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Military Airlift

Turbulence, Evolution, and Promise for the Future

Eichhorst

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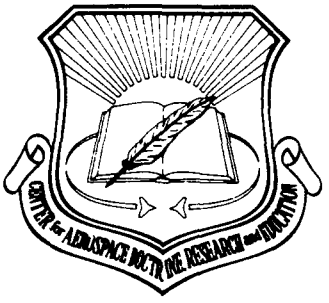

Research Report No. AU-ARI-89-11

MILITARY AIRLIFT

Turbulence, Evolution, and Promise for the Future

by

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Air University Press
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This publication has been reviewed by security and policy review authorities and is cleared for public release.

To my father, William E. Eichhorst

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Preface

From 1982 to 1986 I was assigned to the National Guard Bureau as an airlift program manager. It was in this capacity that I worked with the Air Staff and Headquarters MAC on the Airlift Master Plan and the Airlift Total Force Plan. At the time, both plans were heralded as the best attempt to date at bringing structure and order to the chaos of matching future force structure to airlift requirements. At the same time, however, I wondered what the lasting effects of these plans would be and whether any plan could withstand the pressures of budget, politics, and programming changes that were certain to continue in the airlift arena. Thus, this study was born.

My original plan was to simply review the status of airlift in 1989 and compare that with the program of the master plans. The complexity of such a comparison would not have been apparent to readers not versed in airlift issues, however, and the project quickly expanded into the present effort. An abbreviated history of airlift is required to acquaint the reader with why the master plans were necessary and how modern military airlift has developed. The master plans are summarized because I discovered a widespread lack of knowledge of the plans, even among members of the airlift community involved with airlift programming. Hopefully, this will provide sufficient background for readers not acquainted with airlift to understand the problems encountered in planning a future airlift force—not to mention carrying out those plans.

The conclusions and recommendations included here are the result of my research into this subject and cannot be taken as final or absolute. Each airlift issue discussed in chapter 4 would require a separate study for any true analysis. The airlift issues I identified and the conclusions I reached are presented for consideration—the reader must keep in mind the dangers inherent in simplifying a complex subject.

This has been a year of tremendous personal satisfaction. The combination of completing this study and the opportunity to attend Air War College was a challenge that would have been impossible to complete without the help of many people. The entire AUCADRE organization, like most US Air Force organizations, is professional and extremely competent. However, part of AUCADRE's mission is the specific and personal help provided to each research fellow. This was evident on the first day—their mission was to ensure that my project (as well as those of other command-sponsored research fellows) was successfully completed. A very talented staff was always available to provide invaluable guidance and direction. I extend heartfelt thanks to all AUCADRE personnel.

Specifically, I would like to thank the following people for their help in the assignment process and the actual effort in researching and writing this report: Brig Gen (Select) Charles C. Barnhill, Jr., who, as the 314th Tactical Airlift Wing (TAW) commander (HQ MAC/DP), provided essential support in the nomination process and made this assignment possible; Dr Karl P. Magyar (research adviser) for keeping me on schedule and asking the right questions; Preston Bryant (editor) for his sharp eye and ability to clarify a sometimes confusing subject; Lt Col Manfred ("Manny") Koczur (chief of the Command Research Division) for his honesty, humor, and tireless administrative efforts; and Donnie N. Eichhorst (my wife) for sharing long hours in the library and at the printer, for her ability to find often obscure reference material, and for the inspiration to keep coming back to the typewriter.

THOMAS E. EICHHORST, Lt Col, USAF
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Chapter 1

Introduction

This study is a review of US military airlift from its beginnings to the present force structure, of how the present airlift force structure was determined, and of prospects for the future. The study began as an examination of two plans written in the early 1980s, the effects of these plans on the present force structure, and the suitability of these plans for determining the force structure through the next decade to the year 2000.

In 1983 the United States Air Force published the Airlift Master Plan. This plan's use and importance were described in a joint memorandum signed by US Air Force Chief of Staff Gen Charles A. Gabriel and Secretary of the Air Force Verne Orr. Addressed to the secretaries of the Army and Navy, chief of staff of the Army, chief of naval operations, commandant of the Marine Corps, and commanders in chief of the specified and unified commands, the memorandum stated:

> The Airlift Master Plan provides the Air Force with a long-term document for the effective management and employment of airlift assets needed to sustain our military strategy. The ability of the United States to successfully deter aggression, limit conflict, or wage war depends on our ability to rapidly deploy and sustain fighting units. Airlift provides the capability to deliver forces where they are needed in time to make a difference.
>
> The objective of this plan is to define an airlift force structure that balances validated requirements, military utility, operating costs, manpower constraints, force stabilization, and force modernization to achieve the most beneficial results. The Airlift Master Plan synthesizes numerous national airlift issues, focusing on the need to meet airlift shortfalls and to modernize airlift forces. We expect Air Force planners at all levels to use this document in their deliberations and decisions to assure the airlift needs of the United States Armed Forces are met to the degree possible within funding constraints.[1]

The Airlift Master Plan was followed a year later by the USAF Airlift Total Force Plan. This plan applied the force structure developed by the Airlift Master Plan to a long-term airlift force mix between the active duty Air Force, the Air National Guard, and the Air Force Reserve. In other words, the first plan determined what airlift forces were required through the year 2000 and the second plan determined how those forces should be assigned.

The Airlift Total Force Plan was described in a memorandum similar to the one for the Airlift Master Plan. This second memorandum described a plan "to define an airlift force mix that balances readiness, force sustainment, and cost-effectiveness requirements to achieve the most beneficial results, . . . focusing on the need to meet congressional guidance and to

integrate and modernize the Air Reserve Forces."[2] It ends with the same directive, to "use this document to assure the airlift needs of the United States Armed Forces are met to the degree possible within funding constraints."[3]

These two master plans are, in effect, road maps to the future for airlift. However, before examining the plans and determining whether or not military airlift is on the course charted by these plans, we must understand airlift itself.

Although often portrayed in the past as just a mode of transportation, military airlift is much more. It is not an airline, though it often carries passengers and makes use of commercial airliners. It is sometimes not thought of as a combat force, yet airlift aircraft are often in the midst of combat, have carried and dropped bombs, have been modified as gunships, and have suffered combat losses in and out of war. In fact, the first US aircraft destroyed by enemy action in the Korean War was an airlift aircraft.

These misconceptions about what airlift is and what it does have caused problems in the past. The need for effective military airlift during wartime was readily apparent early on in World War II. Yet immediately following the war there was great pressure to dismantle the military airlift system. It was seen as redundant and competitive to the civil air carriers—an expensive force with little or no peacetime utility. This perception was slow to change, but change it did.

A succession of crises following the Korean War drove home the critical need for airlift to protect national interests. By 1976, the Research and Development Subcommittee of the House Committee on Armed Services listed three primary reasons why military airlift, aside from its importance in wartime, was essential in preserving the peace.

- Military airlift amplifies deterrence by providing combat force mobility, allowing any US force the ability to combat a wide range of threats instead of any single area threat.
- Airlift provides "a very visible element of national defense capability" and deters potential hostile aggression through the demonstration of daily peacetime capability. This visible demonstration of capability maintains the perception of national capability by potential enemies.
- Effective military airlift permits the United States to maintain a substantial portion of its combat forces within its continental boundaries. This reduces expense, allows the maximum expenditure of funds at home, and improves the balance of payments.[4]

The realization of military airlift's critical importance is most clearly presented by reviewing the history of airlift. The historical perspective of airlift presented here starts with the rather uncertain beginnings of airlift and traces its development to the present. Included are descriptions of some major airlift operations and the evolution of airlift doctrine. The operations described are for illustrative purposes and are not intended as a comprehensive review of all major or important airlift operations. Simi-

larly, although airlift is a major function of the Military Airlift Command (MAC), there are countless other important activities that relate to airlift for which MAC is responsible but that are not covered in this short history.

The emphasis is on understanding the major strategic and tactical airlift forces. Other specialized MAC forces—such as rescue HC-130s, Special Operations Force MC-130s and AC-130s, and special airlift aircraft like C-9s, C-12s, C-21s, C-23s, and C-137s—are not included in this discussion. These are critical assets that often perform missions similar to the major airlift force, but they are not germane to this study.

This review of airlift history should build an understanding of airlift and some of its complexities and problems. Although far from an in-depth review, it should be sufficient to demonstrate the importance of the master plans and their effects on the future of military airlift.

Once the development of military airlift is understood, the specifics of the Airlift Master Plan and the Airlift Total Force Plan, and their influence on the present airlift force structure, can be covered. Included here is a discussion of mobility, the part airlift plays in mobility, and how mobility requirements are determined. This is followed by a short discussion of a congressionally directed study that establishes a minimum airlift requirement and ends with a comprehensive summary of the two Air Force master plans designed to meet this requirement.

Because these two plans were written in the early 1980s, there was a chance that subsequent events could differ from those anticipated by the original plans and affect the utility of these plans for building an airlift force for the year 2000. Publication of the plans generated immediate controversy, primarily over buying a new airlift aircraft—the C-17. This controversy was eventually resolved in favor of the Air Force plans.

The intervening years did bring some unexpected changes. Seven issues or potential problems have arisen since the original publication of the plans and although MAC's present airlift force is largely as programmed in the master plans, some variation has taken place in the five years since the plans were written. The issues generated by this variation are addressed as potential problem areas that should be examined by Air Force planners to determine whether an actual problem exists and whether a solution is warranted or possible.

The study concludes with some observations on changes in military airlift and the possible effects of these changes. It also includes a recommendation for realigning airlift master plans according to the evolutionary changes that MAC has experienced in the 1980s. These observations and recommendations are very general in nature. Attempts at specificity in describing the future of military airlift are less than prudent due to the turbulent nature of airlift history and the changes presently occurring.

The data quoted for aircraft force structure (the numbers of particular aircraft) can be confusing because they often vary between sources. Older sources simply list the number of aircraft while more modern sources differentiate between different categories of similar aircraft.

Where possible, an attempt has been made to use MAC figures, which are generally given as primary aircraft authorization (PAA). This number is usually not the total number of assigned aircraft. PAA aircraft are those funded for aircrew, flying time, maintenance, and support. An older term, *unit equipped* (UE), is sometimes used instead of PAA.

The total assigned aircraft include PAA and backup aircraft inventory (BAI)—"extra" aircraft. BAI aircraft are not funded for aircrew, flying hours, maintenance, or support; they are intended as replacement aircraft for those lost through accidents and to fill in for aircraft not available due to major maintenance operations and inspections. The BAI figure is typically 10 percent of the total number of aircraft; a unit with 16 PAA aircraft should also have one or two BAI aircraft assigned but not accounted for in operational planning. This allows planners to plan on an average of 16 aircraft (PAA) available for wartime tasking from that unit since the BAI aircraft will make up any shortage due to maintenance or loss.

Other terms that can be confusing are those used for the Air National Guard (ANG) and the Air Force Reserve (AFRES). Terms in use in various publications include *Guard and Reserve*, *Air Reserve Forces* (ARF), *Air Reserve Component* (ARC), and *reserve forces*. The latter term is used here except for direct quotes from other sources. Other terms not generally known are explained in the text.

Notes

1. Memorandum, Gen Charles A. Gabriel, chief of staff US Air Force and Verne Orr, secretary of the Air Force, to secretaries of the Army and Navy, chief of staff of the Army, chief of naval operations, commandant of the Marine Corps, and commanders in chief of the specified and unified commands, subject: US Air Force Airlift Master Plan, 29 September 1983.

2. Memorandum, Gen Charles A. Gabriel, chief of staff US Air Force and Verne Orr, secretary of the Air Force, to secretaries of the Army and Navy, chief of staff Army, chief of naval operations, commandant of the Marine Corps, and commanders in chief of the specified and unified commands, subject: USAF Airlift Total Force Plan (ATFP), 17 September 1984.

3. Ibid.

4. House Committee on Armed Services, *Report on the Posture of Military Airlift*, Research and Development Subcommittee, 94th Cong., 2d sess., 9 April 1976, 1.

Chapter 2

Historical Perspective of Airlift

Air Force Manual (AFM) 1-1, *Basic Aerospace Doctrine of the United States Air Force*, lists nine fundamental missions and seven specialized support tasks that must be accomplished by the Air Force.[1] Airlift is one of the nine fundamental missions.

> **AIRLIFT** objectives are to deploy, employ, and sustain military forces through the medium of aerospace. The airlift mission is performed under varying conditions, ranging from peace to war. As a combat mission, airlift projects power through airdrop, extraction, and airlanding of ground forces and supplies into combat. Through mobility operations, the joint or combined force commander can maneuver fighting forces to exploit an enemy's weaknesses. As a combat support mission, airlift provides logistics support through the transportation of personnel and equipment. In peacetime, airlift provides the opportunity to enhance national objectives by providing military assistance and civilian relief programs. . . .
>
> Airlift may be performed from a strategic or tactical perspective. Strategic (intertheater) airlift transcends the boundary of any one theater and is executed under the central direction of higher authority, normally in support of a more pervasive or overall effort. In contrast, tactical (intratheater) airlift is performed within a theater of operations and supports theater objectives through the rapid and responsive movement of personnel and supplies.[2]

This description contains numerous specific aspects of airlift, none of which were nearly so clear in the early years.

Airlift Beginnings

The date typically given as the beginning of military airlift is 29 May 1941, the day Air Corps Ferrying Command was activated to speed up delivery of American bombers to England. This mission quickly expanded to include military air transport of passengers; and after the Japanese attacked Pearl Harbor on 7 December 1941, Ferrying Command operations were expanded into the Pacific theater.[3]

But this rather simple story overlooks years of turmoil for air power. The Army air arm was created within the Signal Corps in 1907 as the Aeronautical Division. When it was renamed the Aviation Section of the Signal Corps in 1914, it had an authorized strength of 60 officers and 260 enlisted men. In 1918, when Great Britain's Royal Air Force (RAF) was created as an independent service, the American airmen were still struggling for independence from the Army.[4]

The 1920s saw air power leaders continuing their quest for a separate air arm while refining air power concepts. These concepts included bombardment, pursuit, observation, and attack. Airlift played no role in these arguments. But this is not to say there was no air transport: By 1930 the Air Service had purchased or tested 88 types of transport aircraft and military air transport was in constant demand.[5] Still, autonomy and basic air power doctrine were the issues of the day.

Several boards studied the issue of military aviation organization. The Lassiter Board (1923) acknowledged the usefulness of an independent air arm but the Morrow Board (1925) opposed such independence while the Lampert committee (1925) only implied the need for a separate service. Faced with conflicting and indecisive reports, Congress responded with the Air Corps Act of 1926, creating the US Army Air Corps. In 1933 both the Drum Board and the Baker Board decided against recommending a separate air arm, but their recommendations did result in a General Headquarters Air Force. By 1935 operational control of air units had been taken from corps commanders and placed under wing commanders, who reported to the General Headquarters Air Force. The air arm was finally given quasi-autonomy on 20 June 1941 when the Army Air Forces were established.[6]

Throughout these years of struggle for independence, the struggle for an air power doctrine was also taking place. During the 1920s the Army held the position that air power was auxiliary to the ground forces. Air power advocates continued to develop air doctrine, however, and "between 1931 and 1935 the Army aviators considered the Air Corps to have three major missions: strategic bombardment, coast defense, and ground army support." Strategic bombardment quickly gained ascendancy; by 1933 the Air Corps was building doctrine based on the theories of Giulio Douhet, the Italian air power advocate.[7]

Douhet concentrated on offensive air superiority: "The purpose of aerial warfare is the conquest of the command of the air. Having the command of the air, aerial forces should direct their offensives against surface objectives with the intention of crushing the material and moral resistance of the enemy." Douhet also advocated an independent and highly mobile air force, ideas that fell on fertile ground in the US Army Air Corps.[8] By 1935 the doctrine of strategic bombardment was firmly established; it would follow the Air Corps to World War II relatively unchanged.[9]

The Air Corps struggle for independence suffered during the late 1930s. The chief of the Air Corps, Gen Benjamin ("Bennie") Foulois, was overly zealous in his advocacy of an independent air arm. This created trouble with Congress. Meanwhile, air power advocates were concentrating their efforts on the B-17, ignoring the issue of mobility. No written doctrine addressed airlift.[10]

Lt Col Charles E. Miller listed five tenets of doctrine for military air transportation that were in practice prior to World War II, although no published doctrine yet existed. These tenets are paraphrased here.

- The primary role of military air transportation is support of the air forces to which it belongs and by which it is controlled.
- Air Corps flexibility and mobility require both military and civilian air transportation.
- Military air transportation is an economical, reliable, and important logistical tool for the entire air force.
- Combat forces take precedence over military air transportation forces for development, acquisition, and operation.
- Civil air transportation mobilized during wartime can meet most military needs, and its use avoids the costs of maintaining military transportation in peacetime.[11]

Given this unofficial doctrine, it is understandable that in 1939 only 75 of 2,080 aircraft on hand and 21 of 1,115 aircraft ordered were transports. But the inadequacy of this transport force had not gone unrecognized: Some reports had noted a critical need for air transportation as early as 1925, and a limited air transport service had been used for depot support from 1922 to 1926. A decentralized air transport system had been established in 1932, with four squadrons under the 1st Air Transport Group (Provisional); but efforts for further consolidation and increased numbers of aircraft had failed. With the country drawing closer to war, the need for credible military air transportation was not being met.[12]

In July of 1941 the president asked for an estimate of the forces required to win in the event of war. The Air Corps input was Air War Plans Division-Plan No. 1 (AWPD-1), which called for 1,050 transport aircraft out of a total force of almost 25,000 aircraft. One of the principle authors of AWPD-1, Lt Col Harold George, was named commander of Ferrying Command in March of 1942 when it had a force of 130 transports. By the end of the war, he commanded a force of 3,090 transport aircraft assigned to the redesignated Air Transport Command.[13] This number does not include Troop Carrier Command's transport aircraft, over 1,000 of which were used in the 1944 airborne assault code-named Market-Garden.[14] These two transport forces and the development of air transport doctrine during World War II are discussed in the next section.

Airlift in World War II

In April 1941 Gen Henry H. Arnold, chief of the Air Corps, was sent to England to make arrangements for delivering American aircraft to the British as part of the Lend-Lease Act. This trip led to the establishment of the Ferrying Command.[15] This limited ferrying mission quickly expanded into worldwide air transportation.

Within the first year of operation, Ferrying Command was given responsibility for air transport of people, materiel, and mail throughout the world, while Air Service commands would perform local air transportation opera-

tions within given theaters of operation. With this mission definition came new names: on 20 June 1942 Ferrying Command became Air Transport Command and the Air Service commands became Troop Carrier commands.[16] Thus were established the strategic or intertheater (worldwide) and the tactical or intratheater (specified area) concepts of airlift operations and of dividing them between two commands.

Another issue was operational control of airlift. Theater commanders were directed not to interfere with scheduled transport missions unless the aircraft had to be delayed for security of the airlift mission itself.[17] This policy prevented local operational requirements from interfering with airlift missions supporting a larger need; it remains in effect today.

Other issues and lessons also came out of transport operations in World War II. Both the air supply of China from India (the "Hump") and the airborne portion of Operation Market-Garden contributed to modern airlift doctrine.

The "Hump"

Keeping China in the war, a basic tenet of Allied policy, was difficult. Japanese advances had sealed off land and sea routes of supply to the Chinese forces by 21 March 1942, causing President Franklin Delano Roosevelt to order resupply by air.[18] The route known as the Hump, from India through Burma to China, required crossing Himalayan mountain peaks over 16,000 feet high—a Herculean task for the aircraft of that day.

The early days of Hump operations were dismal. Primitive conditions, bad weather, lack of spare parts, limited numbers of aircraft, high losses due to enemy action and dangerous flying conditions, and a mixed civilian/military operation with limited air transport experience combined to produce poor results.[19] Because few supplies were being delivered, Hump operations were assigned to Air Transport Command in December of 1942.[20]

Early Hump operations had delivered less than 1,000 tons per month. This figure was up to 3,000 tons per month by 1943 and 10,000 tons per month by early 1944; but each increase in tonnage was accompanied by an increase in aircraft accidents. Hump operations were commanded by several different Air Corps officers, but the one most often associated with the Hump was Gen William H. Tunner. General Tunner had more airlift expertise than most, having been the third officer assigned to the newly created Ferrying Command on 29 May 1941. Assuming command in August of 1944, he instituted a number of programs to ensure a professional operation:

- A comprehensive flying training program to teach the skills required for this airlift.
- A safety program similar to the one he had started in the Ferrying Command.

- A unique maintenance program designed to cope with the primitive conditions and long lines of supply.
- A statistical program to track the operation.[21]

The end result of General Tunner's efforts was a massive airlift system that moved 550,000 tons during its last year of operation, an average of over 45,000 tons per month. The command's 650 planes had an accident rate of 0.3 per 1,000 flying hours in 1945, compared to a rate of 2.0 in 1944. The Air Transport Command had proven itself capable of safely launching an aircraft every two minutes to fly the hazardous route over the Himalayas. Tunner's Hump operation was called "an epic of war" by President Roosevelt.[22]

Another aspect of airlift in World War II was the airborne operation, later called tactical airlift. The Troop Carrier commands, created as the intra-theater airlift force when Air Transport Command was created, grew rapidly in the early years of the war. As early as 1942, large-scale airborne training operations were conducted in preparation for the cross-channel invasion of Europe—and airborne forces were used in a number of campaigns but with mixed results. Numerous lessons were learned, including the need for pathfinders, clear operational command, daylight operations, and air superiority; and the experience was applied to Operation Market-Garden.[23]

Operation Market-Garden

On 17 September 1944 the largest airborne operation ever attempted was launched against the Arnhem area in Holland.[24] Allied troops commanded by British Field Marshal Bernard Law Montgomery were to airdrop and airland (by glider) into the three drop zones of Eindhoven, Nijmegen, and Arnhem, forming a bridgehead across the Rhine River and onto the northern German plain.[25] Montgomery's plan was to outflank German defenses in an area least expected by the enemy but within favorable range for resupply from the United Kingdom. The airborne portion of the operation (Market) involved the British 1st Airborne Division, the American 82d and 101st Airborne Divisions, and the Polish 1st Independent Parachute Brigade; the ground portion (Garden) involved the Guards Armoured Division, the XXX Corps, and three infantry divisions. The British 1st Division and the Polish 1st Independent Parachute Brigade were to capture the Arnhem bridges, the 82d Airborne Division was responsible for the bridges at Grave and Nijmegen, and the 101st Airborne Division had the bridges and area between Eindhoven and Grave. These operations were to clear the way for the initial ground assault by the XXX Corps.[26]

Preparation for the airborne assault began on the night of 16 September when 282 RAF bombers attacked flak installations and airfields within fighter range of the drop zones. On the morning of 17 September, over 1,200 aircraft (B-17s, P-51s, Lancasters, and Mosquitos) were launched against flak sites and troop barracks in the objective areas; the IX Troop Carrier Command began launching transport aircraft at 1000 hours. By 1430 they

had airdropped and landed some 20,000 Allied soldiers behind enemy lines.[27]

Due to surprise, initial resistance was light. The 101st was able to secure much of the area between Eindhoven and Veghel while the 82d captured the Maas bridge at Grave but failed to take the Nijmegen bridges. The British 1st Division did not meet with the same success; over 5,000 soldiers landed or were airdropped five to eight miles from the objective area. This forced the 1st to leave a majority of its force behind to guard the drop zones for the next day's missions and allowed the German army time to concentrate much stronger forces than anticipated at Arnhem.[28]

Allied intelligence had predicted a brigade group or less at Arnhem; but the Germans had organized a much stronger force, including two panzer divisions, to defend the area—and radio failure prevented the 1st from communicating its plight to the outside world for five days. By then it was too late.[29] On 18 September another airborne assault reinforced and resupplied the 82d and the 101st; but few supplies and only about 2,000 paratroopers reached the 1st, where the need for resupply was critical.[30]

On the third day, 19 September, "the day dawned as black as the night and the day's reinforcement operations were postponed as all of the British-based airfields were completely closed in."[31] Some resupply attempts were made by the RAF but poor weather conditions, lack of communications, heavy flak, and lack of fighter cover resulted in most of those supplies being recovered by the enemy.[32]

The position of the 1st Division continued to worsen. The Allies took the bridges at Nijmegen on the 20th and the XXX Corps reached the Lek River on the 22d, but heavy enemy action prevented a crossing to reinforce or resupply the British 1st Airborne Division.[33] Finally, on the night of 25 September, 2,200 men of the 1st were evacuated across the river. The unit had suffered some 7,000 casualties and the northern thrust into Germany had failed.

> The battle of Arnhem was ninety percent successful. Full success was denied us for two reasons: First, the weather prevented the build-up of our forces in the battle area; second, the enemy managed to effect a surprisingly rapid concentration of forces to overcome us.[34]

Montgomery's chief of staff listed a lack of airlift as a third reason for the failure of Market-Garden. The Allies did not have enough troop carrier aircraft to carry the entire force in one lift, and the 1st Division was allocated fewer aircraft than the other two divisions. Both the 82d and the 101st had to succeed or the Arnhem bridge would have been worthless and the 1st would be cut off.[35] Complicating this picture were the need for daylight operations to ensure drop accuracy and the limited daylight hours available in September. Thus, transport operations were limited to one sortie per day, forcing an operation of several days' duration.[36]

There were other contributing factors in Market-Garden's failure, including the use of drop zones for the British 1st that were five to eight miles from the objective, slow movement of the ground forces, and radio failure;[37] but the deciding factor was probably the limited capability of the transport force. According to Lt Gen Lewis Brereton, commander of the 1st Allied Airborne Army, Market-Garden's lesson was "don't send a boy to do a man's job . . . concentrate the maximum force on the principal objective."[38]

Despite the failure of Market-Garden to achieve its objectives, it was seen as a success for troop carrier operations. Almost 5,000 troop carrier sorties and over 2,400 glider sorties delivered approximately 35,000 men behind enemy lines—20,000 of them on the first day.[39] The airdrops were largely accurate, and two of the three airborne forces achieved their objectives. Similarly, this first real test of resupply by air was successful for all but the 1st. The concept of the airborne assault had been proven.

Other Operations

Airborne assaults were also conducted in the Pacific theater at New Guinea, Noemfoor Island, Luzon, and Corregidor. This last assault was a very successful combination parachute and amphibious attack against heavily fortified positions.[40]

In Europe, the lessons learned from Market were applied to the final assault across the Rhine. In this assault, code-named Varsity, the airborne attack followed the initial ground assault; and all airborne forces and supplies were dropped during a single four-hour mission. Varsity was termed the most successful airborne operation to date.[41]

By the end of the war, both strategic airlift (Air Transport Command) and tactical airlift (Troop Carrier commands) had proven invaluable. In March 1945 General Arnold reported, "We have learned and must not forget that from now on air transport is an essential element of airpower, in fact, of all national power. We must have an air transport organization in being capable of tremendous expansion."[42] Two years later Maj Gen Robert M. Webster, who had commanded both tactical fighter and transport units during World War II, stated,

> I would say that we went into the last war with only two basic types of military aircraft, the bomber and the fighter. I feel that we have come out of that war with an additional type, the transport plane, and that we should think in terms of bomber-fighter-transport—since they are all equally important—and they must be properly balanced to each other if we are to be prepared to conduct successful war operations.[43]

The AWPD-1 planning document recommended a strength of 1,040 aircraft in 13 transport groups and 1,520 aircraft in 19 troop carrier groups. The actual postwar count was nine air transport divisions and 32 troop carrier groups with a combined total of 10,138 transports.[44] The number of transports actually needed for World War II was almost four times the planned requirement. But the transport forces now faced the postwar drawdown of military forces, competition with civil air transport, and the force structure battles that would come with a truly independent Air Force.

