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## Economics of Airlift

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ECONOMICS OF AIRLIFT

by

Riggs M. Tucker

A Thesis Submitted in Partial Fulfillment  
of the Requirements for the Degree

of

MASTER OF SCIENCE

in

Economics

Approved:

UTAH STATE UNIVERSITY  
Logan, Utah  
1965

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## PREFACE

Airlift is a responsibility that could be, like the space effort, either predominantly military or civilian. The economics of airlift is of such importance that this responsibility cannot be properly assessed without including the strategic and political factors also.

This study was undertaken to attempt to establish an airlift policy that would incorporate all of the above factors and yet be more efficient than a policy which gave the responsibility of airlift solely to the military, or to the commercial carriers.

The author's interest was stimulated by twenty years of military service, eight of which was in the Military Air Transport Service (MATS). During this period the author made numerous trips to Air Force Depots, in the United States and overseas, to co-ordinate maintenance matters for Pacific Division, MATS. He was the maintenance representative for Pacific Division, MATS, on the Civil Reserve Air Fleet (CRAF) program, and as such conducted investigations throughout the Pacific area on the condition of CRAF facilities.

However, reliance on the opinions of persons knowledgeable in aviation was made, and special acknowledgement is due the following



persons whose views are widely respected in aviation circles:

Honorable A. M. Monroney, Senator, Oklahoma

James E. Moore, Vice President-Traffic, United Air Lines

Robert W. Smart, Chief Counsel for Armed Services Committee,  
House of Representatives

C. R. Smith, Chairman of Board, American Airlines

CHAPTER I  
INTRODUCTION

Purpose.-- The purposes of this paper are to analyze past airlift conditions, show why airlift should be adopted, and to determine an effective airlift policy and method of operation that would provide the United States an economical, flexible, and efficient airlift force, helping to ensure the security of the nation.

Scope.--This study will be concerned with the development of an effective airlift policy. It will determine which type of airlift force would be most efficient--primarily military, a balanced force of military and commercial carriers, or, primarily commercial. Obviously, however, there are factors other than economic ones which have to be considered in the final specifications of an airlift force; these are political and strategic factors. For instance, if one decision required the closing of a military base in a community, there would probably be opposition from members of Congress serving that district. An excellent example of the type of Congressional protest that may develop is the opposition recently given to Secretary of Defense Robert W. McNamara in his proposals to close some naval shipyards on the east coast. There could be opposition for strategic reasons from the Joint Chiefs of Staff if the reac-

tion time of the commercial carriers was not what the Joint Chiefs considered acceptable.

Objectives of Airlift.--In evaluating the nation's airlift force and methods of operation it is necessary first to determine what this airlift force should have as objectives. The national goals selected by the author are ones that should serve the nation as a whole, and they are by no means the only ones applicable. They were chosen after considering the entire airlift resources of the United States as being available for service. The goals selected are the following:

1. Recognition that airlift, because of its ability to deploy personnel in large force quickly to any place in the world, serves as an arm of the United States in carrying out its foreign policy. The Military Air Transport Service (MATS) has been utilized in this capacity in the past. The examples listed below, which indicate how airlift has been used as an instrument of national policy to influence world opinion, have been extracted from an undated MATS letter, "What Is Global Airlift?"
  - a. Movement of this nation's mightiest operational missiles.
  - b. Rapid strategic deployment of this nation's military strike forces to wherever in the world they are needed.
  - c. Fast reaction to war alert to produce a continuous flow of equipment to armed forces already at the front, and to re-supply our active combat elements.

- d. Special missions into remote areas with high-value and delicate scientific equipment, or with urgently needed replacement items.
- e. Airdropping of supplies to remote scientific stations near the South Pole, the Arctic Circle, and in other areas of the world; airdropping of foodstuffs, and supplies, and even pararescuemen to disaster sites around the world; and airdropping of paratroopers and combat weapons from formations of airlift aircraft.
- f. Humanitarian airlift of supplies, medical equipment, communication equipment, rescue and survival and medical specialists to countries hard hit by natural disasters or epidemics.
- g. Aeromedical evacuation missions across both oceans (and within the United States).
- h. Routine resupply daily over 115, 000 miles of air routes to Department of Defense combat forces throughout the free world.
- i. Massive exercises, moving thousands of army troops and hundreds of tons of combat gear to and from maneuvers, both in this country and overseas.
- j. Immediate, massive airlifts as an instrument of national defense policy, such as the renowned Berlin Airlift in 1948 and the now-famous Congo airlift which began in July, 1960, for the United States.

2. An airlift force that has the capability of immediate response to any changes in strategy with sufficient flexibility to meet any emergencies.
3. The development and support of a healthy aircraft industry to aid in the growth of the nation's economic and industrial capacity.

With the establishment of the national goals as a guide to aid in the development of a realistic airlift policy, a review of airlift background and history is appropriate.

## CHAPTER II

## DEVELOPMENT OF MILITARY AIRLIFT

History. --The development of airlift as a primary means of transportation has a relatively short history; however, it has been an orderly one. The advent of the twin-engine DC-2, in 1932, gave the country its first promise of airlift potential.<sup>1</sup> After the production of 130 DC-2's, Donald Douglas, President of newly formed Douglas Aircraft Company, took a financial gamble and began production of the DC-3, which was to make a remarkable record in World War II as a cargo transport. The DC-3, a twin-engine transport, carried a total of 21 passengers and was the first airplane that permitted the airlines to make a profit.<sup>2</sup>

World War II accelerated the development of the four-engine transport aircraft, the Douglas DC-4, which was widely used by the "Air Transport Command," the forerunner of MATS. During the Berlin Airlift, the Douglas DC-4 was again used as the primary aircraft for supplying the city of Berlin. However, more advanced four-engine transport aircraft made their appearance, such as the Douglas DC-6 and the Boeing Stratocruiser. These aircraft could carry larger pay-

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<sup>1</sup>Poyntz Tyler, Airways of America (New York: H. W. Wilson Co., 1958), p. 31.

<sup>2</sup>Ibid., p. 32.

loads, and consequently could do the same job as the DC-4 with fewer aircraft.

The Douglas C-124, a four-engine transport aircraft capable of carrying larger payloads than any aircraft then in service, made its debut during the Korean War, and it was the first time an aircraft was specifically designed for airlifting cargo. Although the C-124 increased payload capacity considerably over the previous transport aircraft, it became apparent that this aircraft still was not the ultimate one for airlift because of excessive operating and maintenance costs.<sup>3</sup>

In 1957 MATS began using the C-133, a large trans-oceanic, four-engine turbo-prop aircraft capable of carrying in excess of 30 tons of cargo. This aircraft was procured to carry the "out-size cargo," which is the cargo too large to be carried in other transport aircraft.

Propeller-driven aircraft were not enough, however, and in 1960 a subcommittee of the House Armed Services Committee conducted hearings which exposed the inadequacy of MATS to perform its "Hard-core Mission."<sup>4</sup> The Subcommittee initiated an interim modernization program which, when completed, will add 50 C-130E long range, four-engine turbo-prop aircraft and 30 C-135 long range pure jet aircraft to MATS' airlift force.<sup>5</sup> The above aircraft, added to the propeller

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<sup>3</sup>U.S. Congress, Senate, Study of Military Air Transport Service, 85th Cong., 2nd Sess., 1958, p. 33.

<sup>4</sup>U.S. Congress, Senate, National Military Airlift, 86th Cong., 2nd Sess., 1960, p. 4033.

<sup>5</sup>Ibid., p. 4048.

aircraft already possessed, will increase MATS' capability to provide airlift until such time as the C-141, a long range, four-engine jet transport capable of airlifting 68,500 pounds, is delivered.

The history of airlift development has been rapid; and, with the delivery of the C-141, it will have not only strategic and political value but economical value as well.

Background of MATS. -- MATS was organized in 1948 as one of the major commands within the newly created Air Force. Prior to this time military airlift was performed by two organizations: the Air Transport Command (ATC) of the Army Air Force and the Naval Air Transport Service (NATS). There were three air transport divisions set up within MATS in 1948, and these were maintained until 1960. They were the Atlantic, Continental, and Pacific Divisions. In 1960 MATS reorganized its transport structure, and Continental Division was deactivated. Its area of responsibility was absorbed by the Atlantic and Pacific Divisions. Atlantic Division was renamed Eastern Transport Air Force (EASTAF) and Pacific Division was renamed Western Transport Air Force (WESTAF).

Unquestionably MATS has been flying passengers and cargo that could be airlifted by commercial carriers. MATS continues to do this. However, it should be explained that the Department of Defense, through the Joint Chiefs of Staff, is responsible for the assignment to MATS of what will be airlifted within a specified period of time. In the past, if MATS was not capable of airlifting the requirement, the excess was airlifted by commercial carriers on contract.



