To the Graduate Council:

I am submitting herewith a dissertation written by Kent Neill Gourdin entitled "An Analysis of National Aviation Policy With Respect To America's Strategic Airlift Capability." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Business Administration.

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We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

The Graduate School

AN ANALYSIS OF NATIONAL AVIATION POLICY WITH RESPECT TO AMERICA'S STRATEGIC AIRLIFT CAPABILITY

A Dissertation

Presented for the

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Kent Neill Gourdin

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ABSTRACT

America's national aviation policy has always embodied a commitment to establish and maintain a commercial air transport system responsive to the needs of national defense. Up until 1978, the interests of the airlines tended, for the most part, to parallel those of defense planners. However, since 1978 the airlines' domestic operating environment has changed dramatically, raising serious questions regarding the continued policy of relying on the civil sector for the majority of this nation's contingency airlift support. In order to address some of those questions, various aspects of airline operations, the military airlift system, and commercial aircraft manufacturing were examined.

The results showed that, in the first instance, the composition of the U.S. airliner fleet is shifting away from aircraft capable of fulfilling long-range airlift requirements. Furthermore, while the number of foreign flag carriers serving the United States has not increased significantly since 1978, these airlines have realized gains in both passenger and cargo traffic to and from American points. In the second case, the Military Airlift Command (MAC) was found to be lacking a significant percentage of the materials handling equipment required to support wartime airlift requirements, although sufficient ground support equipment and aircrews are available to support a full MAC/CRAF activation. Finally, while the research found that U.S. airframe manufacturers

have not experienced a decline in market share, the changing nature of foreign competition has become of deep managerial concern. In addition, the costs and risks of developing and producing a future generation heavylift, long-haul cargo aircraft were found to be more than commercial industry can be expected to support. The findings led to the conclusion that the needs of the civilian air transport industry no longer coincide with those of national defense. Our national aviation policy must be restated in light of these changes if this country is to maintain its position as the free world's primary supplier of military airlift.

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CHAPTER I

INTRODUCTION

Military Transportation

Transportation has historically been recognized as a critical factor in the success (or failure) of military campaigns. During the War of 1812, the United States incurred enormous costs associated with transporting men and material, due to inadequate facilities and transportation routes. In fact, the almost universal opinion at the time was that those facilities could have been built for what it cost to cope without them.[1] Sokol notes that, once the situation has become stabilized, the logistics problem, primarily one of transportation, becomes of primary concern.[2] Similarly, General Douglas McArthur realized the importance of establishing and maintaining a viable logistical chain, stating that tactics can be decisively influenced by the means at hand for maneuvering, supplying, and controlling combat forces.[3] But A. C. P. Wavell sums up the critical military value of transportation most succinctly:

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[1] History of Transportation in the United States Before 1840 (Washington, D.C.: Carnegie Institution of Washington, 1917), p. 92.

[2] A. E. Sokol, "Sea Power in the Next War," American Military Policy, ed. by Edgar S. Furness, Jr. (New York: Rinehart & Company, Inc., 1957), p. 103.

[3] Raymond G. O'Conner, American Defense Policy in Perspective. (New York: John Wiley & Sons, Inc., 1965), p. 2.

> The more I see of war, the more I realize how it all depends on administration and transportation. . . . It takes little skill or imagination to see where you would like your army to be and when; it takes much knowledge and hard work to know where you can place your forces and whether you can maintain them there. A real knowledge of supply and movement factors must be the basis of every leader's plan; only then can he know how and when to take risks with those factors; and battles are won only by taking risks.[4]

The government has repeatedly turned to the civilian sector for its contingency transportation needs. Early in American history, the military practice was to contract with civilians for the provision of support functions such as transportation.[5] With the outbreak of World War I, the nation found itself with a private rail network unable to meet wartime transport demands. In order to win that conflict, the federal government took over the railroads in 1917 and ran the system until 1920.[6] This dependency on private transportation continues to exist today, and forms the foundation for much of our total wartime movement capability.