The Postwar Era

The event usually associated with airlift between the end of World War II and the Korean War resulted from the Berlin blockade and the monumental airlift effort that kept the city alive. But the first critical event for air transport was the end-of-war military drawdown when military planners were forced to make a number of difficult choices. Air Corps planners had assumed a postwar strength of 105 groups; the War Department slashed this number to 70. In 1948 the Bureau of the Budget funded only enough to modernize 55 groups; Congress cut this in half. By 1950 the Air Force was limited to a budget of $5.025 billion—a 48-group Air Force.[45]

Complicating these problems were several other issues facing the Air Force. For example, Air Force leaders wanted a unified defense establishment under a single secretary of defense—an idea opposed by the Navy. At this same time the Navy accused the Air Force of attempting to gain all air missions, including naval land-based reconnaissance and antisubmarine missions, while the Air force was concerned over Navy attempts to build a strategic bombing mission. Further, the Air Force had to establish command structures for headquarters and major mission areas along with the necessary supporting commands—some of which were retained by the Army.[46]

An Air Staff study in 1945 recommended the consolidation of troop carrier and air transport resources under a single Air Transport Command. At the same time, Troop Carrier Command advocates proposed a separate Army airborne force that would have parity with the Army ground force. Both of these ideas were rejected, however, and the airlift force remained divided between Air Transport Command (ATC) and the Tactical Air Command (TAC). A 1950 attempt to consolidate troop carrier units under the Military Air Transport Service was also turned down.[47]

To keep ATC from competing with an emerging civil air carrier system, the command's mission statement was extremely limited:

> [To] operate air transport services (except transport services specifically assigned to other commands . . . and intra-theater services required by overseas commanders) for all War Department agencies supplementary to United States civil air carriers.[48]

This idea of an airlift force supplementary to civilian airlines was vigorously opposed by Air Transport Command, but ATC still lacked a clear wartime mission by the end of 1947.[49] The requirement for a strong and capable airlift force that was so clear during the closing days of the war had been lost.

Independence for the air arm came with the National Security Act of 1947. This act established three separate services (Army, Navy, and Air Force) within a national military establishment headed by a civilian secretary of defense. But the act did not fully please any of the services; and because of the air assets left with the other services, at least one Air Force general expressed the opinion that there were now "four military air forces."[50]

The battle between the Navy and the Air Force eventually focused on air transport. Executive Order 9877 (January 1947) directed the Navy to keep only such transport forces as required for internal administration and for travel over routes of sole interest to the Navy; other required air transportation would be supplied by the Air Force. The National Security Act, however, stated that the Navy would keep essential air transportation. The Navy, of course, considered all of its air transports essential and kept them. But in May 1948, despite Navy protests, the Naval Air Transport Service was merged into the new Military Air Transport Service (MATS).[51] Formally created on 1 June 1948, MATS faced its first crisis almost immediately: the Berlin blockade.

Berlin Airlift

Greater Berlin was divided into four sectors after the war, each occupied by one of the Allied powers. Soviet treatment of German citizens, Soviet attempts to control radio and press, and Soviet political power plays were concerns even during the first year of occupation. Despite these problems, an agreement signed in 1946 provided for three air corridors and associated navigational aides through East Germany into Berlin.[52]

Serious difficulties continued to develop between the occupying powers. The Communists made strong and varied attempts to gain control of the city, but their Socialist Unity Party was soundly defeated in West Berlin elections. The Soviets' control over city officials was seriously diminished, and their attempts to regain control failed. They then turned to a strong media campaign for Western withdrawal from the city. Tensions increased; and after a Soviet fighter crashed into and destroyed a British airliner, both British and American passenger flights were given fighter escort.[53]

By the summer of 1948 the city was in a near-crisis condition. Soviet control of the major electrical power supply stations, propaganda about low stocks of food in the Western zone, and stories that the city could not be supplied by air had set the stage for blockade. On 18 June 1948 a Soviet attempt to include the entire city in a currency reform was thwarted by a West German currency reform. The Soviets promptly closed all overland supply routes to the Western zone and cut off electrical power supplied from the Eastern zone. Conflicting currency reforms, a new Soviet claim to the entire city, and public unrest finally led to a total blockade on 24 June 1948. No food, medicine, or fuel would be allowed into the Western sector.[54]

Gen Lucius D. Clay, United States military governor, requested permission to send an armored column to Berlin. This was approved by Washington with the proviso that no shots would be fired. However, there were 30 full-strength Soviet divisions in the Eastern zone and just a few partial divisions in the Western zone; General Clay decided to use airlift.[55] Under Secretary of State Robert A. Lovett explained the decision.

> After discussion with the military services . . . and . . . throughout the National Security Council and finally with the President and the appropriate committees of Congress to whom I reported, we decided to stand firm in Berlin and not be thrown out, confident

> that we could do the job ultimately by the same techniques that we had used in lifting approximately 70,000 tons in one month over the hump from India into China at very high altitudes.[56]

A close examination of the task ahead and the state of US military air transport in 1948 might have resulted in a less sanguine attitude. The 70,000-ton figure used by Lovett was never sustained; and the city of Berlin imported 465,000 tons per month *before* the blockade![57] If severe rationing cut this figure by 75 percent, it would still require more lift than the Hump operation had ever achieved.

The transport aircraft available were the same C-47s and C-54s that had been used over the Hump but there were not as many available. Air Transport Command had gone from 3,088 aircraft in 1945 to 511 aircraft in 1946. With no other option available, General Clay directed Maj Gen Curtis E. LeMay, commander of United States Air Forces in Europe (USAFE), to begin an aerial resupply of Berlin. General LeMay, estimating that he could provide only 225 tons per day with the 102 C-47 aircraft available in Europe, requested C-54s. By July, 45 of these aircraft and crews had arrived.[58] Even with these additional aircraft, however, General Clay estimated the airlift could provide only 600 to 700 tons per day. Cornelius V. Whitney, assistant secretary of the Air Force, told the National Security Council that the Air Staff believed "the air operation is doomed to failure."[59]

By mid-July, the tonnage figures were up to slightly more than 2,000 tons per day. General Tunner, who had done so well with the Hump airlift, was put in command and directed to "produce."[60] He requested and received additional C-54s. By October he had eliminated use of the slower and less capable C-47s and had combined the American and British operations into the Combined Air Lift Task Force (CALTF).[61]

General Tunner made several changes and introduced new programs to improve the efficiency of the airlift, which he had originally termed "a real cowboy operation."[62] Among the changes and new programs were:

- A firm three-minute interval for all takeoffs and landings.
- Set speeds and routes, including a rule that a pilot who missed the first landing in Berlin had to turn around and head back to avoid upsetting the stream of inbound aircraft.
- A special maintenance operation that included German mechanics.
- Special ground handling procedures that cut the turn around time in Berlin to 30 minutes.
- A special newspaper for the airlifters and a competition on tons delivered, both designed to help the morale of crews who had been away from home much longer than expected.[63]

The results were impressive. By May 1949, 319 of the Air Force's 400 C-54 aircraft were delivering an average of 5,600 tons per day to three Berlin airfields. They averaged almost one round-trip per minute, every minute, 24 hours per day,[64] despite weather problems and at least 700 cases of

aircraft harassment: flares, balloons, bright lights, buzzing by Soviet aircraft, and ground fire (55 aircraft were hit).[65]

The blockade ended on 12 May 1949. The final numbers were: 2.231 million tons lifted; a one-day record of 12,940 tons lifted; 75,000 personnel involved; 277,804 total flights, 189,963 by US crews; 12 accidents; and a city of 2.5 million people sustained.[66] General Tunner's conclusions were these:

- This successful airlift was truly a joint and combined operation. It involved units from the US Air Force, the British Royal Air Force, the Royal Australian Air Force, the Royal New Zealand Air Force, the South African Air Force, and the US Navy.[67]
- Military air transportation requirements and economic considerations demand a large airlift aircraft designed for military operations; 68 C-74 aircraft would do the job of 178 C-54 aircraft at less expense for flying time, personnel, and maintenance.[68] (This helped MATS procure the C-124 in 1950. It had four times the cargo capacity of the C-54 and was specifically designed for military air transportation.)
- Airlift can carry personnel and cargo anywhere in the world, regardless of conditions. It will be a vital factor in future military operations.[69]
- For the most effective and efficient operation, airlift must have a single commander. (General Tunner had operational command only; administratively, he was under USAFE command, a situation which caused numerous problems.)[70]

General Clay also made some observations. He identified three main results from the operation:

- American prestige was elevated to new heights through the accomplishment of a seemingly impossible task.
- The American effort demonstrated a firm commitment to establish a sound economy in Europe and improved the prospects for rebuilding the West German economy.
- Morale in all of Western Europe was raised by this demonstrated proof of American resolve "not to abandon them to totalitarian domination. The Airlift has become a symbol of hope."[71]

The September 1948 *Air Force Magazine* stated, "For the first time in History, the United States is employing its Air Force as a diplomatic weapon. . . . The first chapters of the 'role of air power in diplomacy' are being written here."[72]

Without its airlift option, the United States would have been limited to two choices in Berlin: get out or fight. Airlift provided time for negotiations and, more important, weakened Soviet resolve while bolstering German resolve.

This dual wartime/peacetime aspect of military airlift is now part of basic Air Force doctrine. Military airlift has been used to fly medicine, food, clothing, refugees, wounded troops, shelters, fuel, sandbags, water,

blankets, expectant mothers, livestock, and stranded American students to or from almost every country on the globe.

Korean War

The funding malaise that had afflicted the US military after World War II was cured by two world events. The Soviet Union exploded an atomic bomb in August 1949 and the North Koreans invaded South Korea in June 1950. The Army and Air Force Authorization Act (of 10 July 1950) increased Air Force strength from 48 groups to 70 groups. By September 95 wings had been authorized for 1952. Further expansion to a planned force of 143 wings was approved but eventually slowed by fiscal constraints.[73]

Defense funding for 1951 was increased from $13.3 billion to $48.2 billion. In 1952 the Air Force placed orders for 6,944 new aircraft, 244 of which were the new C-123 assault transports. The C-123 was to replace the glider as a transport vehicle.[74]

By the summer of 1950, however, MATS had been reduced to a force based on "ultra-economy." It was limited to a peacetime aircraft utilization of 2.5 hours per aircraft per day; any increase or surge would take time and require augmentation.[75]

On 25 June 1950 the North Koreans invaded South Korea. On the same day, the first American aircraft loss was recorded: a MATS C-54 was strafed on the ground at Kimpo airfield near Seoul. Because the C-54 was still the mainstay of airlift but had a limited cargo capability, large numbers of American troops were airlifted to Korea with too little equipment. Most of their equipment was moved by sea.[76]

MATS eventually increased the average utilization rate from 2.5 to 6 hours per day but moved only 16,766 tons of cargo and 53,904 passengers to Japan from July 1951 to June 1952. This rather poor showing reflected the long distances involved, limited numbers of aircraft, and inadequate manning. At the height of the Korean airlift, MATS had a mixed military and civilian force of only 250 aircraft; and the civil air carriers transported 67 percent of the passengers, 56 percent of the cargo, and 70 percent of the mail—a fact that would pose problems for future command initiatives to create a more capable strategic airlift force.[77]

For tactical airlift, the Korean story is a little better. A new command was created for theater air transport: the Combat Cargo Command (CCC). Later renamed the 315th Air Division, the CCC was organized under the Far East Air Forces (FEAF). It would be responsible for airborne assault, airdropped resupply, and airland missions carrying cargo and personnel.[78] Although his previous experience had been strategic in nature, General Tunner was put in charge of this new airlift force. He immediately argued that all transport planes should be under one command; and over Army, Navy, Marine Corps, and Fifth Air Force objections, the CCC ended up with all theater transport aircraft. He soon had a capable airlift system in operation, and when the Marine landing operation at Inchon ran into supply

trouble, he responded with emergency airlift resupply for the ground forces.[79]

The two major airborne assaults in Korea were at Sukchon and Sunchon in October 1950 and at Munsan-ni in March 1951. An earlier airborne assault at Kimpo to support the Inchon landing was changed into an airland mission because the Marines took the airfield much quicker than expected.[80]

The assault at Sukchon and Sunchon was intended to cut off and trap Communist forces after the fall of the North Korean capital. The 187th Airborne Regimental Combat Team (RCT) was airdropped on 20 October 1950 by 40 C-47s and 76 of the new C-119s. Air support sorties included 75 F-51s, 62 F-80s, and five B-26s flying air-to-ground missions.[81] Over a four-day period, 187 aircraft dropped 3,955 troops and 592 tons of cargo. The 187th commander, Brig Gen Frank S. Bowen, said there had "not been any better combat jump [and that] formation and timing were perfect."[82]

A similar four-day assault was used in March 1951 north of Seoul at Munsan-ni. Although there were some problems with last minute changes and a critical air abort, the drop was successful. From 23 to 27 March 1951, 173 aircraft dropped 3,487 troops and 483 tons of cargo.[83]

The Korean airlift effort also included emergency aerial resupply, evacuation of wounded troops, and support for fast-moving ground units. An example of the first two missions came late in 1950 when the 1st Marine Division was cut off from other Allied forces at the Choshin Reservoir. From 28 November to 9 December, 1,483 tons of supplies were airdropped and 4,600 wounded were evacuated from this completely cut off division. Most airdrops were performed by the C-119 while the C-47 was used to evacuate wounded troops from narrow, rough, dirt landing strips only 2,300 feet long.[84]

General Tunner's conclusions about airlift operations in Korea included:

- The ability of the Eighth Army to move farther and faster than any previous army in history was due in large part to air transport. Aerial resupply allowed the Eighth to drive up the west coast of Korea without regard to lines of ground supply.[85]
- There exists a need for more than one type of combat support airlift aircraft. The C-47 was the only plane capable of routinely landing on short, rough, dirt landing strips to evacuate the wounded, but it was incapable of carrying or dropping the large cargo loads the C-119 could handle.
- Worldwide airlift operations require a long-range heavy-lift aircraft.[86]

The airlift lessons from Korea were mixed. The strategic airlift forces of MATS, due to years of funding neglect and flying-time restrictions, demonstrated an inability to surge for war. The tactical airlift forces, on the other hand, amassed some credible figures. An average force of 210 airplanes "flew 210,343 sorties, carrying 391,763 tons of cargo, over 2.6 million passengers, and over 307,000 patients."[87]

One lesson seemed to be the need for specially designed airlift aircraft. The C-47s and C-54s were more suitable for passengers than heavy cargo. The C-119 with its removable rear cargo door allowed relatively large items of cargo to be airdropped and the even larger C-124, introduced late in the war, could carry vast amounts of cargo but was unable to land on runways shorter than 7,800 feet.[88] However, overall airlift capability had increased. Table 1 represents a comparison of Market-Garden with the two Korean airborne assaults.

TABLE 1

Airlift Capability from World War II to Korea

	*Market-Garden**	*Sukchon-Sunchon*	*Munsan-ni*
Total Aircraft	5,361	187	173
Total Troops	32,519	3,955	3,487
Total Cargo Tons	2,856	592	483
Average per Aircraft			
Troops	6	21	20
Cargo Tons	0.5	3.2	2.8

*The figures for Market-Garden include glider sorties and both airdrop and airland missions. Because an airland mission can carry more than an airdrop mission, the figures for Market-Garden are actually higher than they would be for a total airdrop operation.

Source: Lt Col Charles E. Miller, *Airlift Doctrine* (Maxwell AFB, Ala.: Air University Press, 1988), 113–18; 194–201.

The Turbulent Years

As used here, "the turbulent years" refers to the years from the end of the Korean War to 1965. This period saw growth for both tactical and strategic airlift, but it was growth marred by rivalry between the two airlift forces and between strategic military airlift and the civil air carriers over roles, missions, and aircraft.

Airlift Rivalry

During April and May 1950, a large exercise called Exercise Swarmer was held in North Carolina. The objective of these maneuvers, which combined strategic and tactical airlift into one force, was to airdrop a force that would seize an airfield for airland sorties of reinforcements and resupply.[89] This force included 106 tactical airlift aircraft and 100 strategic airlift aircraft—over one-third of the nation's total airlift capability. The results of the exercise pointed out the need for aircraft capable of assault-type operations into unprepared airfields, aircraft that could carry large army equipment, effective communications, fighter support, and the need to maximize air transportation use.[90]

In December 1950 General Tunner proposed the consolidation of tactical and strategic airlift. His argument, based on his experience in Korea, stressed the economy and efficiency to be gained by consolidation.[91] The commander of TAC argued persuasively that one was an airline type of transport while the other was a combat mission and, as such, an integral part of tactical aviation.[92] Others joined the argument as well, with the end result that the two types of airlift would continue as separate services for the next 25 years.

The strategic-versus-tactical issue had implications for the entire Air Force. The Air Force chief of staff believed the distinction was artificial and worked to eliminate it.[93] So did Gen George C. Kenney, commander of Air University.

> I don't think an airplane should be considered a tactical airplane or a strategic airplane. I think it is an airplane. It may drop its eggs on targets ten miles away . . . and the next day you may be working 5,000 miles away, and to say that one is tactical and the other strategic really doesn't tell the story and it uses these two ground terms which we should keep out.[94]

A 7 December 1956 Department of Defense directive, *Single Manager for Airlift Service*, designated the secretary of the Air Force as the single manager for airlift. MATS was identified as the operating agency. Some Navy airlift assets and all of TAC's C-124s were transferred to MATS. TAC protested that the move complicated its support of the composite strike force.[95]

The next attempt at consolidation resulted from President John F. Kennedy's awareness of the need for a responsive airlift force.

> I have directed prompt attention to increasing our airlift capacity. Obtaining additional air transport mobility—and obtaining it now—will better assure the ability of our conventional forces to respond, with discrimination and speed, to any problem at any spot on the globe at any moment's notice. In particular, it will enable us to meet any deliberate effort to avoid our forces by starting limited wars in widely scattered parts of the globe.[96]

This recognition of the need for a quick-reaction capability brought new life to MATS. MATS's mission statement was changed in March 1963, requiring all of its units to train and equip for *all* airlift tasks.[97] This addition of the airdrop mission, previously performed only by tactical troop carrier units, clouded the division between tactical and strategic airlift. Secretary of Defense Robert McNamara addressed this new look for airlift.

> The distinction between troop carrier and strategic airlift operations based upon differences in equipment will no longer be significant once the C-130Es and C-141s are acquired. Both of these aircraft are suitable for either mission.
>
> Admittedly, the two missions require different training, but there does not seem to be any serious obstacles to cross training the MATS crews. . . .
>
> The line of demarcation between the strategic airlift mission and the troop carrier or assault mission may, in time, become less important. This type of operation might require certain improvements in global communications and control and also possibly some changes in organization.[98]

Adding to the consolidation movement was a 1963 exercise that combined the two forces successfully in a European deployment. The exercise evaluation report emphasized the importance of the single airlift commander and spoke of mixed airlift tasks.

> There is frequently no clearcut demarcation between intertheater and intratheater airlift. Many airlift tasks are, in varying degrees, a mixture of both. The significance of this fact is that the single airlift commander in the theater, because of his dual responsibilities, maintains a dual interest; and, therefore, as a result of his day-to-day management of both inter/intratheater airlift forces, has a more complete picture of the airlift situation. . . . This overall knowledge also supports greater economy in the employment of resources in instances where duplication can be eliminated by such actions as consolidating airlift requirements, rescheduling missions to permit more effective use of opportune capability, or combining support elements at stations where both MATS and theater aircraft are operating.[99]

This argument for consolidation was once again answered by TAC. Col Louis Lindsay responded:

> Adoption of this system could result in serious degradation and misuse in time of war of one of the most essential assets available to the theater commander. The consolidation of strategic and tactical airlift as outlined by the USAFE-MATS agreement (JUNCTION RUN) is fundamentally in opposition to USAF approved doctrine and procedures governing the command and control of military airlift.
>
> Tactical Air Command is fundamentally opposed to the consolidation of tactical and strategic airlift functions under MATS in the overseas commands because such consolidations will not insure the continuous in-place availability of essential, current tactical air and assault airlift command and staff capabilities. . . .
>
> Since assault airlift, tactical fighter, reconnaissance and Army units are integrated into the basic air/ground fighting team, mutual confidence and common understanding among all of these elements are essential. Therefore, all Air Force forces involved in the combat and combat support roles have been properly grouped in Tactical Air and in the overseas Air Force component commands. Command of these tactical forces has been, and should continue to be, vested in a single tactical command whose first and full-time obligation is to the tactical mission.[100]

Along with these arguments were congressional hearings and Department of Defense studies. Opponents to consolidation won out but the issue would resurface in the early 1970s; in 1974 the two airlift forces would be directed to consolidate.

Aircraft

The introduction of the C-124 late in the Korean War started another battle between MATS and TAC. Maj Gen Laurence S. Kuter, commander of MATS, argued that the C-124s programmed for troop carrier units should be assigned to MATS. He said the aircraft was not suitable for tactical operations, there was a "critical shortage of strategic airlift," and MATS could handle the Army's need for airlift of large and heavy items. TAC, on the other hand, wanted the C-124 to meet pressing Army demands for deployment from the United States directly to combat. TAC leaders thought MATS should stay in the global airline business. The aircraft flew with both airlift forces until reassigned to MATS in 1956.[101]

TAC's loss of the C-124, however, was more than offset by the arrival of a new tactical transport aircraft. On 9 December 1956 the first group of C-130 Hercules aircraft were delivered to the 463d Troop Carrier Wing at Ardmore, Oklahoma.[102] This aircraft would replace the C-119 and the C-123. By 1959 there were two wings of C-130s in TAC and one in USAFE.[103] This aircraft would become synonymous with tactical airlift. Designed to carry large loads over strategic distances, it was also capable of airdropping and landing on short, unimproved strips.

On the strategic side of the house, the C-124 became the workhorse of MATS and a congressional subcommittee report took the Air Force to task for failing to modernize MATS.

> Although the Air Force has a program for the replacement of some of those aircraft with more modern turboprop cargo carriers, the rate of replacement appears too slow. Furthermore, there is no plan in existence for the purchase of any modern turbojet transports which appear essential if MATS is to keep pace with the strike forces which it is expected to support in an emergency. The procurement of such aircraft should be given high priority within the Air Force.[104]

Fifty C-133 turboprop aircraft were planned to begin replacing the obsolescent C-124; the jet transport would have to wait for the Kennedy administration's push for an increase in airlift capability. By 1960 MATS had 450 four-engine transports: 31 C-133s (29 more were programmed), 107 C-118s, 56 C-121s, and 256 C-124s.[105] In 1961, 45 C-135 jet aircraft were diverted from Strategic Air Command (SAC) to MATS[106] and Col Herbert Ogleby testified to Congress.

> The workhorse airplane will be the backbone of the strategic force. It will fill a requirement in which there exists today a void in both the military and civil inventory. . . . However, the military requirements should be overriding since they are dictated by national security.
>
> The workhorse airplane should be designed as an efficient transport with truck bed height loading and capable of carrying a reasonable payload over intercontinental range. . . .
>
> Past experience indicates that development and production of this type weapon system in operational numbers will require approximately 5 years. This is too long. It goes without saying that all else being equal, we would prefer the full development of a complete weapon system. We need a modern aircraft now and a compromise may be necessary.[107]

The compromise aircraft were the C-135 and the C-130E; the workhorse aircraft would be the C-141, which would eventually replace them. The slow modernization of MATS was partially due to Air Force concern with strategic nuclear forces.

> The most important mission the Air Force has is the strategic retaliatory force. . . . I would also say that a proper air defense of this Nation is of a very high order of importance. . . . In addition to that, we have the tactical strike missions in support of the Army. . . . They take an enormous part of our budget. Yet at the same time we are accused of not providing airlift. There are even some suggestions that the airlift functions should go to some other service. . . . I say we want it and cannot get it within

> the budget guidelines and within the priorities. . . . If there is to be more airlift, the only question is to establish a requirement for it, and provide the funds.[108]

Despite historical proof of the military necessity of airlift, establishing a requirement was difficult and Secretary of Defense McNamara admitted an inability to find a simple solution for calculating airlift requirements.[109]

The 1963 military budget contained funds for initial procurement of the C-141, an aircraft designed to carry 98 percent of an Army airborne division's equipment at 440 knots over a distance of 5,500 nautical miles. This aircraft would truly become the workhorse of military airlift.[110]

Also in 1963 the Air Force conducted an analysis of the force requirements for 1965–75. The study, known as Project Forecast, recommended procurement of the CX-HLS (heavy logistics support) aircraft. This large-capacity aircraft was needed to support the new Army requirement for air transport of all types of divisions, most with equipment too large to fit in a C-141. In 1965 the Lockheed C-5A was selected to fill this requirement.[111] Procurement was planned for 50 aircraft which, with the new C-141, would increase the airlift capability of MATS sixfold.[112]

Civil Air Carrier Controversy

The third major controversy MATS was involved in during the "turbulent years" concerned the civil air carriers. The widespread attitude that strategic airlift was an airline operation, and the lack of a well-defined Air Force airlift doctrine, placed the command in a position of looking like a government-funded competition to American airlines.

With demobilization after World War II, the Air Transport Command had to contract with civil air carriers for airlift support, maintenance, communications, and weather technicians.[113] Contracts for airlift augmentation during the Berlin crisis involved 110 civilian aircraft from some 25 different companies.[114] During the Korean War, civil air carriers actually carried more than 50 percent of US military cargo and passengers to Japan.

In 1952 President Harry Truman had the Department of Defense and the Department of Commerce sign a joint memorandum establishing the Civil Reserve Air Fleet (CRAF) program,[115] which made it possible to avoid the peacetime expense of maintaining a large military airlift force. Military capability would be contracted out to participating civil air carriers. This involved only strategic airlift whose missions were seen as noncombat in nature.

The CRAF arrangement required that MATS surge on D day and maintain an extremely high level of flying operations for 30 days, a feat that would demand well-trained aircrews. During peacetime, MATS aircrews required 40 hours of flying time per month to maintain proficiency and an aircraft utilization rate of six hours per day. The inability of MATS to surge to a utilization rate of more than 4.3 hours per day during the onset of the Korean War was attributed to the previous restriction of a low 2.5-hour utilization rate allowed prior to the war.[116]

By 1956 civil airlift exceeded demand and MATS was forced to reduce flying hours to a 4.0-hour utilization rate, which resulted in an additional $40 to $50 million in civil contracts. Pressure for more contracts followed and MATS—already contending with funding priority problems, questions of modernization, and a roles and mission dispute with TAC—had to take on the civilian sector.[117]

A series of studies and congressional hearings resulted in numerous and often conflicting recommendations. Some of these hearings helped bring recognition of inadequate funding and outdated equipment; others resulted in the reprogramming of funds away from MATS operations to civil transport contracts and recommendations that MATS carry only such cargo as could not be carried by the civilian sector.[118] But a series of events in 1958 revealed some fallacies and even dangers of the latter position.

In July, Lebanon asked the United States for military assistance. A USAFE and MATS fleet of 110 C-130s and C-124s airlifted 3,103 Army troops, 860 Air Force personnel, and 5,280 tons of cargo to that beleaguered country. In September of that year, a similar response was required in Taiwan. Both airlifts were successful and neither required civil airlift augmentation, but the Taiwan airlift resulted in a backlog of cargo bound for the Pacific. When MATS attempted to contract for civil airlift help, the airlines either bid too high or refused to participate (it was the height of the tourist season).[119] Later in the same year, a Trans World Airlines strike forced MATS to take over all but four of the company's military contract flights.[120]

A special subcommittee of the House Committee on Armed Services, chaired by L. Mendel Rivers, criticized the slow modernization of MATS and delivered a sharp blow to the airline industry and previous congressional detractors of MATS. The subcommittee report concluded that MATS was not competition to the airline industry, registered concern that few responsible persons were aware of the real military need for airlift, and stated that military airlift should not be "expected to subsidize any carrier or class of carrier by the procurement of airlift or other services merely to keep air carriers solvent."[121]

Congressman Rivers continued the fight for MATS modernization and pushed for CRAF contracts that would be fair, equitable, and in the national interest.[122] His efforts paid off: the issue was eventually resolved and the CRAF remains a vital part of the nation's airlift capability. (Nearly 400 commercial aircraft are contracted to respond to military airlift needs.)

During the turbulent period from the early 1950s to 1965, the conflicts over roles and missions, funding priorities, modernization, and the role of the airline industry helped to clarify airlift doctrine. The first Air Force basic doctrine manual, published in 1953, did not even mention airlift;[123] by 1964, AFM 1-1, *United States Air Force Basic Doctrine*, contained airlift mission statements for nuclear and conventional war.[124] Lt Col Charles E. Miller developed a working concept of airlift doctrine in 1988:

1. Airlift is a critical element of the national military strategy. It provides speed and flexibility in a complex world.

2. The distinctions between strategic and tactical airlift are blurring. . . .

3. Military airlift has several unique roles to perform in contingencies and wartime that absolutely demand an in-being, properly trained, highly responsive system that civil air carriers cannot provide.