MATS was the object of considerable opposition from the commercial carriers and some members of Congress. This opposition led to the "Study of the Military Air Transport Service"<sup>6</sup> conducted by the Committee on Interstate and Foreign Commerce of the United States Senate. Its purpose was to explore the possibilities of giving to the commercial carriers the airlift that would be compatible with their operation. As a result of these and subsequent hearings, additional airlift has been assigned to the commercial carriers. Each passing year has seen an increase in airlift provided by the commercial carriers since 1959, as can be seen in Appendix C.

Summary.--The development of transport aircraft has been an orderly one. However, the economics of airlift was not given equal consideration with the political and strategic factors until the acquisition of the interim modernization aircraft. The commercial carriers brought to light the importance of economics of airlift in the late 1950's. Consequently, it is taken into consideration in the development of any new transport aircraft.

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<sup>6</sup>U.S. Congress, Senate, Study of the Military Air Transport Service, 85th Cong., 2nd Sess., 1958.

CHAPTER III  
APPLICATION OF AIRLIFT

Airlift Advantages. --Airlift has definite economic advantages over surface transportation because of its speed, flexibility, extended range, and reduction of packaging and crating requirements. Because of these advantages, economic gains are possible, and one of the major areas in which considerable gains have been made is that of logistics.

The importance of logistics in achieving economic gains is shown in the maintenance of spare parts inventories. The cost of spare parts for aircraft increases with technological improvements because the parts become more complicated and therefore cost more. A large portion of an inventory may become practically worthless because of technological changes that no longer require those particular spare parts.<sup>1</sup> A means of lowering this cost of obsolescence is by reducing the size of the inventory of spare parts. The airlift of spare parts, both in the United States and overseas, has permitted a reduction in the inventory of spares by increasing the speed and range of transport aircraft. This has decreased the en route time of spare parts from sixteen days to two days, thereby decreasing the inventory requirements. This is shown in Appendix B.

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<sup>1</sup>U.S.A.F., Spares Study Group, Selective Management of Material, Dayton: 1960, Report No. 10.

The Air Force has reduced the spare parts inventory at overseas depots to zero according to General William McKee, Vice Chief of Staff, United States Air Force.<sup>2</sup> This resulted in closing five depots located in Africa, England, Japan, and the Philippines.

Airlift, through the medium of speed, permits maintaining the minimum number of any item for the Air Force; therefore, it should have comparable results for the Army and Navy in the words of General John P. Doyle, formerly Director of Transportation, United States Air Force.<sup>3</sup> According to General Doyle the Army had asked for airlift of \$6 million per month and the Air Force could not provide it. With the interim aircraft provided MATS, the C-135 and C-130E, increased airlift should be available for the Army and Navy. Though airlift was directly responsible for the reduction of spare parts requirements and closing the five major overseas depots, there can be no doubt that efficient inventory control procedures were also instrumental in the economic gains achieved. Inventory control procedures have accelerated the requisitioning and processing of spare parts. In the past, an Air Force base located overseas would complete a requisition form and send it to the area depot; if the area depot had the spare part it would be shipped to the base that needed it. If the depot did not have the part in stock, it would submit the requisition to the depot in the United States that was responsible for providing that particular part. The depot in the United States would ship

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<sup>2</sup>"Administrator," Air Force Times, July 29, 1964, p. 5.

<sup>3</sup>U.S. Congress, Senate, Study of Military Air Transport Service, 85th Cong., 2nd Sess., 1958, p. 193.

the part to the overseas depot for trans-shipment to the original base of request.<sup>4</sup> This procedure required days and weeks before receipt of the spare part could be expected.

Airlift and electronic data processing equipment at Air Force bases have combined to reduce the time required to get delivery on a replacement part. The data processing equipment permits an Air Force base overseas to make known its needs within a matter of minutes to the depot in the United States. Airlift is then used to speed the part to the Air Force base.

A look at Table II, Appendix B, which includes data compiled by an Air Force Spares Study Group of the Air Force Logistics Command, which has the responsibility for procurement and support of all Air Force aircraft, reveals how the expenditure for the initial purchase of spares for new aircraft and the replenishment of spare parts has been decreased by approximately one-third between the years 1956-1961. This reduction, as a result of airlift and efficient inventory control, does not mean just a decrease in inventory levels; it has a directly related effect on the amount of storage space required. The standard cost figure of \$2.25 per square foot for storage space is contained in Air Force Manual 67-1 and it permits a comparison which indicates the potential possible savings when storage space is reduced because airlift has reduced the inventory. Assume, for example, that each overseas Air Force depot had 2 million square feet of space, the closing of five depots would save 10 million

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<sup>4</sup>Supply Procedures," Air Force Manual 67-1, Dayton: 1958.

square feet of space. If \$2.25 per square foot is multiplied by 10 million square feet it results in a saving of \$22.5 million. Even though this is only an estimate of the amount of storage space at each of the five overseas depots, it is a fairly accurate one when the responsibilities of a depot are considered: storage of spare parts, gasoline, vehicles, aircraft, and personal equipment.

If airlift is expanded to encompass the requirements of the Army and Navy it would permit the closing of additional depots with resultant savings in inventory requirements, storage space, and personnel.

Normally, Air Force depots in the United States employed between 15,000 and 25,000 personnel while overseas depots had a lower employment rate.<sup>5</sup> However, for the sake of standardization, it will be assumed that each overseas depot employed a combination of 8,000 military and civilian personnel. This would have resulted in a decrease of 40,000 personnel, which, based on an annual average salary per person of \$5,000 would be a saving of \$200 million per year.<sup>6</sup>

The remaining area in which economic gains occurred with the closing of the five large depots was in the expenditure of operations and maintenance funds. These expenditures include such items as the cost of aviation gasoline, gasoline for all type vehicles, road maintenance,

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<sup>5</sup>U.S.A.F., Spares Study Group, Selective Management of Material, Dayton: 1960, Report No. 10.

<sup>6</sup>Stanley H. Brewer and Roger B. Ulvestad, The Cargo Jet In Military Air Transportation (Renton, Wash.: 1960), p. 60.

repair of aircraft and vehicles, electricity, water, etc. An average figure of \$10 million of operation and maintenance money for each of the five depots which were closed down amounts to a saving of \$50 million.<sup>7</sup> Here again, economic gains have been the direct result of airlift, and expansion to provide the Army and Navy airlift to satisfy their requirements should be accomplished to achieve further economic gains.

Hi-Valu Program. --Airlift has been used by the Air Force Logistics Command to support a program which, in essence, procures the minimum number of aircraft and missile parts and maintains a strict control over them for the life of the parts. Airlift is the key to success of the program, which is called the "Hi-Valu" program. For example, a critical part needs repair; it is airlifted to the depot in the United States that is responsible for the repair of that particular part. It is repaired on a priority basis and airlifted back to the base that needs the part.

The reduction of transportation time has been of critical importance in the "Hi-Valu" program. As an example, the Air Force normally ships approximately 21 aircraft engines<sup>8</sup> per day to overseas destinations and each engine has an initial average cost of \$200,000; however, some cost as much as \$500,000 per engine. It will be seen that initial investment costs could run quite high if the engines were shipped by surface transportation. The Air Force

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<sup>7</sup>U.S.A.F. Spares Study Group, Selective Management of Material, Dayton: 1960, Report No. 10.

<sup>8</sup>Air Force Form 110B.

needs to receive 21 engines of various models overseas each day regardless of whether they are delivered by airlift or surface transportation. To determine the requirement for 21 engines per day it was necessary to determine the average engine life at removal of all aircraft engines removed at overseas bases and the average number of aircraft in the Army, Air Force, and Navy that must be supported. There are approximately 2,600 Air Force, Army, and Navy aircraft that are supported by airlift.<sup>9</sup> Considering all types of aircraft in use, the average number of engines installed on each aircraft would be two.

- (1) Each aircraft averages 1,200 flying hours per year.
- (2) 2,600 multiplied by 1,200 hours equals 3,120,000 flying hours per year.
- (3) Each engine averages 800 hours before removal.
- (4) 3,120,000 flying hours per year divided by 800 hours of engine life equal 3,900 engines.
- (5) 3,900 engines multiplied by 2 engines per aircraft equal 7,800 total engines per year.
- (6) 7,800 engines per year divided by 365 days equal 21 engines per day.<sup>10</sup>

The following data is presented to illustrate the difference in initial investment costs between surface transportation and airlift for the aircraft engines that would be in transit at any particular time.

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<sup>9</sup>Air Force Form 110B.

<sup>10</sup>Compiled from information contained in U.S.A.F. Spares Study Group, Wright-Patterson AFB, Ohio, 1960, Report No. 10.