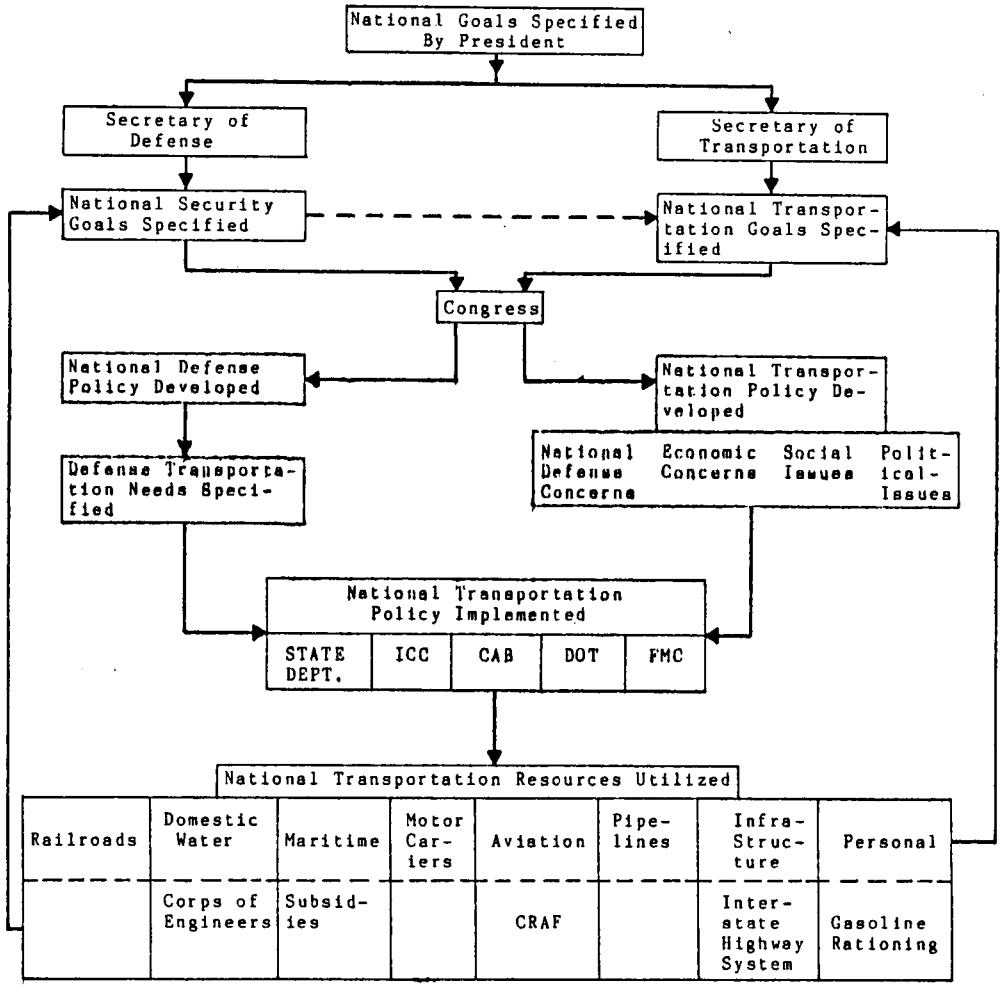
The formal institutional relationship between national security and transportation goals is depicted in Figure 1. Haefele notes that it is national purpose--as articulated and expanded in

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[4]Martin Van Creveld, Supplying War (Logistics from Wallenstein to Patton) (Cambridge: Cambridge University Press, 1977), pp. 231-232.

[5]James A. Huston, The Sinews of War: Army Logistics 1775-1953 (Washington, D.C.: U.S. Government Printing Office, 1966), p. 674.

[6]Joseph L. White, Transportation and Defense (Philadelphia: University of Pennsylvania Press, 1941), pp. 4-9.



Conceptual model of national transportation policy formulation and implementation.

national goals--that determines the structure of supporting policies.[7] Thus, the various cabinet