvement in both Korean and Vietnam wars had increased military funding to previously unseen levels, and would secure a place for airpower in all future diplomatic and military endeavors. As such, aircraft procurement numbers jumped significantly from 1950 onward, from 1,200 aircraft in FY1950 to over 8,500 in FY1951.²⁹⁰

Though fighter and bomber aircraft remained the most visible elements of an air-centric national military strategy, airlifters remained absolutely vital to support all future plans. Of these, the decades following the Berlin Airlift witnessed the development of increasingly larger and more capable transports. The age of nuclear brinkmanship relied heavily on the advancement of a large fleet of intercontinental bombers, supported by a fleet of aerial refueling platforms, which could attack anywhere, anytime. If land-based missiles were destroyed, at least some of the bombers would make it through Soviet defenses to deliver their lethal cargo. As General Nathan Twining surmised, “airlift on the scale we visualize would make it possible to move logistic support with and as the

²⁹⁰ Marcelle Size Knaack, *Military Airlift and Aircraft Procurement: The Case of the C-5A* (Washington, DC: Air Force Historical Research Agency, 1998), 10.

bombers move... Without this support the strategic bombing force is neither truly strategic nor potent.”²⁹¹ Alongside fleets of Air Force bombers, a unified airlift structure continued to utilize USAF to provide the mobility and flexibility necessary for a worldwide fighting force. By the mid-1960s the Military Air Transport Service was transformed once again into the Military Airlift Command (MAC), offering enhanced flexibility and an even greater level of operational cohesion. No longer were tactical and strategic airlift concerns separated.

Though Army, Navy and Marine units retained limited air transport resources (primarily small fixed-wing aircraft and helicopters), the Air Force’s new jet transports provided critical capacity needed for large troop movements and the rapid deployment of tanks, armored vehicles, and support personnel. Throughout the 1950s and 1960s a diverse cadre of turboprop and jet transports came into widespread use and would provide the foundation for future air transport groups. The C-124 and C-133 were key to the Strategic Air Command’s deployment strategy, and the C-130 proved a seminal airframe that would continue operations well into the 21st century. Both President Dwight Eisenhower’s “New Look” and the “Flexible Response” framework that followed were predicated on the availability of high capacity airlift operations. Perhaps the greatest technological achievement of the era was the massive C-5 *Galaxy*, an enormous four engine jet airlifter capable of carrying over 200,000 lbs. of cargo more than 2,000 miles. Its front and rear-facing cargo doors enable simultaneous loading and offloading, and is

²⁹¹ Futrell, 151.

capable of hauling even the largest infantry support equipment such as the M1-A1 *Abrams* battle tank.

Without a robust airlift capacity, the most recent U.S. wars in Afghanistan and Iraq would not have been logistically feasible. In conjunction with sealift and land transportation, airlift serves as the third leg of a “mobility triad” enabling U.S. forces to move anywhere in the globe with remarkable speed. In theaters where roadside bombs and guerrilla forces made ground transportation treacherous, aerial resupply provided a vital lifeline for all ground operations throughout southwest Asia. The U.S. military created a centralized command and logistics framework centered on massive air bases such as Bagram, Balad, and Al Asad. These bases were a point of origin for a vast majority of incoming ground troops, equipment, and materiel entering the theater of operations. As soldiers, airmen and marines manned far-flung outposts throughout the mountainous tribal regions of Afghanistan, air supply drops were the only feasible way they could receive the equipment, ammunition and supplies necessary to continue fighting. Without airpower, the mission was untenable.

The design “DNA” of postwar air transports found their roots in the lessons of Burma and Berlin. Large payload capacities, ease of operation and maintenance, increasingly long range and the ability to land and take off from limited or unprepared runways are essential components of a modern air transport fleet. These elements, vital in wartime, are also key when administering diplomatic and humanitarian aid around the world. As a force in waiting, USAF was routinely called to assist in humanitarian aid situations, disaster relief, and any number of non-military situations “helping emerging

nations meet the needs of their citizens, and in feeding the hungry anywhere in the world.”²⁹² To this end, emerging technologies such as digital datalinks, global positioning systems, and multifunction “glass” cockpits enable airlifter crews to undertake longer and more complicated missions with fewer crew members involved. Increased engine power and efficiency, as well as the advent of aerial refueling, allow USAF crews to haul heavier loads while using less fuel than previous platforms.