Value of One Day's Engines in Shipment (21 Engines)	Days Required for Shipment	Number Engines in Transit	Cost
\$4.2 million	100 (Surface)	2,100	\$420 million
\$4.2 million	4 (Airlift)	84	<u>\$ 16.8 million</u>
		Difference:	<u>\$403.2 million</u> <sup>11</sup>

The Air Force would have to purchase 2,016 more engines if it used surface transportation than it would if airlift were used. This means that \$403.2 million is saved on the initial investment if airlift is used. When highly complex electronic equipment and parts are considered it is apparent that the use of airlift would permit fewer to be purchased resulting in considerable savings.

Packaging and Crating. -- The Rand Corporation, an independent research organization, completed a study for the Air Force in 1952 on the costs of shipment of supplies by surface transportation and by airlift. One facet of the study pertained to the requirements for packaging and crating necessary for each means of shipment. It was estimated in the report that for surface shipment at least 35 per cent of the weight was for packaging and crating. It also reported that the crating for airlift shipment was practically nil.<sup>12</sup> The heavy crating that is required for surface shipment can be attributed to stacking the cargo layer upon layer and to the forces exerted on the cargo during the nor-

<sup>11</sup>Compiled from information contained in U.S.A.F. Spares Study Group, Wright-Patterson AFB, Ohio, 1960, Report No. 10.

<sup>12</sup>U.S. Congress, Senate, Study of the Military Air Transport Service, 85th Cong., 2nd Sess., 1958, p. 107.



mal and sudden starting and stopping which tend to shift the cargo. Tie-down facilities, which transport aircraft utilize, would probably reduce the damage to the cargo and therefore reduce the requirement for crating if utilized on surface shipments.

It is significant to note also that in a study performed by Douglas Aircraft Company on 1.5 million supply items, selected at a given time during 1958, 90 per cent of the items weighed 100 pounds or less, and 99 per cent weighed below 500 pounds.<sup>13</sup> This should mean also that 99 per cent of the airlift could be carried in present MATS or CRAF aircraft because the doors would permit entry to any item weighing less than 500 pounds. Size of the cargo would not be a problem in 99 per cent of the cargo.

As a result of the Rand Corporation study it can be concluded that the use of airlift reduces the weight of a shipment by 35 per cent from what it would be by surface transportation. The United States Government is paying 35 per cent above the actual weight of the shipment.

Airlift of Personnel. --As the use of airlift has reduced the total requirement for spare parts and equipment because of the reduction in the intransit time, so has the airlift of personnel to overseas areas reduced the total requirement for personnel. Airlift, because of its speed, is proving to be the most desired method of shipment of personnel to overseas destinations. This does not mean that the handling or proces-

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<sup>13</sup>U. S. A. F. Mulls Douglas Cargo Study, " Airlift, November 1960, p. 43.

sing of passengers is more efficient by air shipment than by rail or surface shipment. When the maintenance of a particular size force is necessary, it can be accomplished by airlift with much fewer personnel. Through the use of airlift, the en route time of each individual shipping to an overseas point is reduced from sixteen days to two days. The difference in travel time emphasizes the advantage of airlift and is illustrated in an excerpt from Airlift magazine:

It has been estimated that in fiscal 1959, MATS will transport 325,000 Air Force personnel with a saving of 14 days of travel per person flown. This means in effect that it has 12,630 additional personnel in productive employment. It also means that it has been able to close two primary personnel centers, making available an additional 1,350 people for use in other Air Force jobs. These savings are equivalent, according to Gen. Tunner, to the authorized personnel for three heavy bomber wings.<sup>14</sup>

In fiscal year 1963, according to the Air Force Times in a January 1964 issue, MATS and CRAF airlifted a total of 1,300,000 personnel to overseas destinations or return to the U.S.A. It is assumed that at least 400,000 were Army personnel because of the increase in the number of special exercises conducted in fiscal year 1963. Considering the reduction of the intransit time from sixteen days to two days, if 400,000 were airlifted it would be a saving of 5,600,000 man-days (400,000 personnel x 14 days). Divide 365 days into 5,600,000 man-days and it equals 15,342 personnel saved by the use of airlift. This is in excess of an army division. Not only would there be the saving of the personnel but the expenditure for trucks, tanks, artillery, guns, buildings, and supplies would be saved.

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<sup>14</sup>"MATS New Strategy: Sell Airlift," Airlift, May 1959, pp. 36-38.

How much the Army could be reduced in total strength as a result of the use of airlift is unknown because one does not know what the Army will be committed to perform. Therefore, no attempt will be made to establish a numerical figure for a reduction. If the Army uses airlift exclusively and ships 800,000 personnel, approximately 31,000 personnel would be saved, or the Army could reduce its force by 31,000 personnel.

A precedent has been established by Great Britain in reducing the size of its ground forces. Great Britain has followed a policy since 1957 of airlifting its forces to troublesome areas, both by military aircraft and commercial aircraft. From the following article it is readily seen that airlift is necessary for Great Britain's ground forces:

When Great Britain asked the United States and its other North Atlantic Treaty allies to consider stationing peacemaking troops on the island of Cyprus, it only served to illustrate that Britain's military commitments have not decreased commensurately with her divorcement from colonial responsibilities.

With an army of only 170,000 men, plus 15,000 Gurkha troops, Britain has soldiers stationed all over the globe. Some 400 British commandos landed at Dar es Salaam, Tanganyika, on January 25 to quell a new outburst of mutiny. Some 6,000 British troops are patrolling Cyprus, and another 2,000 are stationed on Malaysia's borders with Sarawak and Sabah (North Borneo). Rebel Tribesmen in the South Arabian Federation pin down 5,000 men in the Aden garrison.

The contingent in British Guiana is being halved to about 750. Other Commitments include garrisons of 700 men in Gibraltar, about 5,500 in Hong Kong, 6,000 in Kenya, 1,500 in Libya, 3,000 in Malaya, and 600 in Swaziland. There are 53,000 British troops in the Rhine Army, and 1,000 in West Berlin. (West Germany and the United States are the only NATO countries furnishing their full commitment of troops in the field.) The United Kingdom itself is garrisoned by about 80,000 men.<sup>15</sup>

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<sup>15</sup>"Thin Line of Heroes," El Paso Times, February 8, 1964, p. 4-A.

The above procedure of airlifting troops to vital areas after trouble arises has proved effective for Great Britain. The United States has followed a policy of maintaining a large force of troops in Europe and the Pacific area since World War II. However, Secretary of Defense Robert McNamara and Secretary of State Dean Rusk have told the NATO countries that the United States intends to decrease the Army units in Germany. Secretary McNamara stated that the decrease would save NATO contributions for maintaining this large force in the field with no loss in the ability to withstand any aggression.<sup>16</sup> Airlift, according to Secretary McNamara, could put the forces into position in plenty of time. This mobility would permit a reduction in the size of the total army units.<sup>17</sup>

A precedent has already been established by the Royal Air Force for the use of airlift in this manner.

It would be an undesirable extravagance, however, to attempt to maintain large balanced forces in each theatre sufficient to undertake limited-war operations. Furthermore, in the rapidly changing pattern of world events it is quite impossible to forecast with any degree of accuracy where or when trouble may arise.

This has led to the concept of a central strategic reserve of troops with the ability to deploy rapidly to any part of the world. Such mobility calls for air transport and for this purpose Transport Command in the United Kingdom is being built up.<sup>18</sup>

The words of Wing Commander C. W. Hayes, Royal Air Force, in 1959 lend credibility to the policy of airlifting troops to trouble areas while

<sup>16</sup>"Periscope," Newsweek, May 8, 1964, p. 16.

<sup>17</sup>Ibid., p. 16.

<sup>18</sup>"The Operational Posture of the Royal Air Force, 1959," Air University Quarterly Review, Montgomery, Ala., Summer 1959.

maintaining fewer personnel in service. The extensive use of airlift permits sizable reductions in total army strength, and its use should be applied in the following manner:

1. Normal rotation of individuals to and from overseas.
2. Rotation or placement of complete army units.
3. Special exercises to insure the efficiency of both MATS and the army units.

Though the use of airlift to move personnel of the Army would permit greater reductions in Army strength than it would for the Air Force or Navy because of the larger number of Army personnel being moved, airlift would render savings to the Air Force and Navy in proportion to the number of personnel airlifted.