4. Military airlift aircraft will be designed to perform a variety of missions but will not be primarily designed as passenger aircraft.

5. Civil air carriers make a vital contribution to airlift needs in that they can fill in on routine missions for MATS forces diverted to other activities, they provide a large portion of wartime passenger capability, and they make a significant impact on bulk cargo-carrying wartime missions.[125]

Vietnam and Consolidation: 1965–75

In September 1965 a MATS draft of AFM 2-21, *Airlift Doctrine*, was submitted to Headquarters USAF for approval. It described a total airlift system of deployment, assault, resupply, and redeployment—a proposed consolidation of tactical and strategic airlift missions under one MATS doctrinal manual. The manual proposed that all deployment/redeployment missions could be performed under MATS control. Once in theater, some of these assets would be placed under the theater commander. The thinking was that "organizational fragmentation" of airlift decreased efficiency and effectiveness when compared to a centralized command with decentralized operational command "to insure orderly and timely application of airlift resources in all methods of employment."[126]

This proposal did not sell; in 1966 Headquarters USAF directed that there would be two doctrinal manuals for airlift. The Tactical Air Command would write AFM 2-4, *Tactical Airlift*, and the newly renamed Military Airlift Command (MAC) would write AFM 2-21. The World War II split of airlift doctrine and missions would remain.[127]

Strategic Airlift

MATS began this decade with a name change and a new plan for the future. In 1965 Congressman Rivers, believing the old name did not connote the combat capability and potential of strategic airlift, led the House of Representatives to pass a bill renaming MATS as the Military Airlift Command (MAC).[128] The new MAC commander, Gen Howell M. Estes, Jr., described a two-phase airlift revolution: (1) acceptance of the utility of airlift as a "key element" in a national policy of "flexible, measured response to any situation in the spectrum of war" and (2) the overcoming of technological limitations in airlift aircraft.[129]

The first phase of General Estes's revolution was the development of the command from a nonmilitary concept of moving people and things to a combat potential of specific ton-mile requirements in support of other commands. The second phase was the acquisition of modern transport

aircraft: the C-141 and the C-5. Both aircraft were designed to overcome previous constraints inherent in the older propeller-driven aircraft.[130]

The first operational test of the C-141, Operation Blue Light, took place from 23 December 1965 to 23 January 1966. A mixed force (88 C-141s, 126 C-133s, and 11 C-124s) flew 231 missions to carry 2,952 troops and 4,749 tons of cargo from Hickam AFB, Hawaii, to Pleiku Air Base (AB), Vietnam. The "most massive airlift of US troops and equipment into a combat zone," this movement of the 3d Infantry Brigade, 25th Infantry Division, was described by the commander of US forces in Vietnam as "the most professional airlift I've seen in all my airborne experience." The C-141 had proven itself flexible enough to land on the 6,000-foot runway at Pleiku AB; and it was much faster than the C-124 or the C-133, taking only one-third the time for the same mission.[131]

In 1967 a strategic airlift operation called Eagle Thrust took 391 missions to lift 10,024 troops and 5,357 tons of cargo from Fort Campbell, Kentucky, to Bien Hoa AB, Vietnam. Twice the size of Blue Light, this operation demonstrated not only the speed of the C-141 but also its cargo-handling capability. Twenty-two of the 391 missions were flown by C-133s, and the rest by C-141s. The average off-load time of the C-141 was 7.4 minutes while the C-133s were on the ground an average of two hours.[132]

During the 1968 Tet offensive, 1,036 aircraft lifted 7,996 troops and 13,683 tons of cargo. During a tactical airlift surge at An Loc in April 1972, approximately 25 percent of the intratheater airlift was accomplished by C-141s. Also in 1972, MAC C-141s and C-5s supported a series of major TAC deployments known as Constant Guard. In May, C-5s carried 42 M41 tanks weighing 24 tons each and eight M-548 tracked recovery vehicles weighing 7.5 tons each into a combat environment at Da Nang and Cam Ranh Bay.[133] But the final proof of the C-5's unique capabilities came in another part of the world.

On 6 October 1973 Egypt and Syria attacked Israel—the beginning of the Yom Kippur War. Initial US response was to provide measured support to the Israelis, hoping for a short war that would not involve the superpowers, would avoid undue advantage for either side, and would preserve US standing with the Arab countries. By the middle of the first week it was obvious that massive replenishment of the Israeli forces would soon be required. The Israeli airline El Al began to fly arms shipments from the United States on 10 October, but the quantity was insufficient. Attempts to get US airlines to fly charter flights failed. Meanwhile, the Soviets had begun to resupply Syria, Iraq, and Egypt at a rate of about 30 Soviet airlift sorties per day, quickly increasing to 100 sorties per day after Israeli advances.[134]

On 13 October the United States began a massive resupply airlift that would exceed Soviet efforts and demonstrate US support of Israel. During the next 32 days, 145 C-5 and 422 C-141 missions airlifted 22,395 tons of military supplies and equipment from the United States to Israel.[135] Israeli prime minister Golda Meir called this airlift a decisive factor in the war.

> At last Nixon himself ordered the giant C-5 Galaxies to be sent, and the first flight arrived on the ninth day of the war, on October 14 the airlift was invaluable. It not only lifted our spirits, but also served to make the American position clear to the Soviet Union, and it undoubtedly served to make our victory possible.[136]

Some have argued that little of the US-supplied equipment actually got into the war and that the airlift's contribution was not a material one but rather a signal of US resolve and a boost to Israeli morale. For MAC, however, it was a clear victory. The C-5 demonstrated its ability to carry large military equipment, including the M60 tank. The only other option was sea lift, which would have taken 30 days to deliver the first shipment. If Lajes AB, Azores, had been unavailable, only the air-refuelable C-5 would have been capable of performing the mission (NATO countries other than Portugal refused diplomatic clearance for US aircraft).[137] Nevertheless, the MAC airlift carried more weight over a longer distance with fewer sorties than the Soviet airlift (table 2).

TABLE 2

Israeli Airlift

	US	*USSR*
Sorties	566	930
Total Tonnage	22,400	16,000
Average Round-Trip Distance	12,900	3,400
Total Duration (Days)	32	40

Source: House Committee on Armed Services, *Hearings on the Posture of Military Airlift*, Research and Development Subcommittee, 94th Cong., 1st sess., 11–19 November 1975, 30.

Strategic airlift had come of age, proving itself a flexible and capable force. Both the C-5 and the C-141 had proven vastly superior to earlier strategic airlift aircraft. Their only limitation was a requirement for well-prepared airfields.

Tactical Airlift

In 1964 field exercises called Indian River and Gold Fire I were held at Eglin AFB, Florida. These exercises provided an extensive testing of the C-130 and numerous methods of aerial resupply. Three airdrop methods were tested: (1) the low altitude parachute extraction system (LAPES), where cargo on a pallet was extracted by parachute from a C-130 flying at 10 feet above the ground; (2) the ground proximity extraction system (GPES), where cargo was extracted at low altitude by means of a hook that engaged a cable; and (3) the parachute low altitude delivery system (PLADS), where cargo was airdropped from 200 feet. All of these systems proved accurate. Along with other standard methods of airdrop, they made the C-130 a highly flexible "troop carrier."[138]

Airland missions into 2,000-foot dirt landing strips were also tested during these exercises. A new rough-terrain loader (RTL), which could operate in field conditions and which made ground operations much faster, contributed to the success of these tests.[139] So did a new system of materials-handling equipment (MHE), the key ingredients of which were palletized cargo and an aircraft designed to accept it. Palletized cargo could be loaded by forklift or other similar equipment and thus overcome the time-consuming and labor-intensive requirement to load and unload each aircraft by hand as had been done during the Berlin airlift.[140]

The C-130E, designed to carry six 463L pallets, could accommodate five types of loading equipment. This combination was first tested in combat in Vietnam. The system was so effective that equipment shortages and breakdowns had replaced aircraft downtime as the limiting factor in airlift operations by 1966. It was a much better system, and similar improvements were designed into both the C-141 and the C-5.[141]

Tactical airlift during the Vietnam War involved the C-7 (transferred from the Army to the Air Force in 1966), the C-123, and the C-130. Early operations were primarily conducted with the C-123, including several airborne assaults with South Vietnamese paratroopers that had generally unfavorable results. Paratroop drops of over 1,000 troops were conducted twice in 1963, along with numerous smaller drops; in 1964 only two drops, each with approximately 500 troops, were accomplished. For this war, the helicopter had become the primary air assault vehicle. But this change in operations actually increased the use of C-123s; their capacity, range, and short-runway capability were used to advantage for airland missions and resupply.[142]

> The evidence became unmistakable. Not only did the C-123 excel in airlanded tactics, but also there existed an important need for this kind of activity in a "war without fronts." The airlanded tactical applications, although less dramatic than parachute assault operations, correctly foreshadowed the employment of the C-123s and a larger force of C-130s in Vietnam in later years. The ability of the Southeast Asia Airlift System to sustain daily high volume logistics demands, while maintaining readiness for surges in the tactical effort, became the heart of the airlift story.[143]

The initial C-130 force was based outside Vietnam, but 32 C-130s were based at four locations within Vietnam by 1965. An additional eight squadrons (four on continual 90-day rotations from the US) were based outside the country. By 1966 there were 44 C-130s in Vietnam and 12 squadrons operating from outside the country. This would be the prevalent basing situation for the remainder of the war. To increase the capacity of this force, the aircraft utilization rate (average daily flying hours per aircraft) was increased: a rate of 1.5 hours per day per aircraft was raised to five hours by adding maintenance personnel, increasing the number of aircrews, and working a six-day week. Also, a safety restriction was removed, allowing C-130 operations on runways of 2,000 feet. This increased the average monthly flying hours from 8,640 in 1965 to 18,000 in 1966.[144] Most of the C-130 missions involved shuttling cargo from main

arrival ports to in-country areas: 30,000 tons per month in 1965, 140,000 tons per month in 1966, and 180,000 tons per month in 1968.[145]

The C-130 also took part in a number of surge operations, emergency aerial resupply missions, and air assaults. Practice air assaults were conducted from C-130s in 1966, and in 1967 the "war's first and only American battalion-sized parachute assault" was conducted in a search-and-destroy operation called Junction City. An elaborate decoy plan was used and the participants only learned the location of the drop zone the morning of the mission. At 0825 on the morning of 23 February 1967, thirteen C-130s took off from Bien Hoa and successfully airdropped 60 paratroopers each. These airdrops were followed twice that day by an additional 10 C-130s dropping supplies using heavy equipment and container delivery system (CDS) procedures, delivering an average of 10 tons per aircraft. A massive helicopter assault and more airdrops completed this operation. In all, the C-130s dropped over 1,700 tons of equipment and supplies. The Army termed the drop capability extremely efficient and "not only an emergency but also an expedient means of resupply to tactical units." This capability would result in victory at Khe Sanh the following year.[146]

Khe Sanh was a US Marine base in northern South Vietnam. On 21 January 1968 the base came under a rocket and mortar attack—the beginning of an intensive enemy effort to overrun the area. For 78 days, 15,000–20,000 enemy troops assaulted some 6,000 US Marines, who were supported by US Army and South Vietnamese forces and a massive air power campaign.[147]

The base had a 3,000-foot landing strip but resupply operations would be hampered by enemy fire and bad weather. Surrounded by mountainous terrain, Khe Sahn was called a "fog factory" during the monsoon season. Fog combined with mortar and rocket attacks closed the runway except for three hours a day. By mid-February, landings were suspended except for delivery of emergency medical supplies and evacuation of the wounded by C-123s. Resupply would be by airdrop from C-130s and C-123s.[148]

Airdrops were conducted from high, medium, and low altitudes using CDS procedures for bulk supplies and LAPES or GPES for heavy loads to ensure accuracy in the small drop zone available. Special methods were developed for weather that prevented visual sighting of the 300 x 300-yard drop zone. The siege was lifted on 8 April 1968; the battle for Khe Sahn had been won.[149]

The airlifted resupply averaged 300,000 pounds daily, the equivalent of a 60-truck convoy. This effort was made possible by an overwhelming air superiority. Tactical fighter-bomber support totaled 17,731 sorties and 19,400 tons of ordnance; B-52 bombers flew 2,600 sorties and dropped 75,500 tons of ordnance. The airlift effort is detailed in table 3.[150]

There were numerous other tactical airlift successes in Vietnam. An air evacuation was conducted under heavy enemy fire at Kham Duc on 12 May 1968; 500 people were rescued, two C-130s and four helicopters were

destroyed. Lt Col Joe M. Jackson landed a C-123 at Kham Duc, after it had been overrun, to rescue three American personnel; he was the only airlifter to receive the Medal of Honor in Vietnam. In October 1968, C-130s flew 437 sorties to haul 3,400 tons of cargo and 11,500 men from the 1st Cavalry Division to new base camps northwest of Saigon. In February 1971, C-130s delivered 120,000 gallons of jet fuel and 800 tons of cargo from Da Nang to Quang Tri in support of operations north of Khe Sanh. The most difficult C-130 airdrop resupply came late in the war at An Loc.[151]

TABLE 3

Khe Sanh Airlift
21 January to 8 April 1968

	Completed Missions	*Total Tonnage*	*Average Payload*
C-130 Landings	273	3,558	13.2
C-130 CDS	496	—	—
LAPES	52	7,826	14.3
GPES	15	—	—
C-123 Landings	179	739	4.1
C-123 Drops	105	294	2.3
C-7 Landings	8	13	1.8

Sortie Totals	1,128	Passengers-out	1,574
Tonnage Totals	12,430	Passengers-in	2,676
Airdrop Tonnage Totals	8,120	IMC CEA*	133 yards
Airland Tonnage Totals	4,310	VMC CEA**	95 yards

*Refers to instrument meteorological condition (IMC) or flight in weather without visual references and circular error average (CEA) or the average distance from the intended drop point. Thus the drops made in weather, or without visual reference to the ground, averaged 133 yards from the intended point of impact.

**Refers to visual meteorological condition (VMC) or flight when the ground can be seen. Thus visual airdrops averaged 95 yards from the desired point of impact.

Sources: Ray L. Bowers, *Tactical Airlift* (Washington, D.C.: Office of Air Force History, 1983), 315; and Maj Gen Burl W. McLaughlin, "Khe Sanh: Keeping an Outpost Alive," *Air University Review* 20, no. 1 (November-December 1968): 67.

On 7 April 1972 a major attack by three Communist divisions out of Cambodia surrounded and cut off a garrison of South Vietnamese rangers, local civilians, and a few American advisers at the provincial capital of An Loc. Intensive enemy fire prevented aerial resupply until 14 April. Attempts by the South Vietnamese to airdrop supplies resulted in damage to six transports and destruction of two C-123s. Very few supplies were recovered.[152]

An American C-130 operation begun on the night of 14 April also ran into difficulties: one aircraft was destroyed, another lost two engines, two

crewmen were wounded and one was killed, and the load recovery rate was only 25 percent. Night drops and radar-guided airdrops from higher altitudes also had poor results. By the end of April, conditions were critical. People in the camp were starving, half of the night-flying C-130s were taking hits, and two more C-130s had been destroyed while attempting low-altitude airdrops.[153]

The drop zone was the size of a soccer field. This made drop accuracy difficult and allowed the enemy to concentrate a barrage of firepower in the limited area where each aircraft was forced to fly during the airdrop. Nevertheless, success was finally gained by using special load-rigging procedures, high altitude low opening (HALO), ground radar aerial delivery system (GRADS), and a new C-130 adverse weather aerial delivery system (AWADS). The siege was broken on 18 June but resupply by air continued through the end of 1972. From 15 April to 30 June 1972, 359 C-130 sorties delivered nearly 5,000 tons of supplies, more than 3,000 tons of which were recovered.[154]

The three main tactical transport aircraft used in Vietnam were the C-130, the C-123, and the C-7. All performed well. The C-7, although limited in payload, speed, and altitude, could airdrop into small areas and had an excellent short-field/soft-field capability. It was used throughout the war to deliver people and cargo into areas inaccessible to larger aircraft. The C-123 performed many valuable missions during the war but it was also limited in payload, speed, and range, and would be retired from the active force by the end of the war. The tactical transport workhorse was the C-130. Its success was due not only to its capabilities but also to a flexible airlift system based on user demand.

> The ready availability of the transport force to undertake short-notice emergency lifts permitted the Americans to concentrate forces in offensive roles. Again and again, for example, streams of C-130s reached into the highlands to overcome temporary road blockages. In extreme conditions, parachute supply made possible the survival of hard-pressed isolated garrisons—Khe Sanh and An Loc were the most significant of many such endeavors.
>
> The durability, payload, and flying qualities of the C-130 made this aircraft a particularly remarkable one. The Hercules could land at relatively primitive strips with 15 ton payloads, offload palletized cargo rapidly, and move on to the next task at healthy airspeeds.
>
> Moreover, a C-130 required only one or two refuelings in the course of a full mission day. Fewer than a hundred C-130s could thus do work equivalent to the capacities of fifteen hundred C-47s.[155]

Like the coming of age of strategic airlift with the C-141 and the C-5, tactical airlift would now be identified with the C-130. This aircraft had been proven during emergency aerial resupply missions and daily intra-theater logistics missions. However, the decade of the sixties closed as it had begun, with the issue of consolidation.

Airlift Consolidation

Midway through the war in Vietnam, the Air Force began a study called Project Corona Harvest. Its purpose was to evaluate evidence from Vietnam that would help develop future Air force doctrine. The airlift portion of the study, released in 1973, contained recommendations about tactical airlift command and control, modernization of tactical airlift aircraft, and consolidation of tactical and strategic airlift under a single command.[156]

The command and control recommendation was merely a recognition of reality. Contrary to published doctrine, tactical airlift in Vietnam was controlled by an airlift control center (ALCC) that was largely independent of the tactical air control center (TACC) which controlled strike aircraft. But the system was judged successful:

> The unique organizational management required and effected in Southeast Asia, in which control channels flow separately from the TACC and the ALCC to the air component commander, should be fully recognized and provided for in revised doctrine as an authorized option.[157]

The 1974 rewrite of Multi-Command Manual 3-4, *Tactical Air Operations: Tactical Airlift*, reflected this change as an option for large airlift forces.[158]

The recommendation for tactical airlift modernization stated the need for a new transport to replace the C-130 for large loads and another to replace the C-7 and the C-123 for smaller loads. The C-130 replacement was envisioned as a new aircraft, the advanced medium short takeoff and landing transport (AMST). This was to be a jet transport capable of short takeoff and landing (STOL) operations while carrying a larger payload than the C-130. By 1976 the Boeing YC-14 and the McDonnell Douglas YC-15 prototypes were undergoing flight testing.[159]

The C-7 and C-123 replacement was to be a vertical and/or short takeoff and landing (VSTOL) aircraft. By 1976 the Air Force had concluded that procurement of a VSTOL aircraft by the early eighties was not feasible because "costs exceeded the results to be obtained."[160] Funding constraints and the difficulty of quantifying tactical airlift requirements soon led to a similar demise for the AMST.[161] This left an aging tactical airlift force of C-130s, C-123s, and C-7s, of which only the C-130 would be kept in the active duty Air Force.

The recommendation for consolidation cited duplication in "control, aerial port, and support elements" as a failing that consolidation would correct.[162] TAC again objected, saying the evidence pointed to the need for two airlift forces.

> There is one major lesson which stands out above all others with respect to airlift and that is that tactical airlift is distinctly different from strategic airlift. It operates in an environment which demands association and integration with other tactical forces and it must be directed and controlled by the theater air commander as are the other forces under his jurisdiction. Whereas the strategic airlift task can, in an ultimate sense, be handled by a commercial carrier, the theater airlift task is rooted in combat which requires emphasis on entirely different factors such as short, relatively unprepared

fields, exposure to ground fire, coordination with escorting fighters and integration into the tactical control system for direction, assistance and redirection.

It would indeed be a grievous error to create a single airlift force. All of the experience and facts which have emerged from the Vietnam war again point up the validity of the separate entities of strategic and tactical airlift. Whereas one could not tell the difference between a 707 and a C-141 coming to a protected and secure base such as Cam Ranh Bay, there was never any doubt of the kind of airlift going into Khe Sanh, Lai Khe, Kham Duc and the many other bases where the tactical airlift was in a real sense a combat force under enemy fire. The lesson of Vietnam on airlift further enforces the same lessons of World War II and Korea on the separation of strategic and tactical airlift forces. Theater war demands the assignment of tactical forces which had been designed, nurtured and led by commands devoted to this highly specialized form of warfare.[163]

This argument did not prevail, however. On 19 July 1974 Secretary of Defense James R. Schlesinger directed the consolidation of all airlift forces under MAC to "insure more efficient and effective use of available resources" and "to provide the benefits of flexibility and optimum mix of resources to meet any assigned task, while maintaining use of MAC's worldwide airlift system." Organic naval and Marine airlift was specifically exempted from this consolidation by congressional action.[164]

MAC's commander, Gen Paul K. Carlton, recognizing the need to preserve the "image and spirit" of tactical airlift, instituted a number of programs to preserve and enhance his new tactical force.

- The "tactical" title was retained for C-130 units.
- C-130 operations were integrated into the MAC structure.
- Commanders or deputies of agencies with tactical responsibility had to have tactical experience.
- Mobile airlift control centers and mobile airlift control elements (ALCE) were established as proposed by TAC.
- The Airlift Center (ALCENT) was established at Pope AFB, North Carolina, for test and evaluation of new airlift concepts and hardware.
- The theater airlift manager (TAM) concept was established, providing for a single operational manager of strategic and tactical airlift within a theater.[165]

MAC was established as a specified command on 1 February 1977. This recognition of MAC's continuing worldwide logistic airlift mission and wartime combatant mission elevated airlift from a support force to a combat force. Although there was concern that consolidation would bring about the end of tactical airlift, the reverse was actually the case. With the addition of a "combat" mission, MAC incorporated tactical thinking in all airlift. Today's C-5 and C-141 force would not be confused with a fleet of civilian B-707s.

In 1965 MAC had a force of 517 aircraft with an additional 260 MAC-gained Air National Guard (ANG) and Air Force Reserve (AFRES) aircraft. All but 28 of these aircraft were propeller-driven. By 1975 the MAC force was composed of 234 C-141s, 70 C-5s, and a tactical airlift force of over 300 C-130s. An additional 256 C-130s, 72 C-123s, and 48 C-7s were in

the ANG and AFRES. The capability of this force was described in congressional testimony in 1975.

> So, in the last 10 years, MAC has achieved a 5-fold increase in contingency capability while reducing the peacetime flying hour training requirement . . . by more than 50 percent. And with the C-5/C-141 airlift team, we are performing our mission faster, have far more reliability, and are spending less dollars per ton-mile of cargo we transport.
>
> This evolution is especially dramatic when viewed in the perspective of the Berlin Airlift. If you recall, approximately 266,000 missions were flown in 17 months. Today, 15 C-5s, each flying three missions a day, could accomplish the entire Berlin Airlift in the same period.[166]

MAC closed out the Vietnam era with a combined strategic and tactical airlift force. With few changes, this would be the airlift force of the 1980s.

Modern Airlift

This last section covers the present MAC force. It also includes the status of the Civil Reserve Air Fleet, and it reviews the air reserve component (ANG and AFRES).

Military Airlift Command Today

MAC is responsible for several mission areas and is composed of a large and varied force structure to support these missions.

> The Military Airlift Command serves the national command authorities, the unified and specified commands, and the military services in three roles.
>
> As a specified command, MAC exercises operational command of airlift and special operations forces which the Joint Chiefs of Staff make available. In this role, MAC receives operational direction from the President and the Secretary of Defense, through the JCS, for the performance of operational missions during wartime, periods of crisis, JCS exercises, and in support of the unified and specified commands.
>
> As a major command of the Air Force, MAC is responsible to the Secretary of the Air Force, through the Chief of Staff, USAF, for organizing, equipping, training, and furnishing operationally ready forces for performance of wartime missions.
>
> As the single manager operating agency for airlift service, MAC is responsible to the Secretary of the Air Force, through the Chief of Staff, USAF, for providing logistical airlift support to all agencies of the Department of Defense, except those airlift functions reserved to MAC as a specified command. The Secretary of the Air Force serves as single manager for airlift service within the Department of Defense, and the Commander in Chief, MAC, serves as executive director for the agency.
>
> Systems and services which MAC provides in its role as a major command include Aerospace Rescue and Recovery, Air Weather Service, Aerospace Audiovisual Service, Presidential Airlift Support, Airborne Weather Reconnaissance, Operational Support Airlift, Operational Test and Evaluation, and formal school training programs for aircrews and Special Operations Forces.[167]

MAC is structured into three numbered air forces and several independent agencies and units. The numbered air forces are the Twenty-First

Air Force, headquartered at McGuire AFB, New Jersey; the Twenty-Second Air Force, headquartered at Travis AFB, California; and the Twenty-Third Air Force, headquartered at Hurlburt Field, Florida. Both the Twenty-First and the Twenty-Second are responsible for airlift; the Twenty-Third is responsible for worldwide operations of special operations forces, aerospace rescue and recovery, and aeromedical airlift.

The Twenty-First Air Force area of responsibility can be generally described as east of the Mississippi through Europe and Southwest Asia. The Twenty-Second Air Force is responsible for the area west of the Mississippi and throughout the Pacific.

The active duty aircraft assigned to support MAC's mission include 70 C-5s, 234 C-141s, and 224 C-130s.[168] In 1987 MAC airlifted approximately 375,000 tons of cargo and 1,200,000 passengers; another 3,300,000 passengers were carried by commercial carriers contracted by MAC.[169] These numbers reflect only what is called "channel" or regularly scheduled airlift; that is, they do not reflect special assignment airlift missions (SAAM) or joint airborne/air transportability training (JA/ATT) missions, which provide training for both MAC and the user. This active duty MAC structure is augmented in wartime and in peacetime by CRAF and the air reserve component.

Civil Reserve Air Fleet

The CRAF consists of nearly 400 commercial aircraft that are contracted to support US airlift requirements when these requirements exceed MAC's capability. In a national emergency, CRAF would carry approximately 95 percent of the passenger requirement and 25 percent of the cargo requirement—almost 50 percent of MAC's strategic airlift capability.

The CRAF is divided into five mission segments or capabilities:

1. Long-range international—the largest segment, responsible for extended overwater operations with a desired range of 3,500 nautical miles. Some aircraft with a lesser capability are included for airlift from the West Coast to Hawaii.
2. Short-range international—responsible for short-range operations to areas such as the Caribbean, Greenland, and Iceland as well as theater movement.
3. Domestic—responsible for Air Force and Navy supply requirements within the United States.
4. Alaskan—responsible for airlift requirements within Alaska in support of the 11th Air Force (formerly Alaskan Air Command).
5. Aeromedical evacuation—a new segment authorized by the secretary of the Air Force to offset a shortfall of aeromedical evacuation capability from the European theater.

The CRAF can be employed in three stages. Stage I is activated by the commander in chief of MAC (as this paper was being written, these responsibilities were shifted to Transportation Command, a new joint

command). It consists of about 50 aircraft that must respond within 24 hours to support normal logistic airlift, freeing MAC aircraft to respond to minor contingencies.

Stage II consists of about 170 aircraft activated by the secretary of defense to provide airlift support "during a national security crisis short of a declared defense-oriented emergency." Stage II carriers also have a 24-hour-response-time requirement.

Stage III involves all CRAF aircraft and is activated by the secretary of defense. The conditions requiring Stage III activation include war or "a defense-oriented national emergency." Stage III carriers are given 48 hours to respond.[170]

A program to enhance CRAF capability, first discussed in Congress in 1976, was approved by the House Armed Services Committee.[171] The first enhanced aircraft, a United Airlines DC-10, was modified in 1982 with a strengthened floor and a large cargo door. Under this program the Air Force pays for the modification and reimburses the carrier for the added expense of operating with the additional weight. This program will add over three million ton-miles of capability at about one-sixth the cost of purchasing comparable aircraft.[172]

Air Reserve Component

The Air National Guard and the Air Force Reserve join with MAC to form the "total force" of military airlift capability. Both operate on a daily basis with MAC and both have augmented the command during crisis situations. Over 50 percent of today's strategic and tactical airlift is provided by the reserve forces; but the relationship between the reserve forces and the active duty Air Force has not always been a good one.