With worldwide defense budgets continually fluctuating, it is clear that the development and support of a frontline airlifter force is one of the singularly important facets of any future Pentagon funding bill. Despite budget challenges and sequestration, both the continued procurement of C-17 aircraft, and the enhancement and modification of the C-5B fleet to C-5M standards were exempt from significant budget cuts. Although the C-27 *Spartan* twin-engine transport was shelved by the Air Force (only to be picked up by the U.S. Army for special operations purposes), the four-engine C-130 family of aircraft continues to expand into the most recent “J” model offering a longer fuselage, increased carrying capacity, and a modern suite of electronic navigation, global positioning and communications equipment. Following similar designs in the fighter and bomber fleets, various defense firms have begun preliminary testing of pilotless transport aircraft capable of operating autonomously. As increased use of remotely operated or autonomous aircraft spreads, the flexibility and capability of the American airlifter force will grow. Regardless of the direction future military strategies and technologies may

²⁹² Daniel L. Haulman *The United States Air Force and Humanitarian Airlift Operations 1947-1994*, (Washington, DC: Air Force Historical Research Agency, 1998), vii.

head, U.S. air mobility, born in the skies of Burma and Berlin, will continue to flourish across the country and around the world.

Bibliography

Primary Sources

Unpublished Sources

- Adjutant General's Office, War Department, to the Commanding Generals, all Armies GHQ Air Force Departments and Corps Areas et al., Letter, "Constitution of the Air Corps Ferrying Command," June 5, 1941. Air Force Historical Research Agency, microfilm reel #C5055.
- Airlift Task Force (Provisional), "Minutes of Operational Staff Meeting August 6, 1948." Notes on Operational Staff Meeting August 20, 1948. Air Force Historical Research Agency, microfilm reel #C5055.
- Berlin Airlift Task Force, Interim Report 30 June 1948 to 30 July 1948, Air Force Historical Research Agency, microfilm reel #C5055.
- Berlin Airlift Task Force Headquarters, "Traffic Rules and Procedures for Operations (sic) Vittles," July 27, 1948. Air Force Historical Research Agency, microfilm reel #C5055.
- British Air Forces of Occupation (BAFO) and HQ USAFE, "Letter Directive for a Combined USAF-RAF Airlift Task Force," to Major General USAF (no date). Air Force Historical Research Agency, microfilm reel #C5055.
- Chief of Staff, AF to USAFE, June 28, 1948. Message USAFE number 12936, in June 1948 Cable File. Air Force Historical Research Agency, microfilm reel #C5055.
- Combined Airlift Task Force, "Preliminary Analysis of Lessons Learned," June 1949. Air Force Historical Research Agency, microfilm reel #C5055.
- Daily Log of Operation Vittles July 14, 1948. Air Force Historical Research Agency, microfilm reel #C5055.
- General John Cannon, HQ USAFE to Commanding General, Combined Airlift Task Force General William Tunner, "Deactivation of Headquarters, Combined Airlift Task Force," August 12, 1949. Air Force Historical Research Agency, microfilm reel #C5055.
- General Orders Number 104, HQ USAFE, November 26, 1948. Air Force Historical Research Agency, microfilm reel #C5055.

Headquarters, Combined Airlift Task Force, "History of the Operations Division for 1 – 31 January 1949," March 2, 1949. Air Force Historical Research Agency, microfilm reel #C5055.

Office of the Military Government United States (OMGUS), "Daily Summary Number 1," April 5, 1948. Air Force Historical Research Agency, microfilm #C5055.

Sprague, William interviewed by First Lieutenant L.E. Stockton, USAF, Tegel Airfield February 16, 1949. Air Force Historical Research Agency, microfilm #C5055.