Summary. --Airlift has economic advantages because of its speed, long range, and packaging requirements over surface transportation. It was used as a basis for closing down five large overseas depots, which resulted in estimated savings as follows:

(1) Personnel strength decreased by 40,000	\$200,000,000
(2) Saving of Operation and Maintenance funds - - from closing of five Air Force depots	50,000,000
(3) Storage space saved at \$2.25 per square foot - - (\$2.25 x 10,000,000 square feet)	22,500,000

Other savings from the use of airlift by the Air Force are:

(1) Reduction of intransit time from 16 to 2 days - - (13,980 personnel x \$5,000 annual salary)	69,900,000
(2) Reduction of inventory levels (spares) by one-third (Appendix B)	444,000,000
(3) Initial Investment decrease on aircraft engines	403,200,000

This is an estimated saving of \$1,189.6 million that the Air Force has realized through the use of airlift.

The Army and Navy will be able to effect comparable savings in some of the same areas as the Air Force, such as

(1) Reduction of 31,000 personnel (16 days to 2 days) (31,000 x \$5,000 annual salary)	\$155,000,000
(2) Reduction of inventory levels (spares)	<u>444,000,000</u>
Plus	\$599,000,000

- (1) Storage space reductions.
- (2) Closing of some supply depots.

Sufficient airlift will be available for all branches of the military services and total savings of approximately 2 billion dollars should be attained if extensive use of airlift is made.

## CHAPTER IV

## PROCUREMENT AND MANUFACTURING ASPECTS

Procurement. --Stability in the procurement of aircraft has certain economic advantages in that "feast or famine" conditions could be eliminated, thereby reducing the unit cost of the product. It would provide steady employment, eliminating excess capacity and probably night-shift operations that increase the cost of the product. However, these are not the present conditions. The Air Force has always had the problem of securing enough new advanced aircraft for all its major commands. In this effort to provide adequate aircraft the Air Force has followed a policy in its procurement that a "planning body" determined what the aircraft should be able to accomplish. Aircraft manufacturers then submitted designs and the Air Force selected the one design it felt could best accomplish the objectives. Of course, there were certain limitations, such as the price per aircraft, etc.

Since World War I much has depended on the political and economical conditions prevailing at the time rather than on the true needs for the development and performance of an aircraft. For instance, appropriations for new aircraft were not generally made when the economy was depressed. It has always been easier to get funds for new aircraft when the economy was booming. For example, the Department of Defense in 1948 had established the need for a 70 Wing Air Force minimum.<sup>1</sup>

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<sup>1</sup>Poyntz Tyler, Airways of America (New York: H. W. Wilson Co., 1958), p. 31.

During the recession of 1949 and early 1950 Secretary of Defense Louis Johnson decreased the Air Force to a 43 Wing level. However, this recessionary period would have been an excellent time to award new contracts for aircraft as a stimulus to the economy.

This dependence on "good times" for the Air Force, and also the aircraft manufacturer, created a "feast or famine" condition. These conditions are generally a result of uncertainty in the federal budget, which leads to uncertainty in procurement for those companies that rely primarily on government contracts. Donald Douglas, Sr., President of Douglas Aircraft Company, explained the condition when he stated that he received a telegram on V-J day cancelling every contract the company had. Douglas said that he had 90 thousand people employed at that point and it was necessary to lay them all off.<sup>2</sup> This certainly is not the only problem that the manufacturer must face; however, it is one that has constantly plagued him.

Manufacturing Aspects. --It should be recognized at this point that an aircraft manufacturing company, to some degree, is a quasi-public utility. The company makes its profit, or loss, primarily on government contracts and therefore must operate withing certain governmental restrictions. If its profits on government contracts exceed 7 per cent, it must refund to the government all profits in excess of this percentage.<sup>3</sup>

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<sup>2</sup>Ibid., p. 30.

<sup>3</sup>Franklin G. Moore, Manufacturing Management (Homewood, Ill.: Richard D. Irwin, Inc., 1961), p. 719.



Aircraft manufacturing requires large plant, equipment, and capital outlays; consequently, the number of manufacturers within the industry is kept small. Competition within the industry is keen because one contract can keep the production lines rolling from four to five years. The controversy that arose in 1963 over the award of the TFX all-service interceptor plane contract resulted in the resignation of Secretary of Navy Fred Korth.

Consequently, this competition among the aircraft manufacturers affects the "breakeven point." Normally, a manufacturer producing a new aircraft does not begin to "breakeven" for two or three years. Suppose the "breakeven" point is determined to be the fiftieth aircraft produced and sold. The manufacturer will naturally accelerate production in order to get as much of the market as possible before the competition can catch up, thereby reaching the "breakeven" point quickly. This accelerated production method leads to excess capacity. Large numbers of workers are hired in the beginning to increase production; competitors produce a similar aircraft or one possibly a little superior in its performance, and as orders decrease workers are laid off.

The Air Force contributes to this same production cycle in another manner. As performance of new aircraft normally exceeds that of older aircraft being replaced, the Air Force undertakes accelerating the production of new aircraft to get them into operation. When enough new aircraft are operating, demand decreases, and this adds to the fluctuating production cycles prevalent in the aircraft industry.

It is possible that the "feast and famine" cycles that prevent the manufacturer's full utilization of his economic resources may never be solved. However, it is entirely possible to level out the fluctuations by stabilizing the production cycle.

Some Aspects of Aircraft Replacement. --The end of the Korean War initiated a large scale replacement program to equip the Air Force with more advanced aircraft; the program took advantage of new developments in technology and retired some World War II aircraft that were obsolete. The Korean War awakened the United States to the advancements made by Soviet Russia in airpower since the end of World War II. It was an opportunity to test the latest jet propulsion fighter aircraft that the United States had in production. The Korean War opened the jet propulsion era and made evident the feasibility of jet propulsion for use with all types of aircraft.

As a result of lessons learned in the Korean War, the prevalent strategic viewpoint was that if a war were to occur it would be a general all-out war, and the Strategic Air Command (SAC) would deliver the knock-out blow with its fast jet bombers. Consequently, there were no funds available to modernize MATS' airlift capability to keep pace with the strategic force as Air Force funds were needed to modernize the Strategic, Tactical, and Air Defense Commands. MATS, which had the responsibility of airlifting SAC personnel and equipment to overseas areas, became badly obsolete in a period when the Air Force's offensive and defensive arms were rapidly converting to an all-jet propulsion force.<sup>4</sup> The reason given by Air Force Chief of Staff Nathan F. Twining for not modernizing MATS

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<sup>4</sup>U.S. Congress, Senate, Study of the Military Air Transport Service, 85th Cong., 2nd Sess., 1958, p. 132.

was purely a budgetary one. There were not sufficient funds available and the offensive and defensive aircraft must come first,<sup>5</sup>

After several special exercises, such as "Big Slam," in which MATS and the commercial carriers airlifted units of the Army or Strategic Air Command to overseas areas, it became evident that the airlift capability of the United States must be modernized to keep pace with rapidly changing world conditions. General Maxwell Taylor had long argued that limited warfare was more of a probability than a general all-out war. When General Taylor was made Chairman of the Joint Chiefs of Staff in 1961 the emphasis shifted to being better prepared to combat a limited war situation.<sup>6</sup> Congress, as explained in Chapter I, provided necessary funds in 1960 to begin an interim modernization program that would give MATS the capability of supporting the Army and its limited war requirements.

One of the means that MATS could use to be prepared to provide this support is through the annual budget. If funds were made available on an annual basis, the purchase of replacement aircraft on the same basis would be possible. In this way, each year a part of the airlift fleet would have the latest technological improvements added. This does not mean that a totally different type of aircraft would be procured each year but that an improved series of a model currently in use would be procured. For example, the series of the Boeing 707/C-135 now in production has the turbo-fan engines which are more efficient and have a higher performance than the

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<sup>5</sup>U. S. Congress, Senate, Study of the Military Air Transport Service, 85th Cong., 2nd Sess., 1958, p. 133.

<sup>6</sup>Report of Special Subcommittee on National Military Airlift of the Committee on Armed Services, House of Representatives, 85th Cong., 2nd Sess.

earlier engine model.<sup>7</sup> It is assumed that, unless a major breakthrough in technology is made, such as an efficient rocket engine adapted for aircraft use, a modern airlift fleet can be maintained by improving the model currently in production. A good rule of thumb to use for replacing the type of aircraft in use is to use the depreciation period. If the aircraft are depreciated over an eight-year period the aircraft type should be replaced at the end of this period.

Use of the above procedure in purchasing would permit the manufacturer to level out the fluctuations in his production cycle. Attaining this stability in the manufacturing process should result in production of aircraft at a lower unit cost by utilizing the standard 40 hour work week. As the work week is increased the unit cost starts increasing. If the manufacturer has to accelerate production, his costs will be affected in this way, according to Dr. Franklin E. Moore:

For several reasons first-shift (day-shift) production costs less than second-shift (night-shift) production. The night-shift has more new men than the day-shift and both absenteeism and turnover (men quitting) are higher. Also, night men do too much during the daytime and come to work tired. All of this cuts efficiency and boosts costs.