The Air National Guard traces its history through the Army National Guard to 7 October 1936. It had flying units as early as 1908 but the ANG was not established as a separate component until 1947.[173] Early ANG wings were all fighter and light bomber forces because heavy bomber and transport duties were not considered appropriate for the ANG. Concern over the dual federal/state mission, the selection of ANG bases, and command issues caused friction between the ANG and the Air Force. In 1948 Congress passed a bill that specified three components: the regular or active duty Air Force, the Air National Guard, and the Air Force Reserve.[174]

At this same time, the Air Force Reserve was struggling to compete with the ANG, which had been given priority after World War II. The ANG was equipped with aircraft like the P-51 and P-47, while the Reserves had AT-6 Trainers, C-46s, and C-47s. In 1949 the Air Force requested $56 million for the 57,000-member Air Guard and only $52 million for the 1.5-million-member Air Force Reserve.[175] The situation began to improve in the late

1960s when Secretary of Defense McNamara shifted more resources to the reserve forces and by the early 1970s the status of the reserve forces had been formally upgraded with the establishment of the total-force policy.[176]

The Air Force Reserve was the first of these two reserve forces to be associated with airlift. All 20 AFRES troop carrier wings were mobilized during the Korean War, but by 1955 the AFRES airlift force consisted of only 12 C-46 wings and one C-119 wing.[177] AFRES airlifters participated in both the Cuban missile crisis airlift and the Dominican Republic airlift, and they were mobilized during Vietnam. The associate program, which "matches" a reserve unit with an active duty strategic airlift unit, was started in 1968. The program's C-141s and C-5s are "owned" by the active duty but 50 percent of the aircrews and 40 percent of the maintenance personnel are provided by AFRES. The ANG does not participate in the associate program.[178]

The Air Guard's participation in airlift began in 1955 when the 129th Air Resupply Squadron was established. By 1961 the ANG had five air transport wings, two aeromedical groups, and four troop carrier squadrons; by 1964 this had grown to 26 air transport squadrons; and by 1967 the ANG airlift force consisted of seven wings, 22 groups, and 24 squadrons flying C-97s, C-121s, and C-124s.[179] Like AFRES, the ANG flew numerous missions in Vietnam. Through the 1970s, as the older strategic airlift aircraft were retired, the ANG shifted to tactical airlift with the C-130.[180] It reentered the strategic airlift arena in the 1980s when C-141s were assigned to the Mississippi Air Guard and C-5s were assigned to the New York Air Guard.

The present reserve force of military airlift is a large force trained to Air Force standards and evaluated by the MAC inspector general to ensure combat readiness. AFRES has associate airlift wings at all six active duty Air Force C-5 and C-141 bases. AFRES also has two organic C-5 units and one organic C-141 unit, 15 tactical airlift C-130 units, three air rescue units, and two special operations units—a total of over 200 MAC-gained AFRES aircraft.[181]

The ANG has one C-5 unit, one C-141 unit, 21 tactical airlift C-130 units, one special operations unit, and two air rescue units—a total of 215 MAC-gained ANG aircraft.[182]

All but about 70 of the 400-plus aircraft that comprise the ANG and AFRES components are airlift aircraft that augment MAC. When combined with a Stage III CRAF mobilization, this force has the capability of airlifting more than 45 million ton-miles per day.

Is this a sufficient capability? In 1981 the Congressionally Mandated Mobility Study (CMMS) defined a fiscally constrained goal of 66 million ton-miles per day as a realistic and attainable goal for airlift. The CMMS and the Air Force plan to meet its goal are discussed in chapter 3.

Notes

1. AFM 1-1, *Basic Aerospace Doctrine of the United States Air Force*, 16 March 1984, 3-2, 3-6.
2. Ibid., 3-5.
3. Marcella Thum and Gladys Thum, *Airlift! The Story of the Military Airlift Command* (New York: Dodd, Mead & Co., 1986), 13–14.
4. Herman S. Wolk, *Planning and Organizing the Postwar Air Force, 1943–1947* (Washington, D.C.: Office of Air Force History, 1984), 3, 6.
5. Lt Col Charles E. Miller, *Airlift Doctrine* (Maxwell AFB, Ala.: Air University Press, 1988), 1.
6. Wolk, 10, 12–21.
7. John F. Shiner, *Foulois and the U.S. Army Air Corps, 1931–1935* (Washington, D.C.: Office of Air Force History, 1983), 43–47.
8. Giulio Douhet, *The Command of the Air*, trans. Dino Ferrari (Washington, D.C.: Office of Air Force History, 1983), 128.
9. Shiner, 263.
10. Ibid., 257–63.
11. Miller, 19.
12. Ibid., 9–18.
13. Haywood S. Hansell, Jr., "Harold L. George: Apostle of Air Power," in *Makers of the United States Air Force*, ed. John L. Frisbee (Washington, D.C.: Office of Air Force History, 1987), 84–96. In 1945 the existing force comprised 243 combat groups. The 3-percent difference in the AWPD planned number of combat groups versus the actual combat groups used in World War II speaks well of the planners but they fell far short of the real airlift requirement.
14. *USAF Airborne Operations, World War II and Korean War* (USAF Historical Division Liaison Office, 1962), 56–58.
15. John Schlight, "Elwood R. Quesada: Tac Air Comes of Age," in *Makers of the United States Air Force*, 184.
16. Ibid., 31–35. The newly designated troop carrier commands had been called air transport commands but this name was now applied to the Ferrying Command.
17. Ibid., 33–37.
18. Ibid., 49.
19. Ibid., 47–51.
20. Lt Gen William H. Tunner, USAF, *Over the Hump*, ed. Richard H. Kohn and Joseph P. Harahan, new imprint (Washington, D.C.: Office of Air Force History, 1985), 19–63.
21. Ibid., 41–107. General Tunner described other improvements in these pages (weather forecasting, briefing and debriefing discipline, improvements in facilities, improvements in health and morale, etc.) but the idea is one of professional men running a professional outfit. A feeling for his approach to operations can be gained by reading his description of a staff meeting to discuss the effort he planned for an airlift surge over a 24-hour period (pp. 131–33).
22. Ibid., 114–30.
23. Ibid., 80–114.
24. United States Military Academy, *The War in Western Europe*, pt. 1 (West Point, N.Y.: Department of Military Art and Engineering, 1949), 185.
25. *USAF Airborne Operations*, 55–56. An excellent depiction of the drop areas and the proposed corridor is found in *The War in Western Europe*, map number 13 in the appendix.
26. *The War in Western Europe*, 185–86.
27. Ibid., 58–60.
28. Ibid., 60–61.
29. Ibid., 116.

30. *USAF Airborne Operations*, 60–62. The troop drops and glider landings were considered effective: 853 effective glider sorties out of 904 launched for the 82d and 101st Airborne Divisions, and 90 percent of 2,110 paratroopers on the drop zone for the 1st Airborne Division. The supply drops however, were not as good: 80 percent effective for the 82d, 20 percent for the 101st, and only 12 tons out of 87 tons dropped (less than 14 percent) reached the British. According to *DZ Europe, The 440th Troop Carrier Command*, history of the 440th from 7 June 1943 to 5 July 1945, the need for resupply was critical because the airborne units only carried 48 hours' worth of supplies and ammunition (p. 69).

31. Ibid., 71.

32. Hilary St. George Saunders, *Royal Air Force 1939–1945*, vol. 3 (London, United Kingdom: Her Majesty's Stationery Office, 1954), 193–95.

33. *USAF Airborne Operations*, 65.

34. *The War in Western Europe*, 187–89.

35. Saunders, 192.

36. Miller, 114–15. For a discussion of the lessons learned from the Normandy invasion, see pages 102–3 of this source. Other lessons from this operation included the need for effective communications and the impact of bad weather on airborne operations. The troop carrier used was the Douglas C-47. This aircraft could only carry 28 troops or 6,000 pounds. This is extremely limited compared to the capability of today's airlift aircraft. The Lockheed C-130E/H can carry 92 troops or 64 paratroopers or 47,000 pounds of cargo. The Lockheed C-141 can carry 200 troops or 155 paratroopers or 69,925 pounds of cargo. The Lockheed C-5 has a payload capability of 242,500 pounds while carrying 73 troops in the upper aft compartment. The C-17 is planned for a payload of approximately 172,000 pounds or over 100 paratroopers (see Thum and Thum, 126, 133, 136, 137).

37. *USAF Airborne Operations*, 66–67.

38. Quoted in Miller, 115.

39. *USAF Airborne Operations*, 68.

40. Ibid., 73–77.

41. Ibid., 79, 90.

42. Quoted in Miller, 74.

43. Quoted in Robert Frank Futrell, *Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force, 1907–1964* (Maxwell AFB, Ala.: Air University, 1971), 93. There were a series of Air War Plans Division reports but AWPD-1 was the first and was used as the baseline requirement for the Army Air Corps. This source lists the total planned force as 239 groups and 108 observation squadrons for AWPD-1 versus an ultimate actual force of 269 tactical groups (p. 64). However, some of these groups were "paper" groups and stateside units. The actual combat group total was 243 (pp. 65–66). This last number agrees with the Haywood S. Hansell, Jr., article "Harold L. George: Apostle of Air Power" (notes 26 and 27). The difference in the planned force numbers of 239 and 251 between these two sources is probably a difference in accounting for the 108 observation squadrons. The numbers of air transports in the plan also varied between these sources by 10 aircraft.

44. Ibid.

45. Ibid., 124–63.

46. Wolk, 149–207. The advantage of the strategic bombing mission lay in the importance the services saw in nuclear weapons. They felt the major funding effort would be in this area.

47. Futrell, 94–157.

48. Quoted in Miller, 165–66.

49. Ibid., 165–72.

50. Wolk, 171–76.

51. Ibid., 170–221. All transport assets were by no means in the Military Air Transport Service (MATS), even after consolidation. Second in number only to MATS were the Marine

transports. There were also the Air Force troop carrier assets, the Strategic Air Command support squadrons, and the remaining naval air transports (see Miller, 183–87).

52. W. Phillips Davidson, *The Berlin Blockade*, (Princeton, N.J.: Princeton University Press, 1958), 30–36. The reasons given for the Soviet agreement to establish the air corridors were: the Soviets' desire to maintain good relations with the Western powers at that time; the advantages they would gain by the use of Western navigational aides for their aircrews and the training of their personnel to operate these stations; the corridors would keep Western aircraft in specified areas; and the Soviets would gain access to Hamburg, Braunschweig, and Frankfurt.

53. Ibid., 38–76.

54. Ibid., 62–99. Soviet announcements explained that technical problems in the road and rail systems prevented travel and that supply shortages caused the shutdown of electricity.

55. Tunner, 157–59.

56. Quoted in Futrell, 121.

57. Tunner, 159.

58. Miller, 165–77.

59. Roger D. Launius, "The Berlin Airlift—Refining the Air Transport Function, 1948–1949," *Airlift* 10, no. 2 (Summer 1988): 12.

60. Tunner, 159–66.

61. Miller, 177–78.

62. Tunner, 167.

63. Ibid., 170–83.

64. Ibid., 207, 222.

65. David W. Wragg, *Airlift: A History of Military Air Transport* (Novato, Calif.: Presidio Press, 1986), 81.

66. Ibid.; and Miller, 181.

67. Tunner, 214.

68. Ibid., 198–201.

69. Miller, 181.

70. Tunner, 187–95.

71. "Introductory Statements," *Aviation Operations* 11, no. 5 (April 1949): 4.

72. Quoted in Futrell, 121.

73. Ibid., 153, 161. Air Force Chief of Staff Hoyt S. Vandenburg listed two additional reasons for the increased military spending. In addition to the Soviet explosion of an atomic bomb and the invasion of Korea, he included the US commitment to the defense of Western Europe and the Joint Chiefs of Staff realization that the Soviets would have a sufficient stockpile of nuclear weapons by 1954 "to mount a devastating attack against United States military installations, industry, and population centers."

74. Ibid., 160–64.

75. Miller, 189–90.

76. Wragg, 83.

77. Miller, 203.

78. Ibid., 194.

79. Tunner, 231–35.

80. Ibid., 232–33.

81. *USAF Airborne Operations*, 95–98.

82. Ibid., 97–101.

83. Ibid., 105–10.

84. Miller, 198–99.

85. Tunner, 242–64.

86. Ibid., 263–64.

87. Miller, 194.

88. Ibid., 200–201.

89. Futrell, 157.
90. Miller, 190–94.
91. Futrell, 157.
92. Miller, 213–15.
93. Noel F. Parrish, "Hoyt S. Vandenburg: Building the New Air Force," in *Makers of the United States Air Force*, 214.
94. Herman S. Wolk, "George C. Kenny: The Great Innovator," in *Makers of the United States Air Force*, 148.
95. Futrell, 323, 324.
96. Quoted in Miller, 276.
97. Ibid., 282.
98. Ibid., 282–84.
99. Ibid., 280.
100. Ibid.
101. Ibid., 210–12.
102. Joseph Earl Dabney, *Herk: Hero of the Skies* (Lakemont, Ga.: Copple House Books, 1979), 134.
103. Futrell, 323.
104. Quoted in Miller, 253.
105. Ibid., 255, 275.
106. Futrell, 344.
107. Quoted in Miller, 262–64. General Tunner said the requirement was for 188 workhorse aircraft (plus an additional 10 for annual losses), 50 C-133s, and 94 C-135s. This force could deploy an Army division and a four-wing composite air strike force three times as fast as the current capability.
108. Quoted in Futrell, 327.
109. Ibid., 325, 344. This statement by Secretary McNamara followed an extremely troubled time between MATS and the civil air carriers. Studies of airlift requirements may not have been accepted because a larger and more capable MATS meant fewer Department of Defense contracts with the civil air carriers for military transport. In 1956 and 1957 these contracts amounted to $43,269,349 and $49,746,935 respectively; yet in 1958 the Joint Chiefs of Staff made 18 airlift studies.
110. Ibid., 344.
111. Ibid., 381, 439.
112. Miller, 290.
113. Lt Col Jimmie L. Jay, "Evolution of Airlift Doctrine," research report no. 93 (Maxwell AFB, Ala.: Air War College, 1977), 14.
114. Wragg, 78, 81.
115. Pat Absher, "Civil Reserve Air Fleet," *Airlift Services Management Report*, first quarter, fiscal year 1988, 18.
116. Futrell, 325. The cost of civil air carrier airlift during the Korean War was: fiscal year 1951—$69,941,034; fiscal year 1952—$68,951,344; and fiscal year 1953—$70,843,376.
117. Ibid.
118. Miller, 236–50.
119. Ibid., 251.
120. Futrell, 326.
121. Miller, 251–54.
122. Futrell, 328.
123. Jay, 35–37.
124. AFM 1-1, *United States Air Force Basic Doctrine*, 14 August 1964, 4-3, 5-2.
125. Miller, 290–91.
126. Ibid., 299–302.
127. Ibid., 302–3.

128. House Committee on Armed Services, *Hearings on the Posture of Military Airlift*, Research and Development Subcommittee, 94th Cong., 1st sess., 11–19 November 1975, 458.

129. Gen Howell M. Estes, Jr., "The Revolution in Airlift," *Air University Review* 17, no. 3 (March–April 1966): 4–6.

130. Ibid., 5–6.

131. Miller, 333–34.

132. Ibid.

133. Ibid., 325–40.

134. David R. Mets, *Land-Based Air Power in Third World Crises* (Maxwell AFB, Ala.: Air University Press, 1986), 101, 103–5.

135. Miller, 342.

136. Mets, 108.

137. Ibid., 105–8.

138. Futrell, 414–15.

139. Ibid.

140. Capt Randolph J. Harvey, "Carrying the Load," *Airlift* 10, no. 3 (Fall 1988): 6–7.

141. Ibid., 7.

142. Ray L. Bowers, *Tactical Airlift* (Washington, D.C.: Office of Air Force History, 1983), 128–34.

143. Ibid., 137.

144. Ibid., 176–83. The word *rotation* refers to the practice of sending a US-based unit overseas for a specified period of time. The unit will then operate in that theater. This practice is in use today: active duty C-130 units rotate to Europe and Air National Guard and Air Force Reserve units rotate to Panama. This is a scheduled unit move but these units also deploy on short notice when required.

145. Miller, 311.

146. Bowers, 269–82.

147. Maj Gen Burl W. McLaughlin, "Khe Sanh: Keeping an Outpost Alive," *Air University Review* 20, no. 1 (November–December 1968): 58.

148. Ibid., 59, 60.

149. Ibid., 60–63.

150. William H. Greenhalgh, Jr., "AOK Airpower over Khe Sanh," *Aerospace Historian*, Spring 1972, 6, 8.

151. Bowers, 343–513.

152. Ibid., 539–40.

153. Ibid., 541–48.

154. Ibid., 548–57. Basically, HALO is an airdrop method allowing the load to freefall or drop with only a stabilizing parachute to a given altitude where a timer or barometric device would deploy a larger parachute for landing. This allows more accurate drops from high altitude by cutting down the effects of drift. GRADS is a system that uses ground-based radar to position the aircraft for the airdrop. AWADS is a system on some specially modified C-130s that allows positioning the aircraft for airdrop by a combination of an onboard radar and computer.

155. Ibid., 536–658. The different capabilities of the aircraft are reflected by the number of short-field landing strips available for each aircraft. In 1967, it was reported that the number of usable airfields in Vietnam were: 91 for the C-130; 131 for the C-123; and 174 for the C-7. The most obvious trade-off for the better short-field capabilities is payload. The C-7 has a payload capacity of 6,000 pounds (the same as the World War II C-47), the C-123 has a payload capacity of 15,000 pounds, and the C-130E/H has a payload capacity of almost 50,000 pounds.

From 1961 to 1973 a total of 122 Air Force transports were destroyed in Southeast Asia: 40 to enemy ground fire, 17 to shelling while on the ground, and the remainder to operational

accidents. Most of the accidents were associated with operations in a forward area and nearly 75 percent of all the losses took place prior to 1969.

156. Ibid., 649.

157. Ibid.

158. Ibid., 650.

159. Ibid., 651.

160. House Committee on Armed Services, *Report on the Posture of Military Airlift*, Research and Development Subcommittee, 94th Cong., 2d sess., H.A.S.C. no. 94-40, 9 April 1976, 7.

161. Roy C. LeCroy, "A Well Known Past: An Uncertain Future . . .," *Lockheed Horizons* 21, September 1986, 45–46.

162. Bowers, 650.

163. Jay, 59–60.

164. House, *The Posture of Military Airlift*, 13. This did not include Navy and Marine airlift forces because the Air Force had stated it would need additional funds for flying hours to support Navy and Marine requirements. Funds that had been withheld from these two services for modernization of their airlift forces were restored.

165. Miller, 348–52.

166. House, *Hearings on the Posture of Military Airlift*, 372, 458, 460–64.

167. Military Airlift Command, *Commander's Management Information Summary* (Scott AFB, Ill.: MAC Directorate of Cost, 1 September 1988), General Section, 1-1.

168. Military Airlift Command, *Airlift Services Management Report* (Scott AFB, Ill.: Headquarters MAC/ACIB, first quarter, fiscal year 1988), 3.

169. *Commanders Management Information Summary*, Air Transportation Section, TR-3 through TR-7. During this same period (fiscal year 1987), MAC awarded $225 million in contracts to commercial carriers for passenger and cargo airlift (Military Airlift Command, *Airlift Services Management Report* [Scott AFB, Ill.: Headquarters MAC/ACIB, fourth quarter, fiscal year 1987], 25).

170. *Airlift Services Management Report*, 18, 19.

171. House, *The Posture of Military Airlift*, 20–21.

172. *Airlift Services Management Report*, 19.

173. Capt Leonid Kondratiuk, "Air National Guard Airlift: A History," *Airlift* 5, no. 4 (Fall 1983): 5.

174. Charles Joseph Gross, *Prelude to the Total Force: The Air National Guard, 1943–1969* (Washington, D.C.: Office of Air Force History, 1985), 20.

175. Ibid., 40–41.

176. Maj Bob Townsend, "The Air Reserve Transporter," *Airlift* 5, no. 2 (Spring 1983): 13.

177. Gerald Cantrell, "The Air Force Reserve Airlift Force: The First Twenty Years, 1949–1969," *Airlift* 5, no. 2 (Spring 1983): 21–22.

178. Maj Gen Sloan R. Gill, "The Total Airlift Fighting Force," *Airlift* 5, no. 2 (Spring 1983): 1–2.

179. Kondratiuk, 5, 6.

180. "Interview: Major General John B. Conaway, Director, Air National Guard," *Airlift* 5, no. 4 (Fall 1983): 1–2.

181. *Commander's Management Information Summary*, Air Reserve Components, ARC-4 through ARC-5, ARC-11.

182. Ibid., ARC-19.

Chapter 3

Determining Airlift Requirements

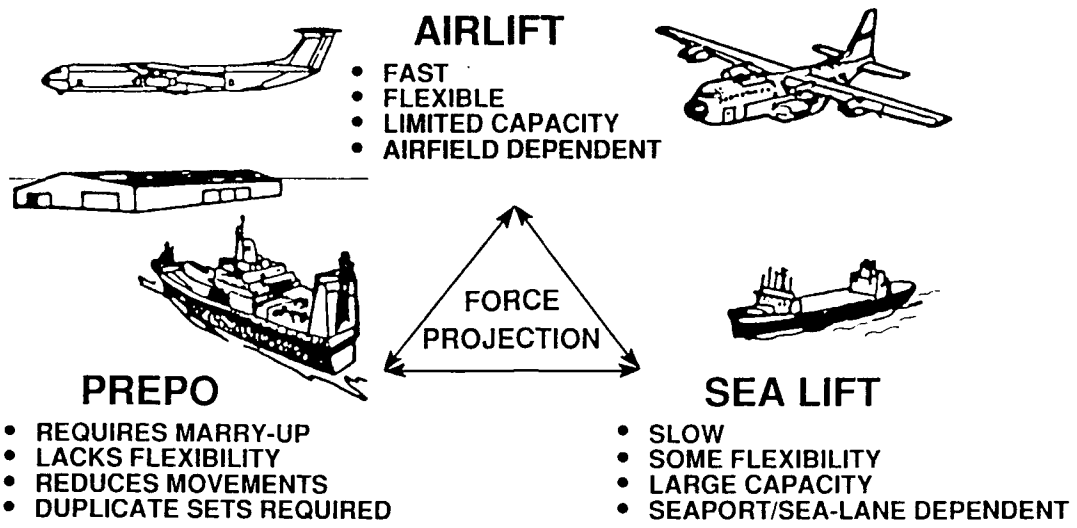
One of the most troublesome issues confronting airlift planners has been determining airlift requirements. The need for airlift was historically evident, but so were the nation's chronic shortage of airlift assets and an inability to forecast requirements accurately. The planned airlift force for World War II was far short of the force eventually required, and a similar shortfall was demonstrated during the Korean War. The war in Vietnam, as well as a number of peacetime contingency airlifts, had validated a continuing national requirement for airlift. But as Secretary of Defense Robert McNamara complained in the 1960s, there was no simple answer to airlift requirements even though a number of airlift studies had been accomplished. Airlift is only one part of the larger issue of mobility, a complex issue involving a number of variables and assumptions.

Mobility has been called a force projection triad—a balance of airlift, sea lift, and prepositioning. These aspects of mobility have different advantages and disadvantages, dependent upon the situation and the capabilities of each leg of this triad. Figure 1 illustrates the concept of the mobility triad as well as some characteristics of the different components of mobility used for force projection.

The balance of this triad involves interaction between all three mobility options. Prepositioning equipment at critical overseas areas lowers movement requirements; but prepositioning is inflexible, actually increases early personnel lift requirements, and could easily be in the wrong place.[1] Sea lift carries the bulk of overall cargo requirements, but it requires ports and is slow; 18 to 19 days are required for a ship to reach the Middle East from the United States.[2] Airlift is fast and flexible, but it is a limited resource and must be used to transport only vital assets that are required quickly.

Once the advantages and disadvantages of the options in the mobility triad are understood, they must be balanced against numerous questions about the scope and nature of the crisis. Maj James Crumley, Jr., MAC's chief of current plans and capabilities, listed some of these questions in 1983.

> **Who is the enemy? Who are our allies? Is the conflict regional or global? If global, does the United States have interest everywhere or only selected areas? Which areas? Would conflict be simultaneous in several theaters requiring airlift forces to be divided? Would conflict in different theaters allow sequential airlift: forces first deploy to one theater, and then deploy to a second or third theater with the same aircraft?[3]**



Source: Lt Gen Oren E. DeHaven, "Strategic Mobility," *Airlift* 4, no. 4 (Fall 1982): 11.

Figure 1. Mobility Triad

These questions address the scope of the problem but the scenario and the planned force must also be included.

The scenario assumptions include such things as warning time, overflight rights, en route access, road and rail infrastructure availability, enemy forces, airlift route security, and so forth. After the scope of the problem and the scenario are determined, the planned force required to be lifted must be addressed. Major Crumley listed four levels of planned force, but his first listed force, "Minimum Risk Force," has since been deleted. The remaining force levels vary according to risk.

> **Planning Force.** Normally, the planning force is smaller than the minimum risk force. It considers some of the assumptions discussed earlier and evaluates the risk of certain shortcomings. But neither the minimum risk force nor the planning force consider one of the most important factors in developing an airlift force structure—affordability.
>
> **Defense Guidance Direction.** Each service and all commands have certain areas of concern and even major shortfalls in capability when related to potential enemy threats. . . . But, whether money should be spent on strategic modernization, naval expansion, tactical forces, or increased airlift force structure depends both on the potential threat and on the money available. The Defense Guidance published by the Office of the Secretary of Defense each Spring provides direction on how the money should be spent. While relating to potential enemy threats, the Defense Guidance prioritizes requirements and directs what capability we should be programming toward. This then is the programming requirement.
>
> **Operation Plans Requirement.** Finally, we have the operation plan (OPlan) requirement. Because OPlans are constrained by actual capability . . . the term "requirement" can be greatly misused. Basically, from a mobility perspective, an OPlan attempts to develop a time-phased-force-deployment list (TPFDL) which matches available forces and available lift to required delivery dates. This process is iterative in nature and various modes of transportation, ports of embarkation and debarkation, specific units, and the required delivery dates are adjusted until the plan is considered feasible. Since the one constant in this TPFDL development is the lift availability, the final product is an estimate of lift capability, not a totally threat-related requirement.[4]

Complicating the process is the fact that there are three different categories of cargo. "Bulk" cargo will fit in all airlift aircraft on a standard 463L pallet (108 inches long x 88 inches wide x 96 inches high) and is the least restrictive cargo category.[5] Oversized cargo exceeds the dimensions of a 463L pallet but will fit in a C-141B (1,090 inches long x 117 inches wide x 105 inches high).[6] Most oversized cargo will fit in the larger CRAF aircraft and the KC-10, although loading and unloading may be more difficult and time-consuming. The most stringent is outsized cargo. It exceeds the dimensions of the C-141B but will fit into the C-5.

Determining the strategic airlift requirement with all of the factors just discussed is complex and the process is often misunderstood. From 1968 to 1983 there were more than 150 mobility studies, and all proclaimed a shortfall in both tactical and strategic airlift. Yet, at the same time, the C-141 buy was cut from 350 to 280 aircraft, the C-5 buy was cut from 120 to 81, the AMST program was canceled, the C-17 was delayed, CRAF enhancement "had a checkered funding history with minimal program results," and Congress became involved in a C-5/B-747 controversy.[7]

The United States has never had the capability to meet its airlift requirements. There seems to have been a disconnect between, on the one hand, the numerous mobility studies that recommended more airlift and, on the other hand, actual force procurement. Jeffrey Record of the Institute for Foreign Policy Analysis, Inc., lists five reasons for the "persistent gap between . . . requirements and capabilities." They are paraphrased here.