Tunner, General William H., "Letter Directive for a Combined USAF-RAF Airlift Task Force," no date. Air Force Historical Research Agency, microfilm #C5055.

Tunner, Lt. Gen William H. Interview by James Hasdorff, 5-6 November 1974, transcript United States Air Force Oral History Program, Air Force Historical Research Agency, microfilm #34909.

United States Department of State. *Foreign Relations of the United States [FRUS]* Diplomatic Papers, China. Washington, DC, 1942. University of Wisconsin Digital Collections.
<http://uwdc.library.wisc.edu/collections/FRUS> (accessed July 23, 2014).

United States Joint Chiefs of Staff (JCS) Paper 1151/3, "European Air Transport in the Transitional Period," February 21, 1945. Air Force Historical Research Agency, microfilm reel #C5055.

"USAFE and the Berlin Airlift, 1948: Supply and Operational Aspects." HQ USAFE History Office, April 1, 1949. Air Force Historical Research Agency, microfilm reel #C5055.

"USAFE and the Berlin Airlift, 1949: Supply and Operational Aspects," HQ USAFE, April 1, 1950. Air Force Historical Research Agency, microfilm reel #C5055.

Published

Aviation Operations Magazine, *A Special Study of Operation Vittles*. New York: Conover Mast Publications, 1949.

Berlin Airlift: A USAFE Summary, 26 June 1948-30 September 1949 Ramstein AB, Germany; HQ USAFE, n.d. Air Force Historical Research Agency, microfilm reel #C5055.

- Clay, Lucius D. *Decision in Germany*. New York: Doubleday, 1950.
- Historical Division, United States Air Force, *Organization of the Army Air Arm 1935-1945*. Maxwell AFB, Alabama: United States Air Force, 1956.
- History Office, United States Air Force, *A History of the United States Air Force 1907-1957* ed. Alfred Goldberg. New York: D. Von Nostrand Co., 1957.
- Task Force Times (Wiesbaden, Germany), October 1, 1948. Air Force Historical Research Agency, microfilm #C5055.
- Tunmer, William H. *Over the Hump* 2nd ed. New York: Duell, Sloan and Pearce, 1964.
- USAAF, Assistant Chief of Staff, Intelligence, Historical Division, "Administrative History, Ferrying Command, 29 May 1941-30 June 1942. <http://www.afhra.af.mil/shared/media/document/AFD-090602-073.pdf> (accessed July 23, 2014).
- USAAF, Office of Statistical Control, Army Air Forces, *Army Air Forces Statistical Digest* (WWII), 1945. <http://www.dtic.mil/dtic/tr/fulltext/u2/a542518.pdf> (accessed July 23, 2014).

Secondary Sources

- Bowers, Peter M. *Boeing Aircraft Since 1916*. 3rd ed. London: Putnam Aeronautical Books, 1989.
- Central Intelligence Agency, "Effect of Soviet Restrictions on the US Position in Berlin," Washington, DC, June 14, 1948.
- Coffey, Thomas. *Iron Eagle: The Turbulent Life of General Curtis LeMay* New York: Crown Publishers, 1986.
- Collier, Richard. *Bridge Across the Sky: The Berlin Blockade and Airlift 1948-1949*. New York: McGraw Hill, 1978.
- Craven, Wesley Frank and James Lea Cate. 7 Vols. *The Army Air Forces in World War II*, Chicago: University of Chicago Press, 1948-1959.
- Davis, Jeffrey. "ATFERO: The Atlantic Ferry Organization," *Journal of Contemporary History* 20 (Jan 1985), 71-97.