Night-shift work is likely to be only 80 to 90 per cent as efficient as day-shift work. Sometimes this doesn't show in the records, however, because troublesome jobs are all done on the first shift. Night men chiefly get easy jobs and long runs.

Night men are also paid a shift differential, an extra wage over day men amounting to about 5 per cent. Add together lower output and higher wages and you will find that products made

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<sup>7</sup>Personal letter from Robert W. Smart.

at night are likely to cost 20 per cent more than products made on the day-shift.<sup>8</sup>

Therefore, the desirable method of production to achieve the lowest unit cost is that of a straight day-shift operation.

Summary. --The progress of military airlift has been rapid in recent years when one takes into account aircraft performance. It has not been quite so rapid from an organizational or procedural aspect. However, the commercial carriers' share of the airlift has been increasing since 1959, and MATS has been inching closer to its true role of providing airlift for special military exercises. MATS can maintain a modern fleet of aircraft with flexibility to meet any emergencies if a systematic, planned procurement program is followed. Such a program would, also, at the same time allow the manufacturer to stabilize his production so that the unit costs could be held to a minimum. This would be advantageous to both MATS and the manufacturers.

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<sup>8</sup>Franklin E. Moore, Manufacturing Management (Homewood, Ill.: Richard D. Irwin, Inc., 1961), p. 110.

## CHAPTER V

## AIRLIFT REQUIREMENTS

Size of Airlift Force. --The size of the airlift force should only be large enough to airlift 1,200,000 passengers and 230,000 tons of cargo annually as shown in Appendix D, Table IV, plus those aircraft necessary to perform the hard-core mission. CRAF should have an airlift force large enough to handle the routine airlift function, while MATS' size should be adequate to perform its hard-core mission. To perform the above missions CRAF should be equipped with 78 jet transport aircraft and MATS with 70 jet transport aircraft. With such a reduction in the size of the airlift force there will be comparable reductions in the flight and ground support personnel.

To determine the size of the airlift force necessary, some assumptions first were necessary because data on the hard-core mission is limited for security reasons. First, in the event of a general war the requirements for airlift will not be as great as in previous years. This is because of the increased range of the B-52, an eight-jet engine bomber capable of bombing any world-wide targets and returning to its home base. Staging bases are no longer needed for the B-52; consequently, no support requirement is needed of MATS. Secondly, the primary requirement will be for airlift of Army units in a limited war situation. Thirdly, the Tactical Air Command will be largely self-supporting with the activation of additional C-130E squadrons. Under these assumptions,

it is probable that much of the continuous airlift requirement over the first few days in a limited war situation will be the airlift of personnel.

Considering the above assumptions, which should reduce the total hard-core airlift requirement from what it has been in the past, it appears that Secretary of Defense McNamara has to face the prospect of increasing airlift costs. The following statement is illustrative of the problem:

Pentagon--Defense Secretary McNamara's plan to build up U.S. airlift capability faces one big obstacle--the price. To fly a division (about 14,000 men and 28,000 tons of equipment) overseas with the transport planes now on hand takes almost a month. McNamara wants to be ready to move two divisions on a week's notice, but the extra jets (plus upkeep for a year) would cost \$3.5 billion.<sup>1</sup>

The cost referred to by Secretary McNamara is one reason why CRAF should be given the responsibility for airlifting the majority of the routine airlift. This would permit MATS, with its 70 aircraft, to engage in the special exercises with the Army and Marines, and handling the nuclear weapons that must be airlifted.

The airlift of nuclear weapons is a critical area which MATS must handle. Present laws controlling nuclear material prohibit the commercial carriers from participating in this airlift responsibility. MATS' capability, with its 70 aircraft, would be adequate to perform this mission.

In the following breakdown, the capabilities of MATS and CRAF, after their modernization, will be shown for the purpose of illustrating what the total capability will be compared to the projected annual require-

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<sup>1</sup>"The Periscope," Newsweek, June 25, 1962, p. 14.

ment. The statistics used are an average based on four different type aircraft, C-141(132), C-135(30), C-130E(50), and the C-133B(50). The figures in parentheses are the total number of that particular type of aircraft that MATS will possess. The original standards were extracted from a document "Strategic Airlift C-141 Starlifter" provided the author by Lockheed Aircraft Company.

MATS Capability (272 Aircraft)

Load Capacity equals personnel or 30 tons of cargo  
 Daily Utilization equals 8 flying hours per aircraft  
 Monthly Utilization equals 240 flying hours per aircraft  
 Monthly flying hours for 272 aircraft equal 65,280 flying hours

CRAF Capability (280 Aircraft)

240 flying hours per month per aircraft equals 67,200 flying hours

This monthly flying hour capability of 65,280 hours for MATS and 67,200 hours for CRAF gives a combined monthly flying hour capability of 132,480 hours. This would be 116,016 flying hours in excess of the peacetime projected requirement, or 479 excess aircraft. Beginning with the projected annual peacetime airlift requirement of 1,200,000 passengers and 230,000 tons of cargo, from Appendix D, Table IV, it is broken down to a monthly basis; 100,000 passengers and 19,167 tons of cargo would have to be airlifted. If the trips are divided equally between the Atlantic and Pacific theaters of operation, the airlift would require 16,464 flying hours, as shown in Appendix E, Table V, or 70 aircraft. In considering the airlift requirements it would not be possible to achieve 100 per cent load capacity on each flight because of numerous factors such as the lack of cargo or passengers available for the scheduled day of departure. Therefore, for the purpose of this analysis, the average



load capacity has been established at 80 per cent. Add 20 per cent to the monthly requirement of 16,464 flying hours and a monthly flying hour requirement of 18,757 hours is established. This is equal to 78 aircraft (16,464 ÷ 240).

With such a surplus of airlift capability that will be available in 1965 with the delivery of the C-141,<sup>2</sup> the airlift fleet should be decreased to the size its requirements call for, with an allowance made for unforeseen requirements, losses due to accidents, etc. The aircraft to be maintained by CRAF and MATS should be the most modern, the C-141, and the surplus should be disposed of. MATS has on order 132 of the C-141's compared to its requirement for 70. The last 62 on the order should be cancelled or leased to CRAF members. The other types of aircraft possessed by MATS should be transferred to other major commands in the Air Force or leased to CRAF members to the extent they would improve the CRAF with more modern aircraft. With CRAF providing the majority of the routine airlift, MATS aircraft would be released for the special exercises and the hard-core mission.

As with MATS, CRAF will probably have a surplus of aircraft. If CRAF modernized its fleet along with MATS, it would have a surplus of approximately 202 aircraft based on military airlift requirements. This would necessitate CRAF disposing of its least economical aircraft or finding new sources of airlift.

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<sup>2</sup>Lockheed-Georgia Co., Strategic Airlift C-141 Starlifter, Marietta, Georgia, 1963, p. 22.

However, there is a question that should be answered at this point. The disposal of surplus aircraft by MATS would include the C-133B which handles the outsize cargo. This disposal would create no problem as the C-141, with some minor modifications, is capable of moving the "Minuteman" missile. The Minuteman-loaded SSCBM (shipping and Storage Container Ballistic Missile) rolls straight in at truckbed height from its special trailer. The pressurized and air conditioned cargo compartment affords maximum environmental protection to sensitive components. The C-141 can also haul one or more of all models of strategic or tactical missiles that require overseas deployment.<sup>3</sup> The capability of the C-141 not only reduces the number of aircraft required for the airlift mission but it has other concurrent economic advantages as well.

Aircraft Crew Requirements.--The crew requirements of CRAF and MATS will be reduced because of the fewer number of aircraft required to perform the airlift mission. MATS, in the past, has operated on a basis of two flight crews for each aircraft assigned in its manning policy.<sup>4</sup> MATS, with a requirement of 70 aircraft versus 272 assigned, would need 140 flight crews for the 70 aircraft and 544 flight crews for 272 aircraft. MATS would have a surplus of 404 flight crews that could be transferred to other Air Force units. If the same criteria of two flight crews per aircraft is used for CRAF, there would be a surplus of 410 crews from the

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<sup>3</sup>Lockheed-Georgia Co., Strategic Airlift C-141 Starlifter, Marietta, Georgia, 1963, p. 15.

<sup>4</sup>Stanley H. Brewer and Roger B. Ulvestad, The Cargo-Jet In Military Air Transportation, Renton, Wash., 1960, p. 55.

military airlift if CRAF reduced their number to 78.

There is no indication that MATS or CRAF would retain all of the personnel they now have if their aircraft was reduced to what the airlift mission requires. As new aircraft are received that can do three or four times the work of their predecessors, it is only natural to cut down the number of aircraft, flight crews, and ground support personnel if full economic advantage is to be gained.