1. US defense commitments overseas have grown steadily since the late 1940s. The most recent growth has been in the third-world areas where the problem is complicated by the lack of prepositioned military equipment.
2. Many people, including some in Congress, associate strategic lift capability with military intervention in places not truly in the national interest. Record quotes a US senator as saying, "If it is easy for us to go anywhere and do anything, we will always be going somewhere and doing something."
3. Strategic lift has historically been a "bureaucratic stepchild" within the Pentagon. The Air Force has historically prioritized airlift below the more glamorous "warplanes" and hesitates to spend money for programs (airlift) that primarily support other services (the Army).
4. Strategic airlift is expensive. To procure an aircraft with the capabilities of the C-5 or the C-17 requires between $100 and $200 million per aircraft.
5. In the past, the Army has paid little attention to airlift capabilities when designing and procuring equipment. The addition of two inches to the width of new jeeps in the 1960s, for example, meant they could no longer be carried two abreast in the C-141, thus doubling the lift requirement.[8]

A sixth reason, not listed by Record, is the seemingly unattainable requirement often recommended by airlift studies. In 1980 MAC, with CRAF augmentation, had a total strategic airlift capability of less than 30

million ton-miles-per-day (MTM/D), while NATO airlift requirements alone were said to be 150 MTM/D.[9] The requirement was not only unaffordable but almost unimaginable.

After the 1960s' procurement programs for the C-141 and the C-5, there was continued recognition of the strategic airlift shortfall but no added capability. In 1980 the Air Force was contemplating a new airlift aircraft with strategic range and some tactical capabilities. Called the CX, it would be capable of lifting outsized cargo into austere airfields—a combination of strategic and tactical capabilities. But this concept was not favored by Congress, and the 1981 Defense Authorization Bill called for a new, comprehensive, mobility study.

> This analysis should form the basis for new airlift and sealift initiatives, as well as for the design of suitable ships, new aircraft and derivatives of existing aircraft. In this regard, the committee is particularly concerned that new-generation aircraft or derivatives should be designed for compatibility with new-generation vehicles and equipment, particularly lightweight armored vehicles now in production and likely to be in production in the future. It is not clear that a concept optimized for strategic airlift of heavy armor into remote, austere fields as envisioned in the Air Force CX concept is militarily valid.[10]

The result of this congressional direction was the Congressionally Mandated Mobility Study (CMMS) of 1981. For the first time ever, the Department of Defense combined Air Force, Army, Navy, Joint Chiefs of Staff, secretary of defense, the Congressional Budget Office, and civilian contractors into one comprehensive mobility study that looked at all mobility modes (airlift, sea lift, and prepositioning) under varying threats.[11]

The CMMS evaluated threat scenarios against a projected 1986 baseline force structure: Airlift enhancements to include a C-5 wing modification, additional C-141 and C-5 spares and crews, and a CRAF buildup equivalent to 32 B-747s; a sea-lift program of eight fast roll-on/roll-off (RO/RO) ships; and a prepositioning program that included six Army divisions of prepositioned overseas materiel configured to unit sets (POMCUS) in NATO, additional USAF and USMC prepositioning in NATO, and a maritime prepositioning ship (MPS) program for two brigade-sized Marine air/ground task forces (MAGTF).[12] These enhancements would result in a growth of strategic airlift capability from less than 30 MTM/D to the projected 1986 baseline capability of 46 MTM/D.

The study recommended an additional 20 MTM/D airlift capability of which half would be outsized capability.[13] The recommended total of 66 MTM/D was less than the requirement for the least demanding scenario but it was considered a realistic minimum goal that the nation could afford.

MAC and the Air Force responded to the CMMS by developing two planning documents to achieve this goal by 1998. The *US Air Force Airlift Master Plan (AMP)*, published on 29 September 1983, presented an airlift force structure that met the CMMS goal. The *USAF Airlift Total Force Plan*

(ATFP), published on 17 September 1984, incorporated the Air National Guard (ANG) and the Air Force Reserve (AFRES) into the planned force structure dictated by the CMMS.

For the first time there seemed to be a chance for general concurrence in a method to redress the nation's strategic airlift shortfall. There would be dissenting viewpoints, of course, but these two documents provided a comprehensive road map for the development of airlift assets to meet a fiscally constrained national objective by 1998.

US Air Force Airlift Master Plan

The Airlift Master Plan is designed to attain an airlift force structure capable of responding to the CMMS minimum goal of 66 MTM/D by 1998.[14] The introduction describes the purpose of the plan, the scope of the project, and the Soviet threat.

Airlift Operations

Chapter 2 of the Airlift Master Plan presents an overview of Military Airlift Command operations, including the contribution of the ANG and AFRES to the MAC force. It describes organic military airlift aircraft and civilian-owned CRAF aircraft, and it tells how the total airlift system works.

The section on organic airlift aircraft presents a short description of the four "primary organic airlift weapon systems capable of intertheater and intratheater operations": the C-5 Galaxy, the C-141 Starlifter, the KC-10 Extender, and the C-130 Hercules. It also mentions the planned development of the C-17 aircraft for deployment in the 1990s.

The section on CRAF operations outlines the three stages of CRAF commitment and the contribution of CRAF to the nation's airlift force. It also describes the primary civilian aircraft involved in CRAF: the Boeing 707 and 747, the Lockheed L-1011, and the McDonnell Douglas DC-8 and DC-10.

The final two sections cover airlift operations and modes of delivery. Typically, intertheater airlift comprises deployment and resupply missions between main operating bases (MOB). Intratheater airlift refers to lateral airlift within a theater as well as the airlift from MOBs to forward operating locations (FOL). Intratheater airlift also encompasses delivery into and out of a combat area.

This discussion of MAC operations closes with the airlift modes of delivery: airland, airdrop, and extraction. Airland is the preferred mode because it delivers quickly with less possibility of damage than airdrop or extraction. Airdrop is used when airland is not possible or when tactical surprise is desired. The low altitude parachute extraction system (LAPES) is used to deliver equipment accurately when there is no available runway.

Airlift Requirements and Capabilities

Requirements are looked at historically and as determined by the CMMS; capabilities are presented as current capability and probable future capability. The requirement issue is highlighted with a list of 17 major mobility studies conducted between 1974 and 1983, each of which demonstrated an airlift shortfall.

The 1981 CMMS recommendation of a 66 MTM/D goal is explained as an examination of four force deployment scenarios and an addition of 20 MTM/D to a projected 1986 mobility force structure baseline of 46 MTM/D. A shortfall in intratheater airlift is indicated for some scenarios; but because it was not quantified by the CMMS, it is stated as a factor requiring future study and inclusion in this plan.

Airlift capability is addressed by defining the most commonly accepted measures of capability, outlining present (1983) capability, and then projecting future capability. The measures of capability are limited, but they are simple and useful: millions of ton-miles-per-day for intertheater airlift, millions of passenger-miles-per-day for passenger-dedicated CRAF airlift, and tons-per-day (T/D) for intratheater airlift. These measurements provide a clear comparison between requirement and capabilit .

The actual 1983 intertheater airlift capability is listed as 1' .8 MTM/D. This figure is less than the full utilization rate of 28.7 MTM/D for 1983 due to shortages in spare parts for the C-5 and the C-141 and a shortage of aircrews for the C-5. For comparison purposes, the full utilization figure of 28.7 is used in the study. This figure also contains an approximate 10-percent aircraft withhold due to high-priority missions not involved in the deployment (table 4).

TABLE 4

1983 Intertheater Airlift Capability

	MTM/D
215 C-141B	10.9
64 C-5A	6.9
49 Wide-Body CRAF (747 equiv.)	7.6
39 Narrow-Body CRAF (DC-8 equiv.)	3.3
Total	28.7

Source: Military Airlift Command, *US Air Force Airlift Master Plan* (Scott AFB, Ill.: Headquarters MAC/XPPB, 29 September 1983), III-10.

The programmed airlift enhancements used for the CMMS would bring this figure up to 46 MTM/D by 1986. Programmed enhancements included the acquisition of 50 C-5B aircraft, 44 KC-10 aircraft (primarily used as tankers but available for an airlift role), and more CRAF enhancement (table 5).

TABLE 5

Programmed 1988 Intertheater Airlift Capability

	MTM/D
215 C-141B	14.2
64 C-5A	11.0
44 C-5B	7.5
39 Wide-Body CRAF (747)	6.0
28 Narrow-Body CRAF (DC-8)	2.4
19 CRAF Enhancement (747)	2.9
41 KC-10	4.5
Total	**48.5**

Source: Military Airlift Command, *US Air Force Airlift Master Plan* (Scott AFB, Ill.: Headquarters MAC/XPPB, 29 September 1983), III-12.

Switching from strategic to tactical, the Airlift Master Plan addresses intratheater airlift as a constant. Because it is not programmed for growth through 1988, the 1983 intratheater airlift capability is assumed to remain constant to 1989. Programmed changes involve the procurement of new C-130H aircraft for the ANG and AFRES to replace older C-130 aircraft (table 6).

TABLE 6

1983 Intratheater Airlift Capability

			T/D
	104	C-130A	1,868
	80	C-130B	1,437
	8	C-130D	144
	237	C-130E	4,257
	83	C-130H	1,491
Total	**512**		**9,197**

Source: Military Airlift Command, *US Air Force Airlift Master Plan* (Scott AFB, Ill.: Headquarters MAC/XPPB, 29 September 1983), III-16.

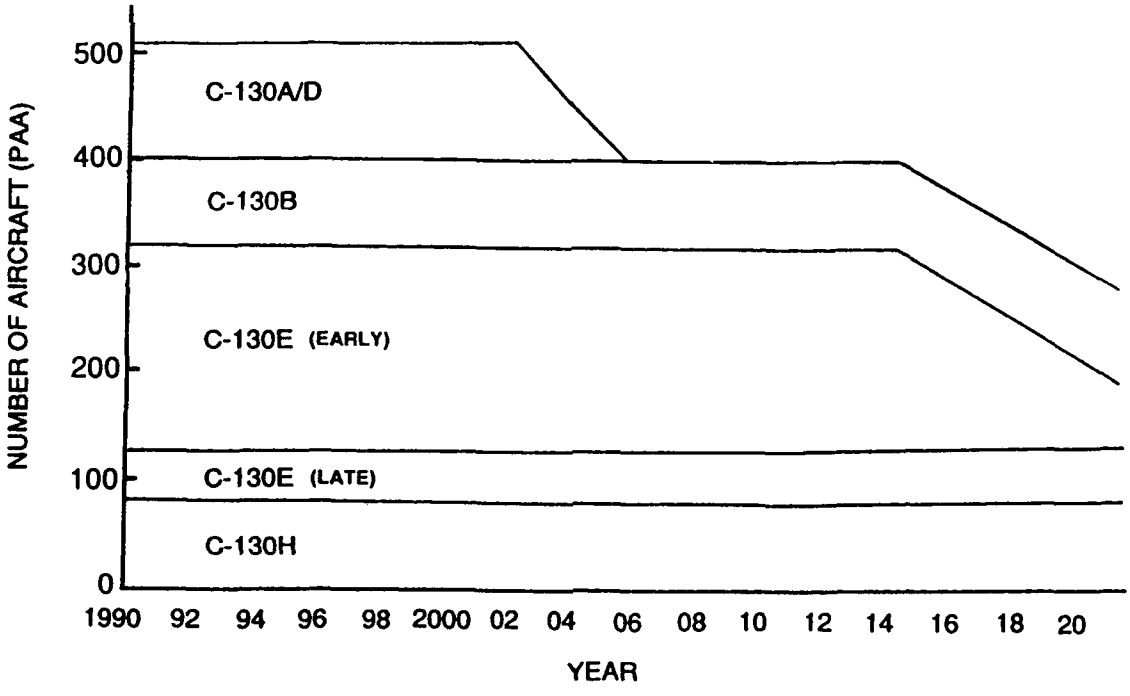
It is difficult to project capability and to use "service life" as a guide to management decisions. A capability projection is only valid if the planned funding remains intact and the programmed force structure remains unchanged. Force structure changes are management decisions based in part on the service life of individual weapon systems.

Service life, an accepted measure of airframe reliability, is derived by projecting an aircraft's use rate into the future and determining when 50 percent of the airframes will require major repair or replacement. This conversion of flying hours into years of useful life depends on both the number and the types of hours flown. Some types of missions are more

abusive on airframe structure than others; and equipment wear-out, increasing cost of obsolescent parts, and increased maintenance requirements are all used to guide management decisions on when an aircraft should be retired or flown less frequently.

The C-5B and the C-5A, after wing modifications, have an expected service life of approximately 30,000 hours, carrying these aircraft well into the next century. Similarly, CRAF aircraft, because of continual industry replacement, and the KC-10, because it is relatively new, can be expected to last well past the year 2000. In 1983 the C-141 had an average age of 24,000 flying hours and an original forecast life of 30,000 hours. When these aircraft were modified to the C-141B configuration, their service life was extended to 45,000 hours. They will begin to exceed their service life in the 1990s.

Many variables affect service life, of course, and an aircraft's service life can be extended by lowering annual flying hours, flying less structurally fatiguing missions, or performing major repair and modification to the airframe and associated systems. Conversely, if more hours are flown or if the hours flown involve more structurally intense missions such as aerial refueling or low-level missions, the service life will be shortened. Figure 2 shows the C-130 fleet estimated service life.



Source: Military Airlift Command, *US Air Force Airlift Master Plan* (Scott AFB, Ill.: Headquarters MAC/XPPB, 29 September 1983), III-8.

Figure 2. C-130 Fleet Estimated Service Life

Force Structure Criteria

Chapter four explains the means used to arrive at an airlift program that would meet the CMMS minimum goal of 66 MTM/D. It discusses the criteria used to evaluate different airlift force structures and the methodology used to select the force structure that best meets the requirement.

The criteria were validated requirements, military utility, operating and support costs, manpower requirements, force stabilization, and force modernization. No single criterion was paramount; each had to be balanced against the others to achieve a total view of any given force structure.

Validated requirements were the CMMS goal of 66 MTM/D for intertheater airlift and the present capability of 9,000 T/D for intratheater airlift. These figures were to be achieved and then preserved as a baseline. Force structure beyond this baseline would be based on future requirements.

Military utility was defined as the usefulness of a weapon system in a combat situation. For military airlift aircraft, this included design characteristics that ease cargo loading/downloading and increase the ability to operate in austere locations, drop troops and equipment, and deliver to forward operating locations.

Costs, which were based on a 30-year life cycle, included acquisition as well as daily operations. Manpower costs were included in total cost figures but were evaluated separately due to the critical nature of manpower requirements.

Force stabilization was evaluated in order to limit the turbulence and expense of site activation/deactivation. This was particularly important for ANG and AFRES units, which depend on existing physical facilities and local populations.

Force modernization took into account the age and eventual need to retire older C-141s and C-130s. Included in force modernization was the option of transferring weapon systems to the ANG and AFRES in order to lower daily utilization and extend service life.

Force Structure Options

The last chapter describes six force structure options and discusses the advantages and disadvantages of each. They are broken down into two additive force options, two modernized force options, and two long-range force options, all based on the 1989 baseline force.

The additive force options met the stated 66 MTM/D requirement by procuring an additional 101 C-5B aircraft (option A) or 115 C-17 aircraft (option B). These options cost more than others and required a substantial increase in manpower. Furthermore, neither solved the problem of the aging C-141 and C-130 fleet.

The modernization force structures (options C and D) were next. The need to modernize the airlift force and retire at least 180 C-130s and 54 C-141s during the 1990s drove these analyses. Both of these options

transferred 180 C-141s to the reserve forces, allowing these aircraft to continue service (at a lower utilization rate) into the next century.

The basic difference between these two options was the manner in which the 66 MTM/D goal was met. Option C required an additional 156 C-5Bs to meet intertheater requirements and an additional 180 C-130s to replace the retired intratheater aircraft. In option D, both the intertheater and the intratheater requirements were met by purchasing 180 C-17s. This met the 66 MTM/D requirement and increased intratheater capability to 16,000 T/D.

Both options met the criteria of requirement and force modernization but there were major differences. Option D increased military utility due to the C-17's capability of airlanding, airdropping, or extracting outsized cargo to forward operating areas. Option D was also $16.1 billion less expensive than option C, and it required 14,800 fewer people while increasing intratheater capability. Option D was the preferred force structure for 1998.

The last two options (E and F) considered the long-range force structure and were concerned with airlift requirements beyond the 1998 time frame of the first four options. They accounted for the retirement of the C-141 by 2015 and the need to replace this capability.

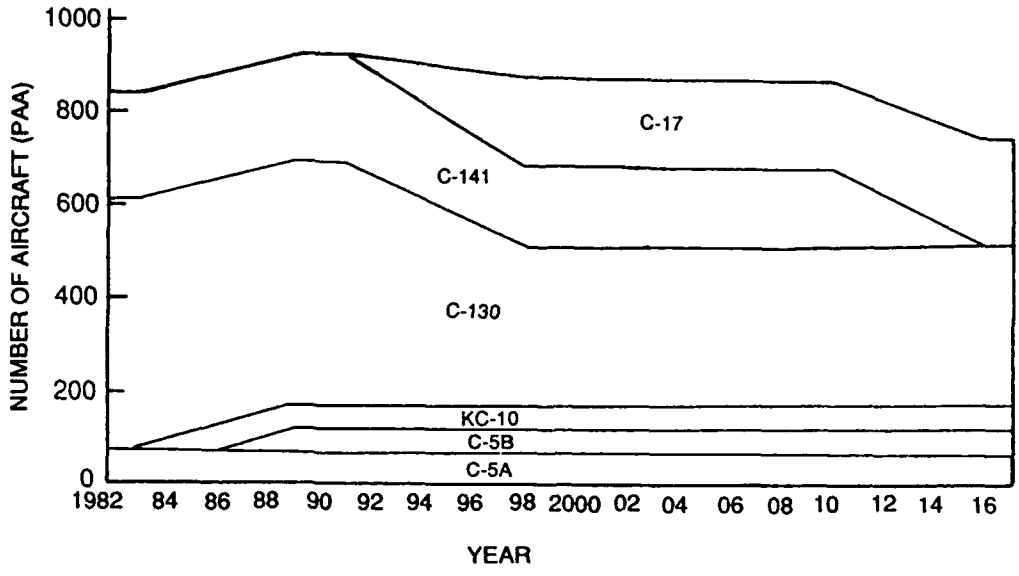
Option E would purchase an additional 191 C-5Bs and replace 180 C-130s. This would assure basic capability requirements for both intertheater and intratheater airlift, but it lacked the military utility criteria of outsized cargo delivery to forward operating areas.

Option F would replace both the C-141 and the retired C-130s with 220 C-17s. This option would cost $17.9 billion less, require 16,500 fewer personnel, and increase intratheater capability. It also reduced the total number of airlift aircraft by 194. The negative impact was that the reduction of aircraft would reduce flexibility and cause some instability as units were matched to this future force structure.

Option F was recommended because it maintained congruency with the 1998 force structure and left room for future growth. This combination of option F and option D resulted in a total 30-year force structure program which best met all criteria. The recommended force structure is depicted in figure 3.

The Airlift Master Plan's recommended force structure for 1998 contains eight major features:

1. 180 older C-130s retire between 1991 and 1998.
2. 54 C-141Bs retire at the end of their useful service life (by 1998).
3. 180 C-141Bs transfer to the ANG and AFRES between 1991 and 1998.
4. 180 C-17s purchased by 1998.
5. 114 C-5s, manned by active duty, ANG, and AFRES.
6. 11.3 MTM/D and 144.9 MTM/D retained in CRAF program.
7. Option retained to add intratheater capability if required.
8. Actual assignment of C-5s, C-141s, C-17s, and C-130s among the active duty, ANG, and AFRES to be determined.



Source: Military Airlift Command, *US Air Force Airlift Master Plan* (Scott AFB, Ill.: Headquarters MAC/XPPB, 29 September 1983), V–8.

Figure 3. Recommended Force Structure

The recommended long-range force structure added three features to the 1998 baseline:

1. 180 C-141Bs retire between 2010 and 2015.
2. 40 additional C-17s acquired as replacements.
3. Option to add new technology aircraft or additional C-17s if required.

The Airlift Master Plan concluded with detailed data on the methodology used to determine cost figures and diagrams of various force structure options (included here for clarity).

The next step in determining how MAC would meet the CMMS requirement was to plan the force mix. How would the programmed force structure of C-5s, C-141s, C-17s, and C-130s be assigned among the active duty, ANG, and AFRES? The Airlift Total Force Plan, like the Airlift Master Plan, is a comprehensive look at numerous options in an attempt to select the option that best meets the needs of the nation, stays within the guidelines of the Airlift Master Plan, and is responsive to the special or unique requirements of the active duty, ANG, and AFRES.

USAF Airlift Total Force Plan

The *USAF Airlift Total Force Plan* was published on 17 September 1984,[15] following the Airlift Master Plan by one year. It uses the recommended force structure of the Airlift Master Plan as a baseline on which to build a

comprehensive airlift force mix for the active duty Air Force, ANG, and AFRES.

Chapter one outlines the purpose and scope of the plan, presents a short historical perspective of the "total force," and describes congressional guidance on the airlift force mix.

The purpose of the Airlift Total Force Plan is to detail an airlift force mix between active duty, ANG, and AFRES that best meets the nation's present and future needs. The plan includes wartime, peacetime, and nonmobilized contingency requirements while accounting for military, economic, and political realities.

To provide a historical perspective, the plan recounts Secretary of Defense Melvin Laird's formation of the Total Force Concept in 1970, which was changed by Secretary of Defense James Schlesinger to the Total Force Policy in 1973. This policy, which states that the needs of both active and reserve components must be considered in developing military capability to meet national needs, is the foundation of MAC's airlift force. MAC is dependent on the reserve forces for 50 percent of strategic airlift aircrews; 58 percent of tactical airlift aircrews and maintenance; 40 percent of combat rescue aircrews and maintenance; 89 percent of aeromedical evacuation aircrews, maintenance, and medical technicians; and 59 percent of the MAC aerial port personnel. Of the 156,000 people assigned to MAC in 1984, 62,000 were in the ANG or AFRES (table 7).

Chapter one goes on to explain the difference between types of airlift squadrons. Organic squadrons are those in the active, ANG, and AFRES airlift forces that have their own aircraft, aircrews, maintenance, and support personnel. Organic squadrons are normally larger (more aircraft and aircrews) in the active forces than the reserve forces. The reserve associate squadron is a partnership between an active Air Force airlift unit and an AFRES airlift unit. Both units provide aircrew and maintenance personnel to operate and maintain aircraft that are assigned to the active unit. This program is used only with strategic airlift aircraft.

TABLE 7

1984 Active/Air Reserve Force Mix

	Active Squadrons	*ARF Squadrons*	*Total Aircraft Active/ARF*
Tactical Airlift Squadrons	14	34	218/302
Strategic Airlift Squadrons (Active/Reserve Associate)	17	17	304/0

Source: Military Airlift Command, *USAF Airlift Total Force Plan* (Scott AFB, Ill.: Headquarters MAC/XPPB, 17 September 1984), 3.

This chapter closes with guidance from Congress that was contained in the 1984 DOD Appropriations Bill. This guidance specifically addressed

the airlift active/reserve force mix and called for a reduction in personnel of 18,000 from the president's 1984 budget request. Congress recommended that the reduction be accompanied by placing new missions or additional existing missions into the ANG or AFRES.

The second portion of congressional guidance was the direction to transfer, in the near term, one C-141 squadron to the ANG and one C-141 squadron to AFRES. These transfers were to be accompanied by a plan for additional transfers to include milestones.

Force Mix Criteria

Chapter two listed the major issues involved in the transfer of forces from active to reserve and discussed the criteria for a balanced mix of readiness, force sustainment, and cost-effectiveness. It listed five issues from a Senate Armed Services Committee report:

1. The transfer of missions to the reserve forces can impact the nation's ability to respond to crisis, and it affects presidential options under the present 100,000 reserve call-up authority.
2. The ANG and AFRES depend on specific location demographics to recruit and retain trained personnel.
3. Such a transfer affects the active force rotational base for overseas deployments (fewer active personnel for the same number of overseas assignments and deployments means they go more often and/or stay longer).
4. Lack of modern equipment and training for the reserve force.
5. Such a transition must be well planned, and it must allow sufficient time for reserve force training and expansion to prevent degradation of overall national military readiness.

Readiness is the primary criterion of the force mix. It includes wartime capability, peacetime activity rates, nonmobilized contingency capability, and operational flexibility. Each is a critical part of readiness and all must be maintained for a viable airlift force.

The wartime role and the critical need for airlift were quantified by the CMMS. Approximately one-third of the nation's wartime cargo airlift capability is provided by CRAF, one-third by the the active force, and one-third is provided by the ANG and AFRES. The transfer of airlift forces impacts this capability in two ways. First, the president's unilateral authority to call up 100,000 reserve force personnel provides the augmentation required by MAC to respond prior to full mobilization. A transfer of airlift forces to the reserves could require that a higher share of the 100,000 be assigned to airlift or that the call-up ceiling be increased to ensure that present response capability is maintained. If neither action is taken, there could be a degradation in MAC's early response capability without full mobilization. The second effect is the potential loss of capability during the

first 48 hours (the time period given to reserve forces to mobilize) of a full mobilization.

The peacetime activity rate must be at a high enough level to meet operational and training requirements and maintain the ability to immediately surge for war or meet short-notice contingencies. This is normally accomplished in conjunction with the movement of validated DOD cargo and personnel. It requires a given number of flying hours to exercise the entire airlift system.

The nonmobilized contingency requirement is the ability of MAC to quickly surge to high activity levels short of war. This response is estimated at 28 MTM/D in addition to the 70 airframes required for other worldwide commitments. Reserve force response to such a contingency, estimated at 20 to 40 percent of their full mobilized capability, would vary with the intensity, length, or importance of the contingency.

Operational flexibility is the ability to maintain sufficient active forces to sustain the overseas rotation base, alert commitments, DOD airlift commitments, exercise taskings, and continuation training. It also means to minimize capability loss during transfer of assets; that is, operational flexibility requires a sufficient active force to support peacetime activity rates and an orderly transfer of forces. The newly equipped reserve force unit must have time to become qualified in the weapon system without an undue loss of capability during the training period.

AFRES, with 50 percent of the C-141 aircrews, flies only 23 percent of the total C-141 flying hours--an advantage for cost and airframe life considerations. But unconstrained transfers would require an increase in active and/or reserve force flying to maintain activity rates. This increased level could adversely affect retention due to increased aircrew time "away from home." Similarly, MAC estimates the minimum active C-130 rotation base should be 2:1 (two stateside squadrons for each overseas squadron). If transfers cause a drop in the rotation base below this figure, overseas activity must be curtailed or assumed by the reserve forces.

Force sustainment is maintaining an adequate number of qualified people to meet wartime requirements. It is mainly an active force problem but it also affects the reserve force because a large number of reserve aircrews were trained and experienced in the active force.

To understand the force sustainment issue, a number of rated force (pilot and navigator) management requirements must be understood. Instructor, supervisor, and staff positions must be occupied by experienced aviators. This experience can be gained only in a flying unit and each flying unit must maintain a minimum level of experience to be ready for wartime tasking. Thus the experience necessary for those positions must be gained from units having a finite ability to provide this experience; and each transfer of assets further limits the availability of training and experience.

To maintain the required level of force sustainment, MAC has operated at the minimum levels of experience and stability since 1982. Each squadron has the maximum amount of inexperienced pilots and navigators;

any drop in retention of experienced pilots or navigators would adversely affect force sustainment because there are no available slots for an increased number of inexperienced aviators. This problem has been most severe in the pilot career field. The minimum required retention rate (years of service after completion of flying training) is an average of 13.3 years of rated service for a strategic airlift pilot and 14.8 years for a tactical airlift pilot. Rates less than these require an increase in flying hours to speed up the experiencing process—an expensive and limited option.

Another aspect of force sustainment is the accession of experienced prior-service personnel by the reserve forces. These are personnel leaving active duty who are recruited by the ANG and AFRES to fly the same type of aircraft they flew on active duty. This averages about 55 percent of separated C-5 and C-141 pilots and 39 percent of separated C-130 pilots. This lessens the training and experiencing requirement for the reserve forces. Increased active duty retention levels, while helping active force sustainment, would adversely affect reserve forces by decreasing the availability of prior-experienced aircrews. This also happens with a reduction in active force structure.

Cost-effectiveness is often cited as the reason for transferring active force assets to the reserves. But such a transfer is more complex than a simple dollar-to-dollar comparison. The cost savings reflected by the reserve forces result primarily from differences in tasking and the fact that the majority of reserve personnel are paid only when performing military duty.

Lower costs in the reserve forces are due to these three factors:

1. The reserve forces perform a lower level of peacetime flying in support of exercises, DOD airlift requirements, overseas rotations, and joint training with other services.
2. All research and development, and the majority of initial and recurring pilot and navigator instruction, is paid by the active force.
3. The reserve forces are primarily part-time military employees. A typical reserve associate unit has only 10 percent of its aircrew, 20 percent of its maintenance, and 15 percent of its base support personnel employed on a full-time basis.