- Davis, John M., Harold G. Martin and John A. Whittle. *The Curtiss C-46 Commando*. Essex, England: Air-Britain, 1978.
- Foulois, Benjamin D. and Carroll V. Glines. *From the Wright Brothers to the Astronauts: The Memoirs of Major General Benjamin Foulois*. New York: McGraw-Hill, 1968.
- Francillon, Rene J. *McDonnell Douglas Aircraft since 1920: Volume I*. Annapolis: Naval Institute Press, 1978.
- Futrell, Robert Frank. *Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force 1907-1964*. Maxwell AFB, Alabama: Air University, 1974.
- George, Harold Lee. "The Air Transport Command, Army Air Forces," *Annals of the American Academy of Political and Social Science*, vol 230 (Nov. 1943), 89-92.
- Glines, Carroll V. and Wendell F. Mosely *The Legendary DC-3*. New York: Van Nostrand Reinhold Co, 1979.
- Haulman, Daniel L. *The United States Air Force and Humanitarian Airlift Operations 1947-1994*. Washington DC: Air Force Historical Research Agency, 1998.
- Hogan, Michael J. *A Cross of Iron: Harry S. Truman and the Origins of the National Security State 1945-1954*. Cambridge: Cambridge University Press, 1998.
- Hitchcock, William I. *The Struggle for Europe: The Turbulent History of a Divided Continent, 1945 to Present*. New York: Anchor Books, 2003.
- Knack, Marcelle Size. *Military Airlift and Aircraft Procurement: The Case of the C-5A*. Washington, DC: Air Force Historical Research Agency, 1998.
- Koenig, William. *Over the Hump: Airlift to China*. New York: Ballantine, 1972.
- La Farge, Oliver. *The Eagle in the Egg*. Boston: Houghton Mifflin, 1949.
- Launius, Roger D. and Coy F. Cross II *MAC and the Legacy of the Berlin Airlift*. Scott AFB, Illinois: Military Airlift Command, 1989.
- Lloyd, Alwyn T. *A Cold War Legacy: A Tribute to Strategic Air Command – 1946-1992*. Missoula, Montana: Pictorial Histories Publishing Co., 1999.

- Maurer Mauer. *Aviation in the U.S. Army 1919-1939*. Washington DC: Office of Air Force History, 1987.
- Miller, Charles E. *Airlift Doctrine*. Maxwell AFB, Alabama: Air University Press, 1988.
- Miller, Roger G. *To Save a City: The Berlin Airlift, 1948-1949*. College Station: Texas A&M University Press, 2000.
- Moody, Walton S. *Building a Strategic Air Force*. Washington, D.C.: Air Force History and Museums Program, 1996.
- Parker, R.A.C. *The Second World War: A Short History*. Oxford: Oxford University Press, 1989.
- Parrish, Thomas. *Berlin in the Balance: The Blockade, The Airlift, The First Major Battle of the Cold War* Reading, Massachusetts: Addison-Wesley, 1998.
- Paterson, Thomas G. *On Every Front: The Making and Unmaking of the Cold War*. Rev. ed. New York: W.W. Norton, 1992.
- Patrick, Mason M. *The United States in the Air*. Garden City, NY: Doubleday, Doran and Co., 1928.
- Pearcy, Arthur. *Douglas Propliners: DC-1 to DC-7*. Shrewsbury, England: Airline Publishing 1995.
- Plating, John D. *The Hump: America's Strategy for Keeping China in World War II*. College Station: Texas A&M University Press, 2011.
- Shlaim, Avi. *The United States and the Berlin Blockade, 1948-1949: A Study in Crisis Decisionmaking*. (Berkeley: University of California Press, 1983).
- Slayton, Robert A. *Master of the Air: William Tunner and the Success of Military Airlift* Tuscaloosa, Alabama: The University of Alabama Press, 2010.
- Tusa, Ann and John. *The Berlin Airlift*. New York: Sarpedon, 1998.
- Werrell, Kenneth P. "The Dark Ages of Strategic Airlift: The Propeller Era." *Air Power History* (Fall 2003), 20-33.
- Wolk, Herman S. *Planning and Organizing the Postwar Air Force 1943-1947*. Washington, D.C.: Office of Air Force History, 1984.

Yenne. Bill. *Hap Arnold: The General Who Invented the U.S. Air Force*. New York: Regnery 2013.