Ground Support Personnel. --It has been said that it is always the ground support personnel that make a system work in the military service. Consequently, this is true in MATS, and especially so in the airlift business. MATS has supported the airlift mission on a basis of 5.12 ground support personnel to one flight crew member. This figure was derived from the following:

	<u>Personnel</u> <u>Man-Years</u>
Direct Expense Functions:	
Crews	5,767
Field and Organizational Maintenance	8,938
Indirect Expense Functions:	
Administration	3,047
Ground Maintenance	4,384
Ground Operations	2,558
Squadron Overhead	419
Traffic	<u>3,766</u>
	14,174
Headquarters MATS overhead and independent Unit support	617
Total Man-Years employed in the Strategic Transport Mission	29,551 <sup>5</sup>

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<sup>5</sup>U.S. Congress, Senate, Study of Military Air Transport Service, 85th Cong., 2nd Sess., 1958.

If MATS aircraft assignment strength was held at 272 with a crew assignment of 544 the ground support personnel required would be 16,712 (3,264 crew members multiplied by 5.12) compared to 4,301 (840 x 5.12) if the aircraft assignment was limited to 70. If the ratio of ground support personnel to 1 flight crew member is increased to 8 to 1 from 5.12 to 1 because of the increased complexity of equipment, then the ground support personnel would be increased to 26,112 for 272 aircraft. For 70 aircraft assigned at a ratio of 8 to 1 it would require 6,720 (840 crew members multiplied by 8) ground support personnel. Therefore a saving of 19,392 personnel would be gained when MATS was limited to 70 aircraft.

It should be pointed out that CRAF members would not require the same ratio of ground support personnel to flight crew personnel because MATS provides CRAF members traffic and operations clearing services.

Summary.--The annual airlift requirements require an airlift force of 78 aircraft for CRAF and 70 aircraft for MATS. CRAF will have a force of 280 aircraft and MATS will have a force of 272 aircraft. This force is far in excess of that required and should be cut back to that required prior to getting the larger number on hand from the manufacturer.

CRAF should handle the majority of the projected requirement of 1,200,000 passengers and 230,000 tons of cargo. MATS would airlift special cargo of a critical nature and conduct special exercises in preparation for its wartime mission.

In addition to the economic advantages modern type aircraft give to airlift by reducing the number of aircraft required it provides for savings in the number of flight crews required for CRAF and MATS. This has concurrent economic gains in that the number of ground support personnel required for MATS will be reduced from 26,112 personnel to 6,720 personnel, more than enough to completely man a B-52 wing.

## CHAPTER VI

## INTEGRATED SYSTEM OF AIRLIFT

Integration of Airlift.--An integrated system, which utilizes MATS and CRAF, appears to be a logical step in the development of an airlift policy. We learned in World War II and the Korean War that CRAF must be relied on heavily for airlift support. At the beginning of both wars, commercial planes and crews were pressed into military airlift service. In the Korean War the commercial carriers were flying their first trips within 24 hours after being called.<sup>1</sup> If CRAF is to be relied upon in an emergency, however, it must be given enough airlift to maintain a modern fleet of aircraft. Mr. Robert W. Prescott, President of Flying Tiger Lines, Inc., expressed the need this way:

To provide the new, heavy-duty, low-cost aircraft essential to the defense plans of the country and to provide new large cargo aircraft with the low ton-mile direct flying costs required to expand and serve the airfreight needs of the country, the civilian carriers must acquire fleets of new, larger, faster, and more highly powered aircraft which the manufacturers can and will supply when orders justify.<sup>2</sup>

Therefore, CRAF should be given the bulk of the routine airlift in peacetime so it will be prepared to carry out its assigned mission in wartime. Not only should this be done for strategic reasons but also for eco-

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<sup>1</sup>U.S. Congress, Senate, Study of Military Air Transport Service, 85th Cong., 2nd Sess., 1958, p. 53.

<sup>2</sup>Ibid., p. 58.

conomic ones, as the cost of an integrated system, comprised of modern aircraft, is below the cost of a purely military airlift force (see Table IV, Appendix D).

There is some opposition, however, to placing too much reliance on CRAF in emergencies. To better understand the pro and con positions, an explanation of CRAF is appropriate.

Civil Reserve Air Fleet--CRAF is a fleet of aircraft, owned by various commercial carriers, which have been designated to be available within a 48 hour period to perform an assigned military mission in the event of a national emergency. Under the CRAF plan, the participating members have a certain number of trips to perform. The CRAF aircraft have additional equipment installed to make them ready for military use. The CRAF fleet is reviewed annually by representatives of the commercial carriers that are members of CRAF, MATS, and the Department of Commerce to bring the fleet up to a current status by adding late model type aircraft and eliminating the obsolete types.<sup>3</sup>

There are many problems in the CRAF program that still remain, although they should have been resolved many years ago. Opposition to the program by the members of CRAF is centered on the following points as compiled by the Reed Committee<sup>4</sup> and given in summary form.

1. There is no incentive to be a member of CRAF. The members feel, and with justification, that as long as they are to provide

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<sup>3</sup>"What is The Civil Reserve Air Fleet," MATS Public Information Office Release (Scott AFB, Illinois).

<sup>4</sup>A Committee, appointed by President Eisenhower, of prominent businessmen to study the airlift dispute between MATS and the commercial carriers.

airlift during a national emergency they should get special consideration on airlift procurement during peacetime operations.

2. The Department of Defense should have the authority to activate CRAF in any type of emergency situation. The CRAF members feel that CRAF should be activated only in an all-out or general war situation. The Secretary of Defense cannot activate CRAF in a limited-war situation such as the Viet-Nam struggle. The CRAF members feel that if they were activated in a limited-war situation, and thus prevented from bidding on new contracts as a result of having their aircraft tied up, they would lose their competitive position for future airlift business.
3. CRAF members must execute a contract which would obligate them to perform. The members feel that they responded dependably in World War II and the Korean War and that this requirement impugns their loyalty. But the position of the government in reference to the CRAF program as stated by the Reed Committee is:
  - a. The responsiveness of CRAF is inadequate. Military leaders feel that the ability of CRAF members to respond within a 48 hour period is extremely doubtful.
  - b. Statutory legislation is necessary to enforce the execution of the contract. While the government does not question the patriotism of any individual, the security of the nation is at stake and any unnecessary risk is too much.

It was explained this way by Robert W. Smart, Chief Counsel of the House Armed Services Committee:

It is pertinent to note that the responsiveness of CRAF is based entirely on a civil contract. Without impugning the patriotism of the crews of the civil aircraft, military leaders obviously have serious reservations about the reliability of this type of responsiveness. The enactment of legislation would be required to improve this situation and the subject is currently under consideration, with a view of developing a legislative proposal.<sup>5</sup>

Legislation has not been enacted at this time. However, it is still under consideration, and the general conclusions of the House Armed Services Committee which met in 1960<sup>6</sup> are listed below:

1. That consideration be given to extending the authority of the President to activate CRAF in national emergencies short of general war.
2. That commercial airlines be required to execute agreements with their employees, or employee representatives, that will insure no work stoppages in the event their efforts are required, as determined by the President, to support a national military requirement.
3. That the Department of the Air Force proceed with the development of a program which would insure both an adequate and an equitable participation of the members in CRAF to meet the contingency of partial mobilization.
4. That, to the extent of the congressional set-a-side in annual appropriation bills, the procurement of civil augmentation

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<sup>5</sup>Robert W. Smart, Chief Counsel, Committee on Armed Services, House of Representatives, Personal letter (July 10, 1961).

<sup>6</sup>Report of Special Subcommittee on National Military Airlift of the Committee on Armed Services, House of Representatives, 85th Cong., 2nd Sess.



airlift be initially restricted to the participants of CRAF.

The differences that exist between government officials and CRAF members must be resolved to provide the United States the greatest security. The nation's total airlift resources must be assessed and the most effective and economical use planned for these resources.

A Comparison of Airlift Systems. -- A comparison of the total costs of airlift systems will aid in determining the type of airlift structure that would be most efficient for the United States. To arrive at a proposed policy or method of operation, the cost data in Table IV was compiled using the flying hour requirements from Chapter III. In this compilation, it was necessary to assume certain common denominators such as

- (1) Average annual salary of \$5,000 per person.
- (2) Air Transport Association (ATA) estimated cost per flying hour for the jet transport aircraft--\$1,025.10<sup>7</sup>
- (3) MATS estimated cost per flying hour for the jet transport aircraft --\$852.45.