These cost savings benefit the active force because training costs are not lost if the aviator joins the ANG or AFRES after leaving the active force. This helps to maximize the return on training dollars. The lower activity rate and other cost savings provide an airlift capability for wartime at the lowest possible expense. This cooperative and interactive nature of airlift funding is difficult to account for on a dollar-to-dollar basis; except in time of war, the two units are quite different.

The proper mix of active and reserve forces, for cost purposes, is that which maximizes the cost-effectiveness of each. Active forces should be sufficient for required high-activity/high-readiness tasks, and reserve forces should be capable of supporting lower-activity tasks in line with their

part-time, limited-availability nature. The objective of a total force mix should be to identify the required capability and then determine the active-reserve force mix that provides it at the lowest cost.

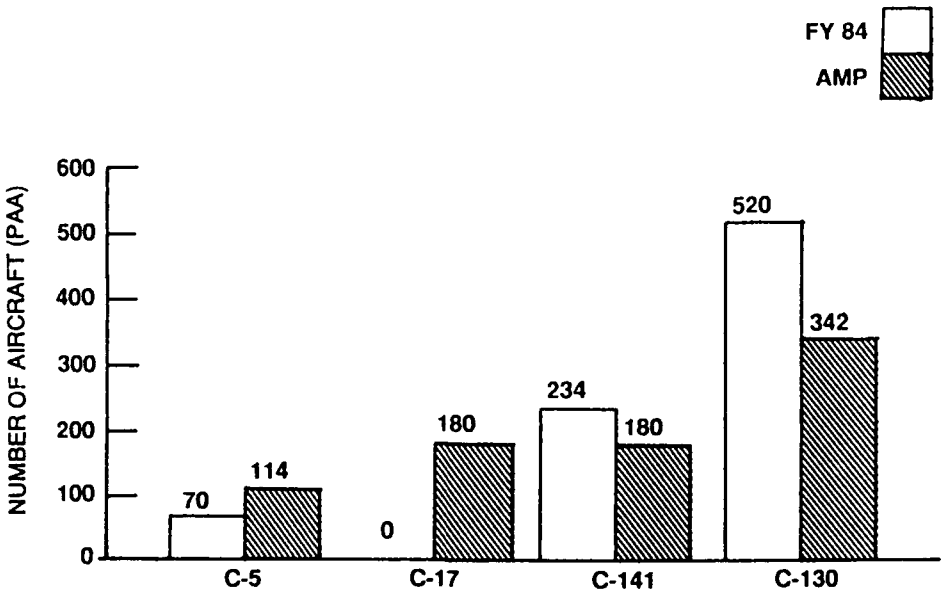
Chapter two closed with other cost issues, two of which are the construction required by the transfer of assets and the economy-of-scale cost savings lost by the existence of numerous "small" (eight aircraft) units in the reserve forces. These costs are extremely difficult to quantify for long-term planning and are thus more important as considerations than as deciding factors.

Force Mix Determination

Determining the force mix was basically a two-step process. First, the force mix that best fit the Airlift Master Plan (AMP) was established. This provided a framework for the second step, which was to build the most effective time phasing between the current force mix and the desired force mix.

The force structure changes from the 1984 airlift force structure to the AMP force structure are shown in figure 4. Two key limiting factors in this force structure are: (1) C-130 and C-141 retirements in the 1990s are not precisely offset by the acquisition of the C-5B; and (2) the total number of airframes available after delivery of the C-17 is eight less than in 1984.

To derive a force mix based on the Airlift Master Plan, force mix alternatives were compared on readiness, force sustainment, and cost-effectiveness. The result was then "fine-tuned," whenever possible, using additional criteria requested by the reserve forces: assign some of each



Source: Military Airlift Command, *USAF Airlift Total Force Plan* (Scott AFB, Ill.: Headquarters MAC/XPPB, 17 September 1984), 18.

Figure 4. 1984 Airlift Master Plan Force Structure Changes

aircraft type to organic reserve force units, and assign no more than 50 percent of any aircraft type to the reserve forces. No reserve force unit was assigned fewer than eight aircraft, and no plans were made to decrease the number of reserve force units.

Each alternative force mix was balanced against economic, military, and congressional requirements. No single criterion was absolute, but readiness and active force sustainment were considered primary; a decrease in either would have meant a loss in capability.

When a force mix met the criteria of readiness and active force sustainment, it was considered against the criterion of cost and the additional criteria requested by the reserve forces. Although cost is perhaps the most visible criterion, it must be considered after capability to ensure that cost-effectiveness does not sacrifice capability.

The development of the force mix for each aircraft was too involved to repeat here. Basically, the number of each aircraft type assigned to the active force was that which maintained the minimum required capability by meeting readiness and active force sustainment criteria.

Five force mix options were developed (fig. 5). Each met approximately equal readiness and active force sustainment criteria. Cost analysis showed option four to be the most expensive, but no single option had an overwhelming cost advantage. Only option one fully complied with all criteria, including those of the reserve forces.

OPTION	FORCE MIX	C-5	C-17	C-141	C-130
1	ACTIVE	0	28	100	190
	ACTIVE/RESERVE ASSOCIATE	70	104	0	0
	AIR RESERVE FORCES ORGANIC	44	48	80	152
2	ACTIVE	0	0	0	190
	ACTIVE/RESERVE ASSOCIATE	114	180	0	0
	AIR RESERVE FORCES ORGANIC	0	0	180	152
3	ACTIVE	0	28	100	190
	ACTIVE/RESERVE ASSOCIATE	0	104	0	0
	AIR RESERVE FORCES ORGANIC	114	48	80	152
4	ACTIVE	0	0	100	190
	ACTIVE/RESERVE ASSOCIATE	70	182	0	0
	AIR RESERVE FORCES ORGANIC	44	48	80	152
5	ACTIVE	0	42	90	190
	ACTIVE/RESERVE ASSOCIATE	57	90	0	0
	AIR RESERVE FORCES ORGANIC	57	48	90	152

Source: Military Airlift Command, *USAF Airlift Total Force Plan* (Scott AFB, Ill.: Headquarters MAC/XPPB, 17 September 1984), C-2.

Figure 5. Alternative Force Mix Options

Recommended Force Mix

Chapter four presents the recommended force mix (fig. 6) and the recommended time phasing for achieving this force mix (fig. 7). Also discussed are important elements of this force mix and how the different criteria are met.

	C-130	C-5	C-141	C-17	TOTAL
ACTIVE	190	0	100	28	318
ACTIVE RESERVE ASSOCIATE	0	70	*	104	174
AIR RESERVE FORCES ORGANIC	152	44	80	48	324
TOTAL	342	114	180	180	816
% CREWS ACTIVE/AIR RESERVE FORCES	56/44	31/69	56/44	50/50	49/51

Source: Military Airlift Command, *USAF Airlift Total Force Plan* (Scott AFB, Ill.: Headquarters MAC/XPPB, 17 September 1984), 29.

Figure 6. Recommended Force Mix

Five specific elements about the recommended force mix are discussed in some detail. They are summarized here.

1. There is a single line entry for organic reserve force units. Not differentiating between the ANG and AFRES will allow the USAF, ANG, and AFRES to determine a mutually agreeable allocation of assets at a future time.

2. The assignment of C-130s allows the active duty force to meet peacetime and nonmobilized contingency requirements, maintain a minimum overseas rotation base, meet force sustainment criteria, and phase out older, less reliable C-130s as the C-17 enters the fleet.

3. The assignment of C-5s takes advantage of existing active duty facilities, allows more cost-effective aircrew experiencing for the majority of active duty aircrew in less-expensive weapon systems, and maintains the potential for additional C-5 transfers as the C-17 enters the fleet.

4. The assignment of C-141s helps the Air Force to meet its force sustainment requirement. The 100 C-141s assigned to the active force have

a planned crew ratio of 2.0 per aircraft, but a crew-ratio option between 2.0 and 4.0 has been preserved.

5. The assignment of the C-17 integrates this aircraft into all components of the total force, modernizes the reserve force fleet, preserves operational flexibility, and establishes a 50-percent active and 50-percent reserve force crew manning.

FY	1985	86	87	88	89	90	91	92	93	94	95	96	97	98	99	2000
ACTIVE																
C-5	-08	05	03													
C-141	00	-04	-12	00	00	00	-16	00	00	-16	-16	-16	00	-32	-22	00
C-17				00	00	00	07	07	10	11	16	14	15	14	25	13
AIR RESERVE FORCES ORGANIC																
C-5	08	00	08	18	10											
C-141	00	04	12	00	00	00	16	00	00	16	16	16	00	00	00	00
C-17									08	08	08	08	08	08	00	00

Source: Military Airlift Command, *US Air Force Airlift Master Plan* (Scott AFB, Ill.: Headquarters MAC/XPPB, 17 September 1984), 42.

Figure 7. Recommended Transfer Plan

This final force mix met the conditions of readiness, force sustainment, and cost-effectiveness. There were some cautions or unknown factors, however.

- While the recommended force mix provides full wartime capability, there may be a requirement to increase the MAC allocation in the 100,000 call-up to retain full responsiveness.
- The allocation of active duty C-130s is the estimated minimum required to support overseas operations. If this proves insufficient, it will require a reduction in peacetime overseas obligations, augmentation by the reserve forces, or the use of other aircraft to fulfill these obligations.
- Since force sustainment is highly sensitive to the rated retention rate, significant changes in the retention rate may require a change in the long-term force mix.
- The lower number of active forces and the high manpower requirement of the C-5 may cause problems for reserve force recruiting/manning and an increase in training costs due to the accession of personnel with no prior service.
- The proposed program calls for significant force changes within the reserve forces; it will have to be closely monitored to minimize disruption.

The recommended time phasing reflects congressional guidance and active duty end-strength ceilings. Although the end result is the same, the time phasing would be quite different without this congressional direction.

The following force mix proposals were reported to Congress in compliance with the fiscal year 1984 Department of Defense Appropriations Bill:

- Beginning in fiscal year 1985, the 16-aircraft C-130 squadron (AFRES) at Kelly AFB, Texas, converts to eight C-5 aircraft.
- In fiscal year 1986, the eight-aircraft C-130 squadron (AFRES) at Andrews AFB, Maryland, converts to eight C-141 aircraft.
- Beginning in fiscal year 1986, the eight-aircraft C-130 squadron (ANG) at Jackson, Mississippi, converts to eight C-141 aircraft.
- Beginning in fiscal year 1987, the 24-aircraft O-2 squadron (ANG) at Stewart AFB, New York, converts to eight C-5 aircraft.
- The transfer of C-5 aircraft to the reserve forces will continue as C-5Bs are delivered. A total of 44 will be transferred by fiscal year 1989.
- An additional 64 C-141s will be transferred to the reserve forces as the C-17 enters the inventory.

The Airlift Total Force Plan concludes with several appendixes. They cover the response to Congress and provide additional detail on force sustainment and the five force mix options.

The Airlift Total Force Plan and the Airlift Master Plan are intended as guides for "Air Force planners at all levels" to meet the airlift needs of the nation through the turn of the century. Force structure decisions as well as force mix decisions should be based on these documents.

If the Air Force program to enhance airlift from 1984 is continued, MAC's strategic airlift force should grow with the procurement of 50 C-5Bs, 44 KC-10s, and the CRAF enhancements.

Chapter 4 will examine the airlift program from 1984 to 1989 with emphasis on the present force and any differences between the planned MAC force and the actual MAC force.

Notes

1. Lt Gen Oren E. DeHaven, "Strategic Mobility," *Airlift* 4, no. 4 (Fall 1982): 10.
2. Ibid.
3. Maj James Crumley, Jr., "What's the Requirement?" *Airlift* 5, no. 1 (Winter 1983): 23.
4. Ibid., 24.
5. Military Airlift Command, *Volant Rally DCS Plans, Book II*, command briefing on the C-17 (Scott AFB, Ill.: Headquarters MAC/XPG, 19 September 1985), 4.
6. Ibid.
7. Crumley, 21.
8. Jeffrey Record, *U.S. Strategic Airlift: Requirements and Capabilities* (Cambridge, Mass., and Washington, D.C.: Institute for Foreign Policy Analysis, Inc., January 1986), 14–15.
9. Ibid., 17–18.

10. Ibid., 18.

11. MAC, *Volant Rally*, 7.

12. Military Airlift Command, *US Air Force Airlift Master Plan (AMP)* (unclassified version) (Scott AFB, Ill.: Headquarters MAC/XPPB, 29 September 1983), III–3.

13. MAC, *Volant Rally*, 7.

14. MAC, *US Air Force Airlift Master Plan* (unclassified version). This entire section is taken from the unclassified version of that document.

15. Military Airlift Command, *USAF Airlift Total Force Plan (ATFP)* (unclassified version) (Scott AFB, Ill.: Headquarters MAC/XPPB, 17 September 1984). This entire section is taken from the unclassified version of that document.

Chapter 4

Airlift 1989—Five Years after the Master Plans

By the mid-1980s, military airlift seemed to have a straight road into the future. The Congressionally Mandated Mobility Study (CMMS) had validated a fiscally constrained minimum airlift goal to which the Air Force had responded with the Airlift Master Plan and the Airlift Total Force Plan. These two master plans formed a programming road map for military airlift to the year 2000. This chapter reviews the two master plans and then examines some current airlift issues that may influence the achievement of the master plan goals over the next decade.

The C-5/C-17 Controversy

A central part of the US Air Force plan to achieve the CMMS goal of 66 MTM/D was the procurement of the C-17. The McDonnell Douglas C-17 was described by the commander of MAC, Gen Duane H. Cassidy, as a "unique and revolutionary airplane [which] looks like a fat C-141 but it can haul the same load as a C-5; and it can move in and out of airstrips the length and width that normally can accommodate only a C-130."[1] These "unique and revolutionary" capabilities, plus cost and timing, became the major issues of contention about the C-17.

For once, the issue was not the airlift requirement or even whether the C-17 was a technologically sound airlift aircraft with both strategic and tactical airlift capabilities. At issue was whether the tactical capabilities of the C-17 were relevant to future tactical airlift requirements and whether an alternative force structure, made up of additional C-5s instead of the C-17, would meet the CMMS goal sooner and at less expense.[2]

Tactical Capability

The argument about the tactical capabilities of the C-17 centers around the aircraft's capability of direct delivery into small, austere airfields. According to the Airlift Master Plan, this allows the retirement of 180 older and less-capable C-130s while at the same time increasing the total intratheater airlift capability from approximately 9,000 tons per day to 16,000 tons per day. Critics contended that to achieve a "residual tactical capability," the C-17 gave up strategic capacity and thus could not carry

the maximum payload of the C-5 (261,000 pounds for the C-5 versus 172,000 pounds for the C-17) and would suffer the same survivability problems of the C-5 or any large airlift aircraft if flown into a combat area.[3] There were also questions about risking an aircraft as expensive as the C-17 in direct combat support.

The answer to these criticisms is evident in the design requirements of the C-17. It was not intended as a duplicate of the C-5 but rather as an aircraft with new technology allowing a combination of the best characteristics of the existing airlift fleet. The C-17 design includes an interior cross section similar to the C-5 for outsized cargo, yet it has overall exterior dimensions like those of the smaller C-141 and the ground-handling and maneuverability qualities of the C-130.[4]

The C-17 was designed to fill a critical gap in military airlift capability. MTM/D requirements and the ability to lift outsized cargo are only part of the airlift equation. In a rapid reinforcement of NATO by airlift, the MAC force structure of C-5s, C-141s, KC-10s, and CRAF aircraft is restricted to operations at a limited number of major airfields. This cargo must then be transferred by ground or other air transportation to where it is needed. This intratheater movement, if by air, will be by C-130, which is capable of landing at forward, austere airstrips. But the C-130 is limited in tonnage capacity and has no capability to deliver outsized cargo. Thus the last 100–200 miles required for reinforcement may take longer than the original 4,000-mile strategic lift.[5]

Even though the C-5 can land on a fairly short runway (4,000 feet), it has been restricted by operational experience to runways 5,000 feet long by 150 feet wide during peacetime and 5,000 feet long by 90 feet wide during wartime.[6] The C-17's ability to land on a runway 3,000 feet long by 90 feet wide increases the number of worldwide available airfields by more than sixfold.[7]

The limitation of runway availability is exacerbated by the large size and limited manueverability of the C-5. On a 500,000-square-foot parking ramp with a single entry point, only three C-5s can be parked for loading or unloading compared to eight C-17s.[8] These restrictions limit the C-5 to "runway only" operations for loading and unloading at many bases; and because these bases are often fighter bases, they are closed to C-5 operations to prevent closing the runway to fighter operations.[9] These operational limitations were identified by the C-X study task force—limitations the C-17 was designed to overcome.[10]

The C-17 did not give up strategic capability in order to gain a "residual tactical" capability; it was designed to fill a shortfall in the nation's airlift force with improved operational utility. Although designed to carry outsized cargo into "tactical" airfields, the C-17 is actually fairly close to the tonnage capability of the C-5 at the standard intercontinental distances of 2,400 to 3,200 nautical miles.

The question of survivability is also answered by the design characteristics of the C-17. On 9 October 1979 the commander in chief, Military Airlift Command (CINCMAC), directed a task group to "review airlift tactics, investigate readily available equipment, identify courses of action to improve airlift integration with ground and air combat forces and to assess the current and projected threats to airlift aircraft."[11] The initial 300-page report, "Close Look II," contained recommendations for training, operations, and equipment to improve the survivability of airlift aircraft.

Aside from improved equipment like modern avionics, a heads-up display (HUD), and improved flight controls, the C-17 design also incorporated operational recommendations from "Close Look II." The C-17 airdrop and LAPES capability (both of which limit hostile-area exposure) adhere to the "Close Look II" recommendation for rapid approach, minimum time over target for airdrops, and rapid exit, all of which are integral to C-17 design.[12] The aircraft is also equipped for combat off-load and onload—the ability to rapidly load or unload cargo, in a hostile area, with the engines running.

Other survivability designs include system redundancy and hardening, provisions for armor, defensive systems, and self-sealing fuel lines, and the capability to limit ground exposure by a rapid descent and landing from high over the airfield.[13]

While there is as yet no hard operational proof of the aircraft's survivability, the C-17 does incorporate many design features to enhance its use and survivability in a forward operating area. Actual survivability is *extremely mission and scenario dependent.* Operational necessity, mission demands, aircraft capability, and available support (such as fighter escort) will all have to be balanced by mission planners.

The question of committing this aircraft to hostile operations when it is both expensive and limited in number was raised by Secretary of the Air Force Verne Orr in 1982. His concern was "that with a very expensive plane like the C-17 and a limited number of them, the forward commander may not want to order them up to the edge of the battle area . . . so we must have something smaller for intratheater."[14]

The definitive answer came in a January 1984 letter from US Air Force Chief of Staff Gen Charles Gabriel:

> The primary mission, and the driving force behind our efforts to acquire the C-17, is to help satisfy the wartime intertheater and intratheater airlift needs of this nation. The C-17 will reduce our intratheater airlift shortfall through its capability to operate into small, austere airfields on direct-delivery missions from the CONUS to forward operating areas and on intratheater shuttle missions. In an intratheater role, the C-17 can deliver people, equipment, and supplies to the brigade level and even further forward, if required. Its design will allow delivery of all sizes of cargo into forward operating locations; its maneuverability, speed, climb rates, and redundant systems will make it more survivable than any current airlift aircraft. Additionally, its larger payload and small crew size allows effective risk management by exposing fewer people and aircraft to forward area threats.[15]

This strong commitment did not seem to stop the "too expensive to put in harm's way" argument, but all evidence points to a continued obligation

to procure a survivable airlift aircraft capable of operating in a threat environment. In 1987 the Air Force was working on cost-effective defensive systems for airlift aircraft at the Wright Aeronautical Laboratory as well as expanding the interactive defense avionics system (IDAS), an attempt to define specific defensive requirements and system specifications for the C-17 as well as other airlift aircraft.[16] In 1988 the C-17 system operational concept (SOC), the official command description of the C-17 and its mission, specifically committed the aircraft to a medium-threat environment with routine destinations at the brigade rear area or further forward if required.[17]

Historically, the question had already been answered. In the early 1960s Secretary of the Air Force Harold Brown had publicly committed to C-5 operations in the forward area if suitable landing zones were available; and during the second Tet offensive in 1972, 16 C-5 missions were flown into Da Nang and Cam Ranh Bay—considered an active combat zone at the time—for emergency resupply of tanks and large vehicles.[18] The extremely expensive C-5 had no defensive capability or design—and there were fewer than 80 in the inventory. A weapon system may be withheld due to an operational limitation, but no commander would sacrifice a mission for fear of using an expensive resource.

Cost Arguments

The issue of airlift was, again, an issue of the C-5 versus the C-17. The argument was basically that the CMMS goal could be met at less expense by canceling C-17 production and buying more C-5 and KC-10 aircraft.[19] This controversy was fueled by an offer from the Lockheed Georgia Corporation to lower the price of the C-5B. Instead of $168 million per aircraft (the price of the original 50 C-5Bs), the company now offered an additional 24 aircraft for $127 million, compared with the $142 million estimated cost of the C-17.[20] The Air Force's concern, as contained in the Airlift Master Plan, was the high operation and support costs as well as the larger manpower requirements of the C-5. Other issues included proposals to increase maritime prepositioning, a further service life extension program (SLEP) for the C-141, and retiring and replacing the 180 older C-130s.

The Congressional Budget Office (CBO) was directed by the Senate Committee on Armed Services to analyze the US Air Force plan and compare it with alternative approaches to improving strategic mobility. The result was a document published in September 1986 titled, "Improving Strategic Mobility: The C-17 Program and Alternatives."[21] This document compared the program recommended by the Airlift Master Plan and the Airlift Total Force Plan with three alternative mobility programs that did not include C-17 procurement. Each alternative was built on the 1989 airlift force structure (48.5 MTM/D capability) recommended by the Airlift Master Plan.

Alternative I achieved the 66 MTM/D goal by 1994 (six years earlier than the Airlift Master Plan) through the purchase of 70 additional C-5Bs and 66 additional KC-10s, and through adding 31 aircraft to the CRAF. This

option included the retirement of 180 older C-130s to be replaced by new C-130Hs, the retirement of 54 older C-141s, a service life extension of the remaining C-141s from 45,000 hours to 60,000 hours, and continued operation of the C-141 with a 4.0 crew ratio.

The 30-year life-cycle cost (1987–2016) of the first option is estimated at $114.4 billion, or a 3-percent savings over the C-17 option of $118.1 billion. The cost of this alternative could increase to $120.6 billion, however, dependent upon the operational requirements of the C-5 flying-hour program.

The CBO report points out that Alternative I does not increase intratheater airlift capability and would require some 12,400 more personnel than the C-17 option. What the CBO report does not discuss is the increasing cost and difficulty of supporting and operating older aircraft. In 1986 Tidal W. McCoy—assistant secretary of the Air Force for manpower, reserve affairs, and installations—addressed this issue. "Putting all the other arguments aside, that is why we have modernization; to replace aging systems that are slowly becoming unsupportable and are becoming a financial burden to operate."[22]

Figure 8 shows the average age of MAC's primary airlift aircraft in 1990. Alternative I maintains the C-141 fleet at an active crew ratio of 4.0 with a full flying-hour program instead of the Air Force plan to extend the life of these aircraft by transferring them to the reserve forces with a 2.0 crew ratio and a reduced flying-hour program. However, under the Alternative I program, even with a service life extension, the C-141 will require replacement by approximately 2010.[23]

AIRCRAFT TYPE	NUMBER	AVERAGE AGE IN 1990 (YEARS)
C-141B	267	25
C-5A	77	19
C-5B	50	3
C-130A	110	34
C-130B	84	31
C-130E	274	26
C-130H	107	12

Source: Military Airlift Command, *The Case for the C-17: The Operator's View* (Scott AFB, Ill.: Headquarters MAC, 1988), 31.

Figure 8. Average Age of Airlift Aircraft

Alternative II in the CBO report reduces the minimum airlift capability goal to 56 MTM/D. Under this option, the nation gives up the ability to respond to a major conflict but maintains sufficient airlift to respond to "limited wars." The notion seems to be that the nation has never had a 66 MTM/D capability and that the chances are greater for involvement in contingency operations rather than major wars.

This alternative is identical to Alternative I with the exception of buying only 24 additional C-5s and 40 additional KC-10s. The estimated 30-year life-cycle cost of Alternative II was $98.5 billion—a savings of 17 percent over the C-17 option.

Like the first alternative, Alternative II ignores the need to modernize the strategic airlift fleet and does not improve tactical airlift capability or flexibility. Current problems in both areas are merely shelved. Additionally, the CBO admits that this alternative puts theater commanders at greater risk and fails to achieve the CMMS validated *minimum* goal of 66 MTM/D—a goal admittedly far short of actual airlift requirements.

Alternative III abandons the requirement for additional strategic airlift and instead purchases 12 maritime prepositioning ships (MPS). These ships would carry the equipment for an Army division and would be deployed overseas. The 30-year life-cycle cost of this alternative is $99.7 billion. This option includes a service life extension for the C-141 and the purchase of 180 C-130Hs. Strategic airlift capacity would remain at the 48.5 MTM/D programmed for 1989.

Despite the cost advantage, the CBO admits this alternative has serious disadvantages. If positioned at Diego Garcia, the ships would require three or four days to reach some areas in Southwest Asia and, although not stated by the CBO, a substantially longer period of time to reach Europe—and not all combat equipment can be stored on ships. Furthermore, this equipment must be unloaded at port facilities and this option may require the purchase of additional specialized ships to facilitate unloading in substandard ports. Finally, all of this equipment must be transported by ground or airlift to its actual destination, arriving later than similar materiel would if airlifted.

The CBO report is a comparison of alternatives; it does not offer a recommendation. The 30-year life-cycle cost of the alternatives is shown in table 8.

TABLE 8

Total Life-Cycle Cost Comparison
(In Billions of 1987 Budget-Year Dollars)

Administration's Plan (Buy C-17)	118.1
Alternative I: Earlier Capability (Buy C-5/KC-10)	114.4
Alternative II: Lower Airlift Goal	98.5
Alternative III: Maritime Prepositioning	99.7

Source: Congressional Budget Office, *Improving Strategic Mobility: The C-17 Program and Alternatives* (Washington, D.C.: Government Printing Office, September 1988), 53.

The three CBO alternatives plus the six contained in the Airlift Master Plan meant that nine alternative means of solving the nation's airlift shortfall had now been examined. The US Air Force position was that the C-5 and the C-17 were different aircraft with different capabilities. Both are needed to satisfy the CMMS goal in a phased effort. The near-term requirement is met with the C-5B, KC-10, and CRAF enhancements; the mid- and long-term requirements are satisfied by the C-17.[24]

The issue was finally resolved in favor of the US Air Force program; in January 1988 the Air Force went on contract for the first two C-17s with initial operational capability planned for Charleston AFB, South Carolina, in 1992.[25]

Current Airlift Issues

In his year-end assessment of the Military Airlift Command, Gen Duane H. Cassidy said:

> MAC has about 1,200 airplanes with 23 different models. On any given day somewhere between 450 and 500 of them are flying more than 1,700 sorties all over the world. Command and control messages to schedule and track down that effort number more than 45,000 a day. Every 24 hours we move an average of 5,000 passengers and 1,000 tons of cargo through our aerial ports. During the same time period we coordinate about eight to 10 rescue missions and save 2.3 lives. MAC airplanes fly an average of 1,270 hours, and MAC aeromedical flights move an average of 213 patients.[26]

At the present time, MAC is a robust and active command—more capable than at any time in its history. But how does the present command compare with the forecast of the 1983 and 1984 master plans, and are there any issues today that vary from the program established over five years ago? The remainder of this chapter reviews seven areas of conflict or potential conflict between MAC today and the airlift force programmed for the year 2000.