Moreover, a unique feature of the jet transport, or any jet-propelled aircraft, is that one can predict with extreme accuracy the performance of the aircraft under prevailing weight conditions and weather conditions. This means that no matter whether it is a commercial jet or a military one, the same model aircraft will give the same performance. Therefore, as one

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<sup>7</sup>Stanley H. Brewer and Roger B. Ulvestad, The Cargo-Jet in Military Air Transportation (Renton, Washington: The Boeing Co., 1960), p. 28.

can see from Table IV, the initial purchase price of the aircraft causes MATS cost to run high. In considering the economic aspects of airlift one can see that it could be advantageous to have the commercial carriers perform the routine airlift function because it would result in a saving of \$406 million, which is the cost of purchasing 70 aircraft for MATS. Naturally, the type of airlift system to be adopted cannot be determined on an economic basis alone. The integrated system, besides being economically practical, is desirable for political and strategic reasons. Moreover, the cost of maintaining the MATS system of aircraft maintenance, traffic, aircraft clearing and control is an annual cost regardless of whether MATS or CRAF airlifts the routine cargo or passengers. Utilization of the MATS system by CRAF would exercise the system adequately so there would be no loss of efficiency. CRAF costs are reduced by the utilization of these MATS services. Consequently, these services that are provided by MATS reduce the contract cost to the government.

Summary. -- CRAF should be assigned the bulk of the routine airlift if it is to be relied on in wartime. This would permit CRAF to main a modern, efficient airlift fleet. There would be economic advantages to this policy as CRAF could perform this routine airlift function at an annual cost of \$230,733,600. However, there are strategic reasons that require a MATS fleet also. If MATS were given the routine airlift responsibility the cost would be \$670,330,600 plus approximately that same amount to perform the special exercises and hard-core mission, or a total of \$1,340,667,200. Assigning the routine airlift

mission to CRAF at a cost of \$230,733,600 and the hard-core mission to MATS at a cost of \$670,330,600 the total cost would be \$900,064,200. This is still \$440,603,000 below the cost of what MATS could perform the entire airlift function for.

The integrated system of airlift is the most advantageous system because of the economic, strategic, and political reasons. Under the integrated system MATS assigned aircraft strength must be held at 70 aircraft. It is not necessary to place a maximum aircraft strength on CRAF, although its requirements would be 78 aircraft, because economic factors would accomplish this anyway.

## CHAPTER VII

## SUMMARY AND CONCLUSIONS

The nation should recognize that airlift is an instrument of national policy and that its potential should be developed aggressively and efficiently. The total airlift resources of the nation must be programmed for, and utilized, to insure the national security within a framework which is financially feasible.

Senator A. M. Monroney (Democrat, Oklahoma), one of the U. S. Senate's most knowledgeable members on airlift, said this in a letter to the author:

I believe that we can only have adequate airlift by developing a maximum force, both military and civil. As I share Billy Mitchell's concept that airpower is a national product and not purely military, I am still convinced that military airlift must be and that it is not yet organized along strike force lines and that the routine logistics job should be done by civil carriers who should be required to meet any standards of equipment and availability which the national interest requires.

I believe that MATS procurement policy should be designed to stimulate the purchase of suitable cargo aircraft by civil carriers and that considerations of cost should be secondary. While the passenger jet transports would be useable in some circumstances for military purposes, they are not satisfactory aircraft for the movement of cargo and combat forces, and reliance on them for this purpose I believe would be a great mistake.<sup>1</sup>

This can be accomplished through the use of the resources of both MATS and the CRAF members. MATS will possess a force of 272

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<sup>1</sup>Hon. A. M. Monroney, Senator, State of Oklahoma, Washington, D. C., Personal letter (June 16, 1961).

modern aircraft transports when its modernization program is complete. This force of transports, when combined with the 280 modern transport aircraft of the CRAF would, when based on an eight-hour daily utilization, permit the airlift, in a one-month period, of more than a million passengers or 336,000 tons of cargo in the Atlantic zone of operation. Because of greater distances involved in the Pacific zone of operation, the combined capability would be 518,800 passengers, or 155,650 tons of cargo. This capability, measured against projected requirements, is in excess of what is needed and poses the problem of how to allocate and program the resources which are available. Therefore, it is necessary that airlift be viewed in its proper perspective. MATS must be manned and equipped against its wartime mission, and this mission only. Airlift of a routine or repetitive nature should be allocated to CRAF. In doing this, a stable force of small CRAF members with modern aircraft would be built up. With this stable force of aircraft, any requirement for airlift would be assured of delivery.

To insure the availability of the CRAF when it is needed, it must be given the mission of airlifting the routine traffic. Further, it should be required to execute contracts with its employees to insure that the passengers and cargo will be airlifted. Although the carriers feel that this is unnecessary, the national security must be preserved and not left to chance. CRAF responsiveness will not be a matter of concern as the CRAF would already be fully exercised as a result of the "routine" airlift. The MATS system would be available and fully exercised as a result of servicing MATS and CRAF.

MATS and CRAF, when used as an integrated team, would provide the United States with quick reaction airlift that would have the capacity to perform any requirement that might face it.

One recommendation of all committees which have participated in discussions about the operation of MATS is that a greater portion of MATS' peacetime capacity should be employed in special exercises with the Army and other tactical units which MATS would support in wartime. MATS' peacetime hourly utilization rate should be held at a level which is at least half of its wartime rate, according to the report of the Reed Committee,<sup>2</sup> a special committee composed of disinterested civilian personnel, and the Rivers House of Representatives Subcommittee. If MATS projected aircraft were flown at half of their wartime projected utilization, this would take care of the projected routine airlift and still leave ample capability for special exercises. This is not necessary nor is it the most economical airlift policy, as shown in Table IV, Appendix D.

In addition to increasing the number of special exercises with the Army and other tactical units, increasing use must be made of airlift to supply overseas units with added high value parts. This airlift would further reduce the pipeline time, reduce total inventory, and thereby reduce the amount of storage space required. Further, a substantial increase should be made in the number of personnel to be airlifted to overseas destinations, to effectively utilize the excess airlift capability. The increased use of airlift would then insure economy in the personnel and logistics areas. When 1,200,000 passengers

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<sup>2</sup>"Modernize MATS, Reed Group Urges," Journal, Vol. XCVII, No. 33, (April 16, 1960), p. 1.

are airlifted, and their in-transit time reduced from 16 days to 2 days, it means an economic gain of 46,032 personnel to the military services.

However, in addition to explaining what the airlift capability would be if MATS retained the 272 aircraft on order, or received, and if CRAF retained 280 aircraft, it should be shown that the requirement is only necessary for 70 aircraft in MATS and 78 in CRAF. CRAF could airlift, with its 78 aircraft, the routine requirement of 1,200,000 passengers and 230,000 tons of cargo at a cost of \$230,733,600. However, for strategic reasons MATS must handle the special exercises and hard-core mission with its fleet of 70 aircraft. MATS, to fly its 70 aircraft, must be authorized and manned for 140 flight crews and 6,720 ground support personnel. In considering the flight crews and support personnel for CRAF, it must be assumed that economic forces would keep CRAF personnel at the proper level.

Therefore, there is a responsibility in the national airlift requirement for MATS and CRAF. If they are given their proper roles a healthy aircraft industry will be a reality and national security can be assured. If MATS is over-manned with aircraft and personnel, an unhealthy economic condition will result and this should never be allowed to happen.

APPENDIXES



TABLE I  
COMPARATIVE AIRCRAFT PRODUCTIVITY

Type Aircraft	Initial Cost of Aircraft	Max. Range for Max. Payload (NM)	Payload for 2000 NM Range (Tons)	Initial Cost Per Available Ton Mile Per Hr. (Dollars) (3000 NM)
C-54	\$ 650,000.00	1330	7.35	\$ 812.00
C-97C	1,284,000.00	2410	12.50	873.00
C-118	1,200,000.00	1730	13.90	746.00
C-121C	1,747,300.00	1580	11.86	1,529.00
C-124C	1,646,406.00	1320	19.75	1,108.00
C-133B	4,710,000.00	2000	45.20	1,218.00
Cargo-Jet	5,800,000.00	2365	53.00	377.00

SOURCES:

1. Brewer, Stanley H. and Roger B. Ulvestad, The Cargo-Jet in Military Air Transportation, January 1960.
2. Planning Research Corporation, An Economic Study of Supersonic Transports, 24 May 1959.

TABLE II  
AIRCRAFT INITIAL AND REPLENISHMENT SPARE PARTS  
U.S. AIR FORCE FISCAL YEARS 1956-1961  
(In billions of dollars)

Fiscal Year	Initial Spares	Replenishment Spares	Total
1956	1.146	0.304	1.450
1957	0.880	0.500	1.380
1958	0.600	0.680	1.280
1959	0.450	0.750	1.200
1960	0.229	0.855	1.084
1961	0.116	0.900	1.016

SOURCE: "Selective Management of Material," USAF Spares Study Group, Wright-Patterson AFB, Ohio, Report No. 10 (1960).