Airlift Force Structure

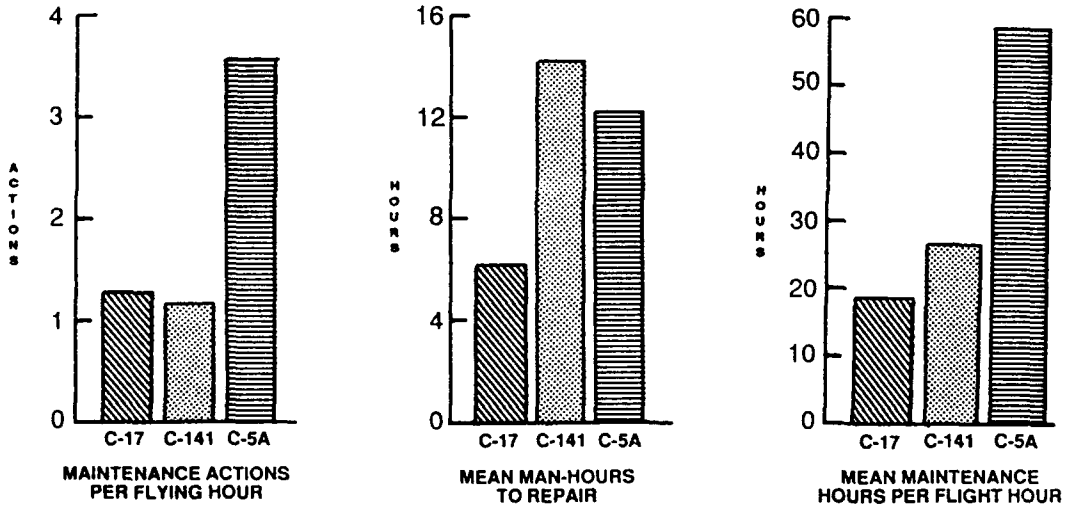
By early 1989 the baseline force structure programmed in the Airlift Master Plan had been achieved; but this force structure of 215 C-141Bs, 64 C-5As, 44 C-5Bs, 41 KC-10s, and 100 long-range international CRAF aircraft has a strategic airlift capability of 46.4 MTM/D instead of the planned 48.5 MTM/D.[27] The primary reason for this shortfall in capability is the reduction of the utilization rate and crew ratio of the C-5. The utilization rate discussed here represents a surge rate for the opening days of hostilities. Long-term sustained operations are planned with lower utilization rates.

The Airlift Master Plan was based on a C-5 utilization rate of 12.5 hours per day with a 4.0-crew ratio. Subsequent Air Force and Department of Defense (DOD) analytic simulations of strategic airlift deployment, with

actual units and cargo loads, demonstrated that a utilization rate of 11.0 was in fact more realistic.[28] This lower utilization rate means a lower MTM/D capability for the C-5. Subsequently, the crew ratio was reduced to 3.0 per aircraft.

This lower MTM/D figure could mean that the Airlift Master Plan program will not achieve the 66 MTM/D goal without additional airlift assets. A factor which adds to this uncertainty is the high utilization rate forecast for the C-17. Because of the manufacture-warrantied low maintenance hours per flying hour specified for the C-17, as well as numerous features to expedite loading and unloading, thus limiting ground time, the C-17 MTM/D capability was figured with an average utilization rate of 15.65 hours per day.[29] Although higher than any other military airlift aircraft, this rate is based on numerous operational improvements in the C-17. A similar rate was achieved by several commercial carriers for over a year during the Vietnam War.[30]

Figure 9 shows a comparison of maintenance factors for the three strategic airlift aircraft. These maintenance man-hours equate to time on the ground—a lower figure means less ground time and a higher utilization rate. Added to this, for MTM/D capability, is the cargo capacity difference of the aircraft. This means that although the C-141 and the C-17 are fairly close on maintenance man-hours per flying hour, the much higher cargo capacity of the C-17 will equal a higher MTM/D figure.



Source: Military Airlift Command, *The Case for the C-17: The Operator's View* (Scott AFB, Ill.: Headquarters MAC, 1986), 28.

Figure 9. Maintenance Man-Hour Comparison

It must be kept in mind, however, that airlift productivity (MTM/D) is the product of a number of variables: cargo volume and weight, aircraft speed, utilization rate, maintenance requirements, aircrew ratio per aircraft, and

ground time requirements for loading and unloading. Any or all of these can change and thus affect an individual aircraft's MTM/D capability. The fact that MAC has achieved the 1989 master plan force structure is more important to long-range capability than any single year's measurement of MTM/D, and the 1989 force structure is a solid baseline for airlift modernization and capability growth.

Retirement of Aircraft

The retirement of an aircraft was presented in the Airlift Master Plan as a management decision based largely on service life forecasts. Other factors like equipment wear, increasing cost of obsolescent parts, and increased maintenance requirements must also be considered. Critics of the Airlift Master Plan questioned the planned 1990s retirement of both the 54 C-141s and the 180 C-130s. At issue was the service life extension of the C-141s to 60,000 hours and the ability of the C-17 to replace the C-130. As the retirement actions of the Airlift Master Plan come closer to fruition, the pressures to retain older aircraft or extend the service life of certain aircraft will undoubtedly increase. These pressures will likely be based on the immediate cost savings offered by lower procurement of modern aircraft and the maintenance of proven capability.

This issue could easily assume more importance than it warrants. Older aircraft could be kept active, at an increasing cost, to provide increased capability. However, fiscal reality forces a choice—in this case between airlift modernization and improved capability or the maintenance of older and less-capable systems. Other than the C-5 and the C-130H, MAC's present airlift fleet of C-141s and C-130s is approximately 25 to 35 years old. By 2010, these aircraft will be *half a century* old.

Since the master plans were written, many of the aircraft originally identified for retirement have in fact been retired. Only 44 of the 110 C-130A models identified for earliest retirement remain, due to congressional buys of newer C-130Hs (for the reserve forces) and transfers of C-130Es from the active force. The majority of the operational C-130s are early C-130E aircraft, most with service lives ending by 2015. Like the C-141, these 200 planes, if kept on active duty, will add capability for only a finite period of time. If this is done at the expense of modernization, it will also be done at the expense of the nation's airlift capability.

The Airlift Master Plan may be slightly wrong on the exact number of aircraft to retire, or the precise year their service life expires, or the exact number to be transferred to the reserve forces; but there is no mistaking the fact that these actions have to be accomplished if the nation is to redress the imbalance between airlift requirements and airlift capability.

Budget

Of all the issues concerning airlift modernization and uncertainties, the military defense budget is certainly the most pervasive in effect. The history

of military airlift is filled with examples of recognized airlift shortfalls, plans to fully modernize and increase capability, and budget constraints that limit or eliminate these plans. If the original programs in the 1960s for the C-141 and the C-5 had remained intact, the airlift enhancements accomplished between 1983 and 1989 would have resulted in a combined capability of 58.9 MTM/D.[31]

Of course this difficulty of procuring a planned force is not unique to the airlift community. Air Force planners in all areas face the identical problem of programming long-range force structures only to be faced with budget constraints that cause difficult short-range decisions among conflicting programs.[32]

This problem of long-range plans and short-range fiscal reality has been further complicated in the past by systems that cost more than was originally estimated. In the 1950s the C-133 cost more than one-and-one-half times the original cost estimate, and, although not nearly as bad, the C-5A became infamous in the 1960s for exceeding the original estimated cost by 36 percent.[33]

Cost growth in a major weapon system program can be caused by a number of factors. Late design changes, unrealistic requirements, poorly forecast cost of new technology, operational deficiencies, and changes in the total quantity procured are just some of the cost growth factors. Other than quantity changes, however, the Airlift Master Plan program for the new C-17 is likely to remain at the original cost estimate.

The C-17 appears capable of meeting or exceeding all Air Force requirements; and critical specifications—such as performance, reliability and maintainability, and structural integrity—are warrantied so that any deficiency will be corrected with no increase in the contract price.[34] Similarly, strict controls and new management programs have greatly improved the DOD acquisition record.

This leaves a change in the quantity of C-17s procured as the remaining factor for cost growth. A decrease in procurement would mean sustaining the gap between airlift requirements and airlift capabilities. But there is certainly historical precedence for such a move and the current budget climate will undoubtedly force some critical decisions on military spending.

Pressures to reduce the budget deficit are quite likely to have a serious impact on defense spending. The DOD request to sustain a 2.0-percent real growth in defense spending (fig. 10) has caused serious congressional debate. A cut in this programmed growth will force decisions that could affect the C-17 and either slow or eliminate attainment of the 66 MTM/D minimum requirement for airlift. An important mitigating factor is the support found for the C-17 program by not only the Air Force but the other services as well.[35]

Thus the overall budget picture for the Airlift Master Plan and specifically the C-17 is that of a technically strong, well-supported, and correctly priced program that will have to compete for funding in a tight budget. Airlift

	FISCAL YEAR				
	1990	1991	1992	1993	1994
TOTAL BUDGET AUTHORITY	305.6	320.9	335.7	350.7	365.6
PERCENT REAL GROWTH	2.1	2.0	2.0	2.2	2.0
TOTAL OUTLAYS	293.8	304.7	316.2	329.3	343.4

Source: *Annual Report to Congress* (Washington, D.C.: Government Printing Office, 17 January 1989), 88.

Figure 10. DOD Budget Forecast

programs in the past have lost this competition. The outlook this time is better, however, due to solid requirements, a user-driven aircraft design, low technological risk, and multiservice support. Interestingly, another budget issue has been the number of American troops deployed overseas, especially in Europe. If budget pressures and the perception of a new and benign Soviet Union cause a reduction in US overseas deployed strength, the mobility requirement will rise and the minimum airlift goal may need adjustment.

Force Sustainment

The problem of force sustainment was previously discussed as it relates to the transfer of active duty aircraft to the reserve forces. Force sustainment for the active duty Air Force means the ability to maintain sufficient numbers of qualified personnel to meet wartime requirements. Pilot retention is typically the concern in this area. For the reserve forces, higher active duty force sustainment through greater pilot retention rates means fewer prior qualified people available to the reserve forces.

The Airlift Total Force Plan listed force sustainment as an active duty problem. A minimum of 13.3 years of rated service is required for a strategic airlift pilot—14.8 years of rated service for a tactical airlift pilot. Low pilot retention rates can eventually lead to force sustainment problems because there would be fewer experienced pilots to fill required positions and because the number of available aircraft limits the number of new pilots that can be trained. A pilot retention problem can lead to a loss of wartime capability. At best, this means increasing flying hours to provide pilot experience faster, an option which can be limited due to force structure. In the worst case, there will not be enough pilots to fly at the high utilization rates required for wartime.

When the master plans were written, the Air Force was experiencing the highest pilot retention since a previous all-time low in 1979. At that time, the future active duty force structure was sized to meet minimum force sustainment requirements. Since 1984–85, pilot retention has steadily

declined in both MAC and the Air Force. In fact, the minimum rates of average rated service have not been sustained for either strategic airlift or tactical airlift since 1984 (table 9).

TABLE 9

Pilot Total Active Rated Service

Year	*Air Force*	*Strategic Airlift*	*Tactical Airlift*
1977	11.8	9.3	12.2
1978	10.7	8.0	10.2
1979	8.7	7.7	7.9
1980	10.7	9.9	11.0
1981	12.4	11.0	12.6
1982	14.0	13.6	14.2
1983	15.6	15.8	16.4
1984	14.2	13.5	13.8
1985	13.0	11.4	12.1
1986	13.0	11.4	12.2
1987	12.3	10.2	11.9
1988	11.9	9.9	11.6

Source: "Rated Management Document" (Washington, D.C.: Headquarters USAF/XOOTW, October 1988), 4-2.

The main reasons given for this exodus of Air Force pilots are the increase in pilot hiring by the airlines and systemic dissatisfiers within the Air Force (lack of geographic and personal stability, erosion of pay and benefits, and Air Force personnel policies).[36] Both Air Force and MAC have instituted a number of programs to improve pilot retention, but the low retention trend continues.

One well-publicized initiative was the pilot pay bonus, officially known as aviation continuation pay. This program offers a pay bonus to Air Force pilots with 7 to 13 years' service in return for continued service. As of March 1989, 64 percent of eligible Air Force pilots and 59 percent of eligible MAC pilots had signed up for this program.[37] While these initial figures look promising, the sign-up rate is much lower in the earlier year groups; it gets higher as the individual has more time committed to an Air Force career. Still, this program combined with other Air Force and MAC initiatives may stem the loss of experienced pilots. If not, force sustainment and military capability will be at risk. This issue is critical and Air Force-wide.

Force Mix

The Airlift Total Force Plan established an optimum force mix and a phasing plan to accompany the Airlift Master Plan, meeting conditions of readiness, force sustainment, and cost-effectiveness. This force mix was then "fine-tuned" under several reserve forces considerations: assign some of each type of aircraft to organic ANG/AFRES units; assign no more than

50 percent of any one weapon system to the reserve forces; do not plan a decrease in the number of ANG/AFRES units; and assign no fewer than eight aircraft per unit. This force mix plan came with a caution about several unknowns or potential problems, however, one of which was potential disruption in the reserve forces.

The initial transfers have proceeded smoothly with minimum disruption. However, there is a potential problem with the next phase of the Airlift Total Force Plan. The available force structure or number of aircraft decreases by approximately 50 from today's force structure; and while the total number of aircrews remains fairly constant, there is a slight growth in active duty aircrews and a corresponding decrease in reserve force aircrews. In isolation, these numbers are insignificant; applied against the present number of reserve force units, they indicate a potential problem.

Since the master plans were published, the number of reserve forces airlift units has grown. If these units remain as airlift units, there will not be enough aircraft to maintain a minimum of eight aircraft per unit.

At present the number of organically equipped ANG/AFRES units is 40. If the three C-5 units are removed from this number as well as from the ANG/AFRES organic line total, then there are 280 aircraft for 37 units—7.5 aircraft per unit. This number is even lower if an assumption is made that some of these units will have more than eight aircraft per unit—and there are already five ANG/AFRES units with 12 or 16 aircraft. It follows that some units will have to convert to a different mission, some will have to close, or some will be equipped with fewer than eight aircraft.

A similar potential problem has surfaced in Headquarters AFRES concerning the associate programs. The active/reserve associate line in the recommended force mix was left blank under the C-141. This number was to have been added, dependent upon future operational requirements. According to a Headquarters AFRES point paper, the number that is eventually applied to this block can determine whether AFRES will lose some associate units.[38] This cannot be determined from published force mix numbers and is probably dependent upon assumptions about future beddown of active/associate C-17 units. In any case, a potential for problems exists.

Since publication of the master plans, events have changed some of the underlying assumptions used in the original development of those plans. Thus the future force mix will require further fine-tuning.

Civil Reserve Air Fleet

The participation of commercial air carriers has grown beyond what was predicted in the Airlift Master Plan. CRAF presently accounts for almost 50 percent of MAC's strategic airlift sources—24 percent of the cargo capacity and 95 percent of the passenger capacity.[39] This amounts to 13.1 MTM/D, 1.8 MTM/D higher than expected.

The long-standing partnership between MAC and the civil air carriers has been productive despite conflicts over the peacetime use of military airlift. CRAF has been and is supported by MAC (the CRAF enhancements), and CRAF is necessary to the nation's strategic lift capability. However, if the trend of increasing CRAF capability continues, there may be pressure to sacrifice military airlift.

Military airlift and CRAF are complementary but by no means the same. CRAF is limited to secure areas of operation at major airfields and is not designed to optimize military cargo handling. Overreliance on commercial airlift for military use has proven to be a faulty concept in the past. Growth of CRAF at the expense of military airlift is not an equal trade of ton-mile capability; military utility and flexibility are also sacrificed.

Tactical Airlift

The master plans included tactical airlift as a requirement but lacked an accepted, quantified goal. Emphasis was on maintaining present capability as a minimum and adding outsized cargo capability with the direct-delivery ability of the C-17. The issue of modernization and required capacity had not yet been sufficiently quantified to be included in the plans.

Determining the requirement for tactical airlift is much more difficult than arriving at specific strategic lift needs for a given national strategy. Tactical airlift is user driven and must be capable of response to ever-changing demands brought about by military conflict. This difficulty was reported by the House of Representatives Subcommittee on Military Airlift in 1970.

> The tactical airlift force must have the size and capability to respond to a wide range of user requirements rather than simply a gross troop/tonnage deployment capability. *Sortie generation rates become a more important consideration than ton-mile productivity.* In addition, the nature and location of a particular tactical situation, the size of the conflict, the number of forces engaged, and such key factors as the quality and security of a country's road, rail, water and pipeline networks, become the driving factors in seeking a solution to this question. The range of unknowns does not permit sizing the tactical airlift force with the same degree of precision that is possible in strategic airlift computations [emphasis added].[40]

This subcommittee report was provided in response to congressional concern over reductions in the total number of tactical airlift aircraft planned for 1974. Witnesses from Tactical Air Command testified "to a positive need for a replacement for the C-130E" as well as for the aging C-123 and C-7.[41] Similar testimony in 1975 was still calling for a replacement for the aging tactical airlift fleet and for introduction of the advanced medium (short takeoff and/or landing) transport (AMST) to complement the C-130 force, which due to tactical use had aged 10 times as fast as expected.[42] These are the C-130s still in use.

From 1967 to 1987 there were 10 attempts to designate a program as a C-130 replacement.[43] This led to a congressionally mandated study of

tactical airlift, initiated by the Joint Chiefs of Staff and the Office of the Secretary of Defense, called the Worldwide Intratheater Mobility Study (WIMS).[44] The WIMS was intended to quantify intratheater airlift requirements like the CMMS had done for intertheater airlift. Although completed, the results of the WIMS are still classified. However, even without these results, other studies and expert testimony concur in the need for a larger and more capable tactical airlift fleet.[45]

The US Air Force's answer to the need for a new tactical airlift aircraft is the Advanced Tactical Transport (ATT). However, this aircraft is still in the analysis phase. The Advanced Transport Technology Mission Analysis (ATTMA) is a joint effort by MAC, the Aeronautical Systems Division, and the Boeing, Lockheed, and McDonnell Douglas aircraft corporations to define tactical airlift requirements, capabilities, and threats for the next century.[46] In the interim, critics will continue to protest the retirement of C-130s as called for in the Master Airlift Plan.

The issue will continue to be that "the C-17 cannot replace 180 C-130s." Because there is no C-130 replacement readily on hand, the retirement of a number of aging C-130s will be linked with the acquisition of the C-17 instead of being viewed as a need to retire aircraft that are presently 25 years of age or older. However, reality often requires a choice—in this case, a phased approach to solving two problems. The C-17 is not intended as a replacement for the C-130, but it has special ability that allows it to augment the tactical airlift fleet. The Airlift Master Plan program will solve the immediate strategic airlift problem; the tactical airlift problem should be addressed next. In the interim, the C-17 will help fill the void left by retiring C-130s until the ATT comes along.

Summary

Since the publication of the Airlift Master Plan and the Airlift Total Force Plan, we have witnessed an improvement in MAC's airlift capability. Despite controversy over the choice of the C-17 as the central effort toward modernization, the plans have proven valid. However, any plan for the future suffers at the hand of reality. Today's actions often change yesterday's plans for tomorrow. It is no different with the Airlift Master Plan and the Airlift Total Force Plan.

In 1989 seven issues posed potential problems for the airlift plans: (1) the programmed force structure for 1989 has been attained, but it differs slightly from planned capability; (2) the planned retirement of aircraft has been criticized and misunderstood—and the pressures in this area will increase as actual retirement draws closer; (3) the deficit will increase pressure to reduce military budgets, which may affect force modernization; (4) low pilot retention could cause problems in force sustainment; (5) events have complicated the attainment of the desired force mix; (6) the successes

of CRAF could undermine modernization; and (7) the numerous issues surrounding tactical airlift complicate attainment of the force programmed for the year 2000.

These issues may or may not prove to be problematic, but there are indications that this road to airlift modernization will be no easier than past attempts. The central program of the plans is still a valid one, but the next five years will undoubtedly require additional fine-tuning.

Notes

1. Military Airlift Command, *MAC News Service 1988 Year-End Review* (Scott AFB, Ill.: Headquarters MAC, 30 December 1988), 2.

2. Jeffrey Record, *U.S. Strategic Airlift: Requirements and Capabilities* (Cambridge, Mass., and Washington, D.C.: Institute for Foreign Policy Analysis, Inc., January 1986), 21–22.

3. Ibid., 21–23.

4. Military Airlift Command, *Volant Rally DCS Plans, Book II*, command briefing on the C-17 (Scott AFB, Ill.: Headquarters MAC/XPG, 19 September 1985), 12.

5. Maj James Crumley, Jr., "Rapid Reinforcement of NATO," *Airlift* 4, no. 4 (Fall 1982): 16–17.

6. Military Airlift Command, *The Case for the C-17: The Operator's View* (Scott AFB, Ill.: Headquarters MAC, 1986), 18.

7. MAC, *Volant Rally*, 21.

8. MAC, *The Case for the C-17*, 18; and United States Air Force, *Air Force Issues Book* (Washington, D.C.: Office of the Vice Chief of Staff, USAF, 1984), 68–71. The capabilities of the C-5 have been extensively tested since its introduction in the late 1960s. The original test program, operational tests conducted in the late 1970s, and extensive operational experience have all demonstrated the ability of the aircraft to operate on a 5,000-foot runway as well as on hard surfaces. The design of the aircraft concentrated on runway length and width, but experience has since shown that other factors are just as important. The narrow taxiways and small ramps associated with most small airfields severely limit or prohibit C-5 operations—experience that was used in the design of the C-17.

9. Crumley, 17.

10. Col Dean A. Hess, Jr., "Theater Airlift for Wartime," *Airlift* 7, no. 2 (Summer 1985): 7–9.

11. Lt Col William D. Forsythe, "Close Look II," *Airlift Operations Review* (July–September 1980), 14.

12. MAC, *The Case for the C-17*, 20.

13. Ibid., 22.

14. Record, 28.

15. Quoted in MAC, *The Case for the C-17*, 15.

16. United States Air Force, *Air Force Issues Book* (Washington, D.C.: Office of the Vice Chief of Staff, USAF, 1987), 4-3.

17. Point Paper, "Civil Reserve Air Fleet (CRAF)," MAC/LO conference (Scott AFB, Ill.: Headquarters MAC, 25–27 October 1988), 166.

18. Lt Col Charles E. Miller, *Airlift Doctrine* (Maxwell AFB, Ala.: Air University Press, 1988), 305, 339–40.

19. Record, 30.

20. Congressional Budget Office, *Improving Strategic Mobility: The C-17 Program and Alternatives* (Washington, D.C.: Government Printing Office, September 1986), 24. All budget figures used were in 1987 budget-year dollars.

21. Ibid. Unless otherwise indicated, all data discussed concerning the CBO study is derived from that study.

22. Quoted in MAC, *The Case for the C-17*, 30.

23. Ibid., 37.

24. United States Air Force, *Air Force Issues Book* (Washington, D.C.: Office of the Vice Chief of Staff, USAF, 1985), 68.

25. United States Air Force, *Air Force Issues Book* (Washington, D.C.: Office of the Vice Chief of Staff, USAF, 1988), 4-3.

26. MAC, *MAC News Service 1988 Year-End Review*, 2.

27. Interviews with personnel at Headquarters MAC/XP on 28 March 1989; and Point Papers from MAC/LO conference, 25–27 October 1988.

28. CBO, *Improving Strategic Mobility*, 15.

29. Ibid., 14.

30. Ibid.

31. The 58.9 MTM/D figure was calculated, using utilization rates for 1989, with the original programmed buy of C-5As (120) and C-141s (350), minus a 10-percent withholding. Aircraft attrition due to accidents since the original buy was not included. The figures from this original program, 20.8 MTM/D for 315 C-141s and 14.5 MTM/D for 108 C-5As, were then added to the figures from the airlift enhancement program—6.0 MTM/D for 44 C-5Bs, 4.5 MTM/D for 41 KC-10s, and 13.1 MTM/D for 100 CRAF aircraft.

32. Col Alan L. Gropman, "Air Force Planning and the Technology Development Planning Process in the Post-World War II Air Force—The First Decade (1945–1955)," in *Military Planning in the Twentieth Century*, ed. Lt Col Harry R. Borowski (Washington, D.C.: Office of Air Force History, 1986), 158–59.

33. Ibid., 160.

34. CBO, *Improving Strategic Mobility*, 46.

35. James W. Canan, "Tough Choices for Hard Times," *Air Force Magazine* 72, no. 2 (February 1989): 50.

36. Point Paper, "Pilot Retention" (Scott AFB, Ill.: Headquarters MAC/DPXA, 12 March 1989); and Canan, 54. The pilot retention problem is worldwide in scope. Other nations, such as the United Kingdom and Australia, are experiencing the same types of problems as the United States.

37. Point Paper, "Aviation Continuation Pay (ACP) Update" (Scott AFB, Ill.: Headquarters MAC/DPXA, 27 March 1989). Other retention initiatives include: improved and firmer schedules with fewer "last minute" or late notice flights for MAC aircrews; attempts to increase pay and entitlements; increased weight allowance for permanent change of station moves; changes in the personnel system to eliminate square filling and concentrate on job performance; a more responsive assignment system; and increased travel benefits for military dependents. However, the airlines are still hiring more pilots per year, of which 67 percent are from the military, than the military trains.

38. Point Paper, "Future Airlift Force Structure Impacts on USAFR" (Robins AFB, Ga.: Headquarters AFRES/REX, 18 January 1987).

9. "Civil Reserve Air Fleet (CRAF)," 154.

1. House Committee on Armed Services, *Report by the Subcommittee on Military Airlift*, 94th Cong., 2d sess., 24 June 1970, 27.

41. Ibid., 29.

42. House Committee on Armed Services, *Hearings on the Posture of Military Airlift*, Research and Development Subcommittee, 94th Cong., 1st sess., 11–19 November 1975, 288–94

43 Jeffrey Record, *Determining Future U.S. Tactical Airlift Requirements* (McLean, Va.: Pergamon-Brassey's International Defense Publishers, 1987), 10.

44. Ibid., 11.

45. Ibid., 37.

46. Point Paper, "Advanced Tactical Transport (ATT)," MAC/LO conference (Scott AFB, Ill.: Headquarters MAC/XP, 25–27 October 1988), 183.

Chapter 5

Observations and Recommendations

This study has not sought to validate the Airlift Master Plan or the Airlift Total Force Plan. Both have successfully withstood numerous attempts to prove them faulty. This study is intended as "a midcourse check" on the possible effects of five years of changes and any conflicts between the original plans and the present posture of military airlift.

Because this subject is complex, an overview of military airlift from its beginning to the present was used as the means to examine the master plans. This overview included a look at airlift's sporadic beginning, its slow and difficult growth, its significance and its contributions to the nation, and its plans to modernize for the twenty-first century. Also, some issues and potential problem areas were examined.

These issues cannot be resolved here; indeed they may not need resolution, and in any case this will be handled by military planners. These issues are not as simple as presented here. Each issue is complex and interrelated with many other aspects of airlift; a simple fix for aircraft retirement or force structure can affect force mix, force sustainment, readiness, capability, the budget, and numerous other aspects of airlift.

This midcourse check identified seven issues possibly at variance with the original plans, but did not offer specific solutions. The importance of these issues is twofold: they should be identified for consideration by military planners and, while they do not invalidate the master plans, they do indicate a need for some readjustment in these plans in order to continue a smooth transition to the airlift force structure of the future.

The very complexity of airlift has made its evolution difficult. It surely makes any prediction about the future of airlift a chancy proposition. However, some observations can be made about possible trends in military airlift, and some recommendations can be made. Included here are recommendations concerning the master plans and the possibility of modifying airlift doctrine by redefining the airlift system.

The Master Plans

As previously stated, the validity of the master plans is not in question. To date, the Air Force plan to meet the CMMS minimum goal of 66 MTM/D has been funded—a good indication of acceptance. There is every indication

that the program specified by the master plans will modernize airlift and build an airlift capability unmatched in the nation's history.

Because of the numerous variables in measuring and determining airlift capability and the uncertainties still to be faced, airlift may not achieve the full MTM/D requirement. In fact, without some other change, the C-5's lower utilization rate limits the planned program to a lower capability. Similarly, changes in the planned crew ratio or operational experience may change the utilization rate of the C-17; and developments in ground-handling procedures could possibly change the utilization rate of all airlift aircraft. But this is a matter of degree and does not invalidate the plans.

The seven issues discussed in chapter 4, combined with the possibility that airlift may not reach the full CMMS goal, raise the probability that the plans are in need of some fine-tuning. This can be done through an updated addendum or by constructing a new master plan built upon the baseline of the original master plans. This second option seems to offer the greatest benefit.