TABLE III  
 MATS AIRLIFT, INCLUDING COMMERCIAL  
 FISCAL YEARS 1951 THROUGH 1962

Fiscal Year	Passengers			Cargo-Tons		
	Total	Military	Commercial	Total	Military	Commercial
1962	992,062	433,652	558,410	291,936	156,222	135,714
1961	986,978	578,303	408,675	269,364	197,364	71,817
1960	993,209	564,297	428,912	279,144	213,906	65,238
1959	925,603	545,355	379,248	201,689	169,536	32,153
1958	889,930	530,563	359,367	164,957	146,009	18,948
1957	939,307	748,841	190,466	167,013	194,531	17,482
1956	848,845	700,250	148,595	165,217	150,125	15,092
1955	625,742	617,100	8,642	123,808	120,517	3,291
1954	488,764	440,359	48,405	85,082	75,173	9,909
1953	482,054	380,886	101,168	79,103	59,109	19,994
1952	435,180	323,145	112,035	76,113	52,862	23,251
1951	345,822	216,670	129,152	62,918	43,449	19,469

SOURCES: 1. Twenty-Eighth Report by the Committee on Government Operations, Military Air Transportation, Eighty-Fifth Congress, Second Session, June 26, 1958.

2. Airlift Service Management Reports, Military Air Transport Service.

TABLE IV  
INITIAL COST DATA FOR ROUTINE AIRLIFT REQUIREMENTS  
FOR ONE YEAR

Operator	No. A/C	Support Personnel Rqmt.	Annual Projected Load	Air Crew Members	Total A/C Costs (5.8 ea.)	Operating Costs	Personnel Costs	Total Costs
MATS	70	6,720	1,200,000 psgrs 230,000 tons	840	\$406,000,000	ATA \$230,733,600	\$33600,000	\$670,333,600
	272	16,712	1,200,000 psgrs 230,000 tons	3,264	1,577,600,000	ATA 803,022,336	116,200,000	2,496,822,336
CRAF	280		1,200,000 psgrs 230,000 tons					230,733,600

ATA Estimated Cost Per Flying Hour equals \$1,025.10.

SOURCES: Compiled from data contained in reports:

1. Military Air Transport Service, Airlift Service Management Report, July 1958 - June 1962.
2. Brewer, Stanley H. and Roger B. Ulvestad, The Cargo-Jet in Military Air Transportation, January 1960.

TABLE V

Monthly Flying Hour Requirement			Monthly Flying Hour Capability	
	<u>Round Trips</u>	<u>Flying Hours</u>	<u>MATS (272 A/C)</u>	<u>CRAF (280 A/C)</u>
Passengers				
Atlantic	250	4,000		
Pacific	<u>250</u>	<u>7,500</u>		
Total	500	11,500		
Cargo				
Atlantic	160	2,560		
Pacific	<u>160</u>	<u>4,800</u>		
Total	320	7,360		
Grand Total			65,280	67,200
Atlantic	410	9,104		
Pacific	<u>410</u>	<u>7,360</u>		
Total	820	16,464 $\neq$ 20%		

## SOURCE:

Compiled from data contained in:

1. The Cargo-Jet In Military Air Transportation, Renton, Wash., 1960.
2. Strategic Airlift C-141 Starlifter, Marietta, Ga., 1963.

## APPENDIX B

## General Descriptions of MATS

C-141 Starlifter. --The new Lockheed C-141 Jet-powered four-engine aircraft is being built for the United States Air Force. Slated to enter Military Air Transport Service (MATS) global operations in the spring of 1965, it will be capable of airlifting 50,000 pounds of cargo 4,600 statute miles, or 20,000 pounds of cargo nonstop from California to Japan, a distance of 6,325 statute miles.

C-135 Stratolifter. --The Boeing C-135 Stratolifter is the first pure-jet cargo aircraft in military service. The 500-mph aircraft, with non-stop over-ocean range, can fly at twice the speed, twice the height, and can carry three times the load for a 50 per cent greater range than most airplanes MATS uses currently. It can carry 38,000 pounds of payload 3,600 miles at 40,000 feet. Basic crew is six.

The aircraft, similar to the Boeing 707, is slightly smaller in most dimensions. Primarily a cargo carrier, it can be converted to carry troops or litter patients. It is the only aircraft now used for aeromedical evacuation from overseas points to the United States. The first aircraft was delivered to MATS in June 1961. Now a total of 44 are in service with MATS, 29 with turbofan engines.

C-133 Cargomaster. -- The Douglas C-133 Cargomaster is the largest aircraft in the MATS global airlift inventory. Designed to handle outsized cargo, the Cargomaster can airlift all U. S. operational missiles. With it MATS has cut delivery time, from manufacturer to launch site, to hours instead of the days required by overland hauling.

In December, 1958, a C-133 established the world's record for a single cargo airlift. It flew 118,000 pounds of cargo to an altitude of 10,000 feet, topping previous records by 40,000 pounds. The plane continually demonstrates its tremendous capacity by carrying everything from giant missiles to rocket launchers.

The Cargomaster normally operates between 15,000 and 30,000 feet, cruising at nearly 300 miles per hour. With a 20-ton payload, its range is more than 3,700 miles. It carries a basic crew of five and is powered by four Pratt and Whitney T-34 turboprop engines developing 6,000 equivalent shaft horsepower each. MATS has 45 of these aircraft, part of them assigned to Dover AFB, Delaware, and the others to Travis AFB, California.

C-124 Globemaster. -- The Douglas C-124 Globemaster is the backbone of MATS' airlift force. Introduced to MATS in June, 1950, it has been in on every major airlift since Korea. It has even become a missile carrier, airlifting the Thor IRBM and its component parts to England for RAF use.

This aircraft has flown cargo airdrop missions for seven consecutive years in "Operation DEEP FREEZE," the resupply of scientific stations in the Antarctic. It bore the brunt of the Chile, Congo and Cuban airlifts.

It can carry 200 fully equipped combat troops or 127 litter patients or a 20-ton cargo payload. With this load it has a range of 1,808 miles. Its speed is 230 miles per hour at a normal cruise altitude of 7,000 to 10,000 feet. Its four Pratt and Whitney piston engines develop 3,800 horsepower each. The basic crew is six.

MATS had 331 C-124's in the global airlift force on March 1, 1963.

C-118 Liftmaster. --The Douglas C-118 Liftmaster, one of the very dependable passenger and cargo aircraft in MATS, joined the airlift force in September, 1952. It made the first MATS nonstop flight across the Atlantic in early 1954. The liftmaster had a key role in "Operation SAFE HAVEN" when 14,000 Hungarian refugees were airlifted to the U. S. in late 1956 and early 1957.

The aircraft can carry 60 combat troops and their equipment and can deliver them within a range of 2,760 miles. It cruises at 18,000 feet at 276 miles per hour. Basic crew is seven. MATS had 110 liftmasters in the global airlift force on March 1, 1963.

C-121 Super Constellation. --The Lockheed C-121 Super Constellation joined MATS in 1953 and has been used as a convertible carrier for both cargo and personnel. It flies both oceans from its two bases of operation, Charleston AFB, South Carolina, and Moffett Naval Air Station, California. Besides normal passenger and cargo operations, the C-121 is used on the State Department "embassy runs" operating into South America.



The C-121 cruises at 17,000 feet at 282 miles per hour and carries a basic crew of eight. All the Super Constellations can be converted for passengers, cargo or air evacuation missions. It can carry 76 fully equipped troops over a 3,050 mile range. MATS had 42 of these in the global airlift force on March 1, 1963.

C-130 Hercules. -- The extended-range Lockheed C-130E Hercules provides valuable interim modernization to the airlift force of MATS. The first several were delivered in August, 1962.

Refinements over the C-130B, already in service, give the high-winged Hercules 10 tons more gross take-off weight--155,000 pounds. Also, additional fuel tanks (between the nacelles of the turboprop engines), which each carry 1,360 gallons, enable the "E" version to fly the Atlantic nonstop with normal loads, and the Pacific with one stop. Rear loading at truck-bed height, ability to land and take off from comparatively short runways and a relatively high speed (more than 300 mph) all make this aircraft valuable for global airlift.

These C-130E aircraft will help fill MATS' needs even after pure-jet aircraft designed specifically for cargo are available in mid-1964. Its normal load is about 16 tons and it can carry 64 combat troops or 74 litter patients. MATS had 48 C-130 aircraft on March 1, 1963. Additional deliveries are being made each month.<sup>1</sup>

NOTE: Mileage figures are statute. Airspeed figures are statute miles/hour.

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<sup>1</sup>General Description of MATS Global Airlift Aircraft, MATS Public Information Office Release (Scott AFB, Illinois).

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