Both the Airlift Master Plan and the Airlift Total Force Plan include strategic and tactical airlift. When these plans were written, however, there was a validated requirement for strategic airlift only; tactical airlift, included by necessity, was limited to a plan of maintaining present capability. Without validated requirements such as those provided by the CMMS for strategic airlift, plans for tactical airlift modernization were unlikely to receive general support. There was a valid requirement for tactical airlift, but the question of how much had not been answered satisfactorily.

Tactical airlift modernization faced many problems: (1) the capability and relative inexpensiveness of the C-130 is attractive to critics of newer and more capable (but more expensive) systems; (2) there is no recent experience to lend urgency to the need for modernization of tactical airlift like that of strategic airlift; and (3) there is a lack of quantified requirements.[1]

Tactical airlift modernization was needed, but valid system requirements had not been defined. The Worldwide Intra-theater Mobility Study (WIMS) and the Advanced Tactical Transport Mission Analysis (ATTMA), along with related studies, should begin to fill this need.

A new Airlift Master Plan could take advantage of the results of the WIMS and other studies. It could build on the existing plans and develop a comprehensive airlift plan for the future. The strategic airlift program would come intact from the previous plans, the tactical airlift program would be fully integrated into the plan, and any issues that have developed in the last five or six years concerning strategic or tactical airlift could be fine-tuned as required.

A comprehensive airlift plan built around the CMMS and the WIMS requirements offers the advantages of integrating strategic and tactical airlift modernization plans while at the same time updating the master

plans. Such a plan also offers the opportunity to clarify the role of the C-17 and define the requirement for the advanced tactical transport (ATT).

The C-17 capability for direct delivery should be separated from the issue of tactical airlift modernization. Direct delivery primarily provides operational utility and flexibility. While this is an augmentation to tactical airlift, it must not be measured against tactical airlift requirements. Direct-delivery ton-mile capability does not replace an equal amount of tactical airlift capability. It does provide increased airlift capability for the entire airlift system, but the need for tactical airlift modernization remains. In fact, increased strategic airlift capability means more cargo and personnel arriving faster and in greater numbers in a given theater—thus possibly increasing tactical airlift requirements despite the contributions of direct delivery.

A new master airlift plan should adjust any problems carried over from the old plans, clarify the role of direct delivery, and present the timing and requirements for tactical airlift modernization. The characteristics required of the next generation of tactical airlift aircraft include the following:

1. High survivability, including defensive systems, low-signature design (stealth-type technology), and high maneuver load factors of 4.0g to 5.0g (an ability to maneuver quickly, with stresses almost twice that of the maximum for the C-130).
2. The ability to take off and land on runways of 1,500 feet or less.
3. The ability to routinely operate off-runway and use sections of roadways for landings and takeoffs.
4. Long-range capability (1,500- to 2,000-mile radius).
5. A cargo compartment slightly larger than the C-130 (to accommodate the Army's light divisions) and an airdrop capability of 66,000 pounds.[2]

These characteristics are meant to fill a gap in tactical airlift capability not addressed in the original master plans. With these characteristics, however, the ATT crosses the doctrinal line between strategic and tactical airlift. Since direct delivery and other combat capabilities give the C-17 a tactical operational capability, the long-range requirement of the ATT is more typically strategic than tactical. The ATT will draw criticism because of this "residual strategic capability"—similar to that directed at the C-17 in the 1980s for its "residual tactical capability." This criticism should be anticipated and the case made now for the next-generation tactical airlift aircraft.

A new master plan is needed to integrate tactical and strategic requirements, resolve any issues left unanswered by the original master plans, and develop a proposed force structure. Hopefully, this plan will incorporate total airlift requirements in addition to merely updating the Airlift Master Plan and the Airlift Total Force Plan. But this is only part of the requirements for military airlift of the future. A new approach to airlift doctrine is needed.

Airlift Doctrine: A Revised Airlift System

The September 1965 MATS draft of AFM 2-21, *Airlift Doctrine*, was more than an attempt to consolidate strategic and tactical airlift. Although not accepted for reasons already explained, this document was an attempt to describe a total airlift system of deployment, assault, resupply, and redeployment without the traditional labels of "tactical" and "strategic." Under this concept, strategic and tactical were mission descriptions rather than aircraft designations.

The long-standing battle over airlift consolidation under one command seems to have overshadowed the original concept contained in the early MATS document. With eventual consolidation in 1974, the program instituted by Gen Paul K. Carlton to preserve the "image and spirit" of tactical airlift actually preserved the split between tactical and strategic airlift within MAC. However, events since consolidation have tended to blur the clear distinction between tactical and strategic airlift.

The C-17 with its direct-delivery capability will not be the first airlift aircraft to cross doctrinal lines. Although identified as a strategic airlift aircraft, the C-141 has many capabilities traditionally thought of as tactical. Although limited to standard airfield landing operations, the C-141 has proven very successful at low-level tactics and airdrop.

In 1981 a C-141 squadron commander, Lt Col Neil Sorenson, called for a change in airlift doctrine to emphasize "combat tactics" in strategic airlift doctrine and to get away from the traditional "air bridge" doctrine so similar to airline operations. He was forced to conclude:

> For the most part, we can assume that MAC will continue to operate its tactical and strategic forces like it has always done. The tactical airlifters will be trained to operate near the forward edge of the battle area, to deliver supplies to troops under fire, and to carry essential equipment to field units regardless of the load. The strategic airlifters will continue to operate their specialized logistics air line of communication with scheduled routes, stage crews, and en route support bases.[3]

This pessimistic forecast is only a partial picture of modern strategic airlift. It is true that strategic airlift aircraft still conduct numerous air bridge-type operations, as this has proven an effective and efficient means of moving large numbers of people and huge amounts of cargo in a benign environment. Also true is that airlift doctrine still reflects the original strategic-tactical split. However, airlift operations no longer reflect the same clear division between strategic and tactical forces.

A spectator today would not have a problem in telling the difference between a C-141 and a civilian 707. Strategic airlift is no longer a civilian airline-type operation performed by military aircrews. While some were calling for a change in strategic airlift thinking, MAC was moving in that very direction.

By the early 1980s, C-141s were routinely participating in Red Flag and Maple Flag exercises. These exercises simulate a wartime environment, and C-141s were performing tactical airlift deliveries along with C-130s in

simulated combat. After-action reports, conferences, inspections, and Scientific Advisory Board findings documented numerous shortfalls in tactics, training, threat evaluation, mission planning, and mission execution during these exercises. These problems were not confined to C-141 operations but were also found in C-130 operations.

The command responded with a number of initiatives. Both the C-141 and the C-5 were given a camouflage paint scheme. A major factor in this change was to subdue the aircraft's visual signature, making it less vulnerable on a European ramp; but the result also favored "flag" activities. The C-130 also received a more effective camouflage paint scheme.

More important than new paint, two new schools specifically designed for combat tactics were begun. The first school was the Combat Aircrew Training School (CATS) at Nellis AFB, Nevada, established in 1983. The CATS program was an intensive, nonflying program to train pilots, navigators, and intelligence officers on combat tactics and techniques and, more important, on how to establish in-unit CATS programs. Early efforts for the C-5 and the C-141 were slow due to a perceived lack of direction and resources.[4]

MAC revitalized the program with dedicated flying hours for combat aircrew training, changes in training regulations, and guides for establishing in-unit programs. In 1988 a task force was formed to plan a program with regularly scheduled evaluations to initially qualify and maintain combat aircrew training for MAC airlift forces.[5] Strategic airlift aircrews will maintain a qualification to plan and fly missions once thought the exclusive domain of tactical airlift.

The second school concerned with combat tactics was the Advanced Airlift Tactics Training Center (AATTC) at Saint Joseph, Missouri. The AATTC, started soon after the Nellis CATS, includes both academic and flying training in combat tactics for C-130s.[6] Similar formal flying training has recently been initiated for the C-141 and the C-5 at Altus AFB, Oklahoma.[7]

While airlift doctrine still differentiates between tactical and strategic airlift, the realities of modern military airlift are eroding this distinction. The 1964 idea of a total airlift system describing tactical and strategic mission types rather than force structure is closer to reality now than ever in the past. The delivery of the C-17 could be the doctrinal watershed that was missed during airlift consolidation. But the capability so easily recognized in the C-17 is addressed to some extent in MAC's training programs today.

These present trends and possible future airlift developments require a new look at how airlift carries out its mission. Today's airlift system is more cohesive and the old descriptive labels are no longer as clear as they once were. In fact, they may actually be invalid. One recent proposal envisions an airlift system where strategy and tactics are ends of a spectrum that allows assignment of the aircraft best suited to the mission.[8] In other

words, each airlift aircraft is used according to mission requirements and aircraft capability without regard to tactical or strategic designation.

This rather simple concept contains vast and exceedingly demanding implications in execution. Traditional notions of planning, operations, command and control, and training will change. Some of these changes, such as training, are taking place right now. Airlift is evolving and the spectrum approach may be the airlift system of the next century.[9]

Whatever the final result, the old definitions of airlift no longer fit. Airlift has already experienced a multitude of changes; and both the C-17 and the ATT clearly cross the doctrinal lines left over from World War II. Actually, the same lines are being crossed today by the C-5 and the C-141—they just have not received the attention the new airlift aircraft is getting. A new definition of airlift and some changes in doctrine are likely.

From a rather uncertain beginning, military airlift has evolved into a critical national asset. The ups and downs of the past have been replaced by a dynamic force that is potentially ready for the requirements of the future. Plans initiated in the early 1980s established a solid course for airlift through the year 2000. The need now is to build upon those plans to ensure an integrated airlift force that reflects the maturity and technology of today's military capability.

Notes

1. Jeffrey Record, *Determining Future U.S. Tactical Airlift Requirements* (McLean, Va.: Pergamon-Brassey's International Defense Publishers, 1987), 4–10.

2. Roy C. LeCroy, "A Well Known Past, An Uncertain Future . . .," *Lockheed Horizons*, no. 21 (September 1986): 51–52. The characteristics listed by LeCroy, the technical director for the Lockheed-Georgia Company's Advanced Tactical Transport Program, are very similar to the "general consensus" of ATT requirements listed by Jeffrey Record, 32–36.

3. Lt Col Neil Sorenson, "Airlift Doctrine," *Airlift Operations Review*, July 1981, 31.

4. Point Paper, "Combat Aircrew Training (CAT)," MAC/LO Conference, Headquarters MAC/DOTS, Scott AFB, Ill., 25–27 October 1988, 15.

5. Ibid.

6. Ibid., 16.

7. Point Paper, "Combat Tactical Training and Airdrop Improvement Initiatives," MAC/LO Conference, Headquarters MAC/DOXT, Scott AFB, Ill., 25–27 October 1988, 53.

8. Ibid., 54.

9. Maj Rick Pilling, "Airlift's Corporate Culture," *Airlift* 10, no. 1 (Spring 1988): 12–13.

Appendix

US Military Transport Aircraft

Curtiss C-46. The C-46 Commando was first delivered in 1942. This twin-engine cargo transport, the largest transport aircraft in World War II, saw action in three wars. The C-46 had retractable landing gear and was extensively modified after World War II for a variety of missions.

Specifications (C-46A)

Contractor: Curtiss-Wright Corporation

Power Plant: Two 2,000-HP Pratt & Whitney R-2800-51 18-cylinder radial piston engines

Dimensions: Wingspan: 108 ft, 1 in; length: 76 ft, 4 in

Weight: Maximum loaded—45,000 lb

Performance: Maximum speed, 269 mph at 15,000 ft

Range: 1,200 miles

Load: 50 troops, 33 stretchers, or 16,000 lb cargo

Crew: Three to four

Douglas C-47. The C-47 Skytrain, called the Dakota by the RAF, was popularly known as the Gooney Bird. This military version of the commercial DC-3 was first delivered in 1941. Like the C-46, it was used in World War II, Korea, and Vietnam. The twin-engine C-47 was also extensively modified and saw service in more than 60 air and naval forces around the world. Some 10,926 were built in the United States; others were built under license by other countries, including Japan and the Soviet Union.

Specifications

Contractor: Douglas Aircraft Company

Power Plant: Two 1,200-HP Pratt & Whitney R-1830-90C 14-cylinder air-cooled radial piston engines

Dimensions: Wingspan: 95 ft; length: 64 ft, 5 in; height: 16 ft, 11 in

Weight: Empty—16,970 lb; maximum loaded—26,000 lb

Performance: Maximum speed, 229 mph at 8,000 ft; normal cruise, 185 mph at 10,000 ft; service ceiling, 24,000 ft

Range: 1,500 miles

Load: 28 troops, 18 stretchers, or 6,000 lb cargo

Crew: Three

Douglas C-54. The C-54 Skymaster was originally designed as a civilian transport called the DC-4. It flew as a prototype in 1938. The initial production of 60 civilian aircraft was taken over by the USAAF for use in World War II. It first flew as a military C-54 in 1942. The C-54 bore the brunt of the Berlin airlift and was the first aircraft destroyed in the Korean War. A C-54C was the first aircraft specifically modified and designated for presidential transport.

Specifications (Post–WW II Variant)

Contractor: Douglas Aircraft Company

Power Plant: Four 1,450-HP Pratt & Whitney R-2000-2SD-13G 14-cylinder radial engines

Dimensions: Wingspan: 117 ft, 6 in; length: 93 ft, 11 in; height: 27 ft, 6 in

Weight: Empty—40,000 lb; maximum loaded—73,000 lb

Performance: Maximum speed, 280 mph at 16,900 ft; normal cruise, 228 mph at 10,000 ft; service ceiling, 22,300 ft

Range: 1,680 miles with maximum payload; 4,250 miles empty

Load: 50 troops or 14,000 lb cargo

Crew: Six

Douglas C-118. The civilian DC-6 became the military transport C-118 Liftmaster in 1946. This four-engine transport made the first MATS nonstop flight across the Atlantic in 1954; and it played a key role in airlifting 14,000 Hungarian refugees to the US in 1956 and 1957. The C-118, which looks very similar to the C-54, was used for presidential transport during the Truman administration and for aeromedical evacuation during the Vietnam War. A total of 101 C-118A aircraft were built.

Specifications

Contractor: Douglas Aircraft Company

Power Plant: Four 2,500-HP Pratt & Whitney R-2800-52W 18-cylinder air-cooled radial piston engines

Dimensions: Wingspan: 117 ft, 6 in; length: 105 ft, 7 in; height: 28 ft, 5 in

Weight: Empty—46,760 lb; maximum loaded—107,000 lb

Performance: Maximum speed, 360 mph at 18,000 ft; normal cruise, 276 mph at 18,000 ft

Range: 3,000 miles

Load: 76 troops, 60 stretchers, or 27,000 lb cargo

Crew: Five to seven

Fairchild C-82. The C-82 Packet was designed as a tactical transport to meet USAAF needs in 1941. The first prototype flew in 1944. By 1948, a total of 220 C-82 aircraft had been delivered. Five of these aircraft were used during the Berlin airlift to carry specialized large vehicles. Limited in range and cargo capacity, the C-82 was judged obsolete in 1954. It was subsequently sold on the civilian market.

Specifications

Contractor: Fairchild Aircraft Corporation

Power Plant: Two 2,100-HP Pratt & Whitney R-2800-85 18-cylinder air-cooled radial engines

Dimensions: Wingspan: 106 ft, 6 in; length: 77 ft, 1 in; height: 26 ft, 4 in

Weight: Empty—32,500 lb; maximum loaded—54,000 lb

Performance: Maximum speed, 248 mph at 17,500 ft; normal cruise, 200 mph at 10,000 ft; service ceiling, 21,200 ft

Range: 500 miles with 13,000 lb cargo; 1,000 miles with 6,000 lb cargo

Load: 42 troops, 34 stretchers, or 13,000 lb cargo

Crew: Four

Fairchild C-119. Called the Flying Boxcar, the C-119 was developed from the C-82 by widening the fuselage, strengthening the wings, and adding more powerful engines. When production ceased in 1955, over 1,000 C-119s had been delivered to the USAF. The aircraft was equipped with large clamshell cargo doors to facilitate loading/unloading and aerial delivery. C-119s were used extensively in Korea, and a modified AC-119G served as an early gunship in Vietnam.

Specifications

Contractor: Fairchild Aircraft Corporation

Power Plant: Two 3,400-HP Wright R-3350-89W air-cooled radial piston engines; C-119K version had two 3,700-HP piston engines and two 2,850-HP General Electric J85-GE-17 auxiliary turbojet engines

Dimensions: Wingspan: 109 ft, 3 in; length: 86 ft, 6 in; height: 26 ft, 3 in

Weight: Empty—39,982 lb; maximum loaded—74,400 lb

Performance: Maximum speed, 269 mph at 17,000 ft; normal cruise, 200 mph

Range: 900 miles with 20,000 lb payload; 2,280 miles empty

Load: 62 troops, 40 paratroops, or 30,000 lb cargo

Crew: Four

Lockheed C-121C. The triple-tailed C-121 Super Constellation was procured by the USAF in 1953 to increase the long-range transport capability of the Air Transport Service. Sixty-five of the large four-engine C-121Cs were delivered. This aircraft was basically a stretched version of the civilian L-749, of which the first 20 production aircraft had been delivered earlier to the USAAF as the C-69 (later designated as the C-121A). Aside from transoceanic transport of people and cargo, the C-121C was reconfigured in the mid-1950s as the EC-121 electronic aircraft, the RC-121 radar surveillance aircraft, and the WC-121 weather reconnaissance aircraft. One was configured as President Dwight D. Eisenhower's aircraft, *Columbine.*

Specifications

Contractor: Lockheed-Georgia Company

Power Plant: Four 3,250-HP Wright R-3350-34 turbo compound air-cooled radial engines

Dimensions: Wingspan: 123 ft, 5 in; length: 116 ft, 2 in; height: 24 ft, 9 in

Weight: Empty—73,133 lb; maximum loaded—137,500 lb

Performance: Maximum speed, 376 mph at 20,000 ft; normal cruise, 280 mph

Range: 3,000 miles with normal passenger load

Load: 76 troops, 47 stretchers, or 40,000 lb cargo

Crew: Eight

Fairchild C-123. First delivered in 1955, a total of 300 C-123 Provider aircraft were built. This tactical assault aircraft was designed for airborne operations. There have been many modifications, including the addition of skis for ice operations, spray units for aerial spraying, and auxiliary jet engines to improve short takeoff and landing characteristics. The last C-123s were retired from the AFRES in the mid-1980s.

Specifications

Contractor: Fairchild Aircraft Corporation

Power Plant: Two 2,500-HP Pratt & Whitney R-2800-99W air-cooled radial engines; the C-123K was also equipped with two 2,850-HP General Electric J85-GE-17 auxiliary turbojets

Dimensions: Wingspan: 110 ft; length: 76 ft, 3 in; height: 34 ft, 1 in

Weight: Empty—31,380 lb; maximum loaded—60,000 lb

Performance: Maximum speed, 253 mph at 6,000 ft; normal cruise, 186 mph

Range: 1,340 miles with 19,000 lb payload; 2,440 miles with 12,000 lb payload

Load: 60 troops, 50 stretchers, or 24,000 lb cargo

Crew: Four

Douglas C-124. Development of the Globemaster II began in 1947 from the earlier Douglas C-74. Delivery began in 1950 and eventually over 440 C-124s were built. The first 204 aircraft, designated the C-124A, had smaller engines (3,500 HP) than the subsequent 243 C-124C aircraft. This large four-engine transport was called "Old Shakey" by the aircrews. It could accommodate large and heavy cargo (such as bulldozers) through its clamshell doors in the nose of the aircraft. It was used in both Korea and Vietnam. Over 90 percent of the Army's Field Force vehicles could be carried fully assembled in this transport. In the early 1960s, there were 27 C-124 squadrons.

Specifications

Contractor: Douglas Aircraft Company

Power Plant: Four 3,800-HP Pratt & Whitney R-4360-63A air-cooled radial engines (C-124C)

Dimensions: Wingspan: 174 ft, 1 in; length: 130 ft, 5 in; height: 48 ft, 3 in

Weight: Empty—101,165 lb; normal loaded—185,000 lb; maximum loaded—194,500 lb

Performance: Maximum speed, 304 mph at 20,800 ft; normal cruise, 272 mph

Range: 1,232 miles with 56,000 lb payload; 6,820 miles empty

Load: 200 troops, 127 stretchers, or 74,000 lb cargo

Crew: Eight

Douglas C-133. The C-133 Cargomaster, first flown in 1956, was delivered to the Air Force in 1957. Although not much larger than the C-124, it had a much greater cargo capacity. The C-133 was the largest production model prop-driven transport ever built. Production was completed in 1961 with 34 C-133As and 15 of the upgraded C-133Bs. The C-133Bs had better engines, increased payload capability, and clamshell rear-loading doors. One of the major uses of this aircraft was to transport intercontinental ballistic missiles.

Specifications

Contractor: Douglas Aircraft Company

Power Plant: Four 7,500-HP Pratt & Whitney T34-P-9W turboprops

Dimensions: Wingspan: 179 ft, 8 in; length: 157 ft, 6 in; height: 48 ft, 3 in

Weight: Empty—120,263 lb; normal loaded—286,000 lb; maximum loaded—300,000 lb

Performance: Maximum speed, 359 mph at 8,700 ft; normal cruise, 320 mph at 26,000 ft

Range: 1,727 miles with 77,600 lb payload; 4,030 miles with 51,845 lb payload

Load: 200 troops or 110,000 lb cargo

Crew: Five minimum

Boeing C-135B. The C-135B Stratolifter was first delivered to MATS in 1962. This first USAF jet transport was similar to the KC-135A tanker aircraft but it had bigger engines and was configured for cargo. Seen as an interim measure until the C-141 was procured, only 30 C-135Bs were built.

Specifications

Contractor: Boeing Aircraft Company

Power Plant: Four Pratt & Whitney TF33-P-5 turbofans with 18,000 lb thrust each

Dimensions: Wingspan: 130 ft, 10 in; length: 134 ft, 6 in; height: 41 ft, 8 in

Weight: Empty—106,470 lb; normal loaded—275,500 lb; maximum loaded—292,000 lb

Performance: Maximum speed, 638 mph at 36,000 ft; normal cruise, 528 mph at 35,000 ft

Range: 2,994 miles with 82,530 lb payload

Load: 126 troops, 44 stretchers, or 82,530 lb cargo

Crew: Six

De Havilland C-7. The relatively small, twin-engined, high-winged C-7 Caribou was developed in Canada in the late 1950s. The first prototype flew in 1958. The US Army ordered 159 of these aircraft under the designation CV-2. The first aircraft was delivered in 1959. In 1967 the 134 aircraft still in service were transferred to the USAF as tactical airlift aircraft and were redesignated as C-7s. Although slow and limited in cargo capacity, the Caribou was able to operate out of assault landing strips only slightly longer than 1,000 feet. The C-7 was eventually transferred to the reserve forces.

Specifications

Contractor: De Havilland Aircraft of Canada, Ltd

Power Plant: Two 1,450-HP Pratt & Whitney R-2000-7M2 14-cylinder air-cooled radial engines

Dimensions: Wingspan: 95 ft, 7 in; length: 72 ft, 7 in; height: 31 ft, 9 in

Weight: Empty—18,260 lb; maximum loaded—28,500 lb

Performance: Maximum speed, 216 mph at 6,500 ft; normal cruise, 182 mph at 7,500 ft; service ceiling, 24,800 ft

Range: 242 miles with 8,740 lb payload; 1,307 miles empty

Load: 32 troops, 26 paratroops, 22 stretchers, or 8,740 lb cargo

Crew: Three

Lockheed C-130. The high-wing, four-engine turboprop C-130 Hercules was designed in the early 1950s to meet USAF specifications. The first C-130A was delivered in 1956. Over 50 versions of the C-130 have been produced since the aircraft first flew in 1954: gunships, tankers, electronic surveillance, command and control, special operations, and ski-equipped aircraft for ice operations. The C-130 can operate out of assault strips of 2,500 feet and drop over 45,000 lbs of cargo. Over 50 nations fly the C-130, and over 500 C-130s are flying as airlifters in MAC's active duty and reserve forces. Another 200 are serving the USAF in other roles. The four basic transport models are the C-130A, C-130B, C-130E, and C-130H (the current production model).

Specifications

Contractor: Lockheed-Georgia Company

Power Plant: Four 4,300-HP Allison T56-A-15 turboprops

Dimensions: Wingspan: 132 ft, 7 in; length: 97 ft, 9 in; height: 38 ft

Weight: Empty—80,000 lb; maximum loaded—155,000 lb; maximum overload—175,000 lb

Performance: Maximum speed, 386 mph at maximum load; normal cruise, 345 mph

Range: 2,500 miles with 25,000 lb cargo

Load: 92 troops, 64 paratroops, 74 stretchers, or 46,700 lb cargo

Crew: Five

Lockheed C-141B. The C-141B Starlifter is a high-swept-wing, four-engine jet with a T-tail configuration. This long-range, high-speed transport, first flown in 1963, entered service with MAC in 1965. Clamshell rear cargo doors and a two-position ramp allow the aircraft to be loaded and unloaded with minimal ground support and provide an excellent airdrop capability. By 1982 all of the C-141As had been "stretched" by over 23 feet, equipped

with an in-flight refueling capability, and redesignated the C-141B. Over 230 are in service.

Specifications

Contractor: Lockheed-Georgia Company

Power Plant: Four Pratt & Whitney TF33-P-7 turbofan engines with 21,000 lb thrust each

Dimensions: Wingspan: 159 ft, 11 in; length: 168 ft, 4 in; height: 39 ft, 3 in

Weight: Empty—150,000 lb; maximum loaded—323,000 lb

Performance: Maximum speed, 570 mph; normal cruise, 500 mph

Range: Unlimited with in-flight refueling; without refueling, 3,500 miles with 40,000 lb cargo

Load: 200 troops, 155 paratroops, 103 stretchers, or 69,900 lb cargo

Crew: Six

Lockheed C-5. The C-5 Galaxy is a four-engine jet with high wings and a T-tail configuration. It was designed to carry very heavy payloads and outsized cargo at high speeds over great distances. At one time the largest aircraft in the world, the C-5 is equipped with clamshell doors and a loading ramp in the rear and a full-width opening capability plus loading ramp in the front. It also has the ability to "kneel" on the landing gear to facilitate loading and unloading. The two configurations are the C-5A, of which 70 are in service, and the newer C-5B, of which 40 are in service; both are capable of in-flight refueling. The C-5B incorporates a new wing design (subsequently added to the C-5A) and other state-of-the-art improvements.

Specifications

Contractor: Lockheed-Georgia Company

Power Plant: Four General Electric TF-39 turbofans with 38,000 lb thrust each

Dimensions: Wingspan: 222 ft, 8 in; length: 247 ft, 8 in; height: 65 ft, 1 in

Weight: Empty—374,000 lb; maximum loaded—769,000 lb (although the aircraft has flown at heavier weights after in-flight refueling)

Performance: Maximum speed, 571 mph at 25,000 ft; normal cruise, 518 mph

Range: Unlimited with in-flight refueling; without refueling, 3,500 miles with 170,000 lb cargo

Load: 291,000 lb maximum cargo with 73 passengers

Crew: Normal seven; minimum four

Douglas C-17. The C-17 will be a four-engine, high-speed jet transport. It will be able to carry oversized cargo great distances. The C-17 was announced as the winner over two other designs for the C-X competition in 1981. Planned for operational capability in 1992, the C-17 is designed to incorporate state-of-the-art avionics, a HUD for each pilot, STOL characteristics, fully in-flight reversible engines, fly-by-wire flight controls, in-flight refueling, one loadmaster cargo operation, integral troop seats, and a full range of aerial delivery options.

Specifications*

Contractor: McDonnell Douglas Corporation

Power Plant: Four Pratt & Whitney 2037 turbofan engines with 41,700 lb thrust each

Dimensions: Wingspan: 165 ft; length: 175 ft, 2 in; height: 55 ft, 1 in

Weight: Empty—over 260,000 lb (estimated); maximum loaded—570,000 lb

Performance: Cruise speed, 515 mph (estimated)

Range: Unlimited with in-flight refueling; without refueling, 3,000 miles with 170,000 lb cargo

Load: 102 paratroops, or 172,000 lb cargo

Crew: Four to seven

*Some data has been rounded off and/or averaged due to conflicting sources.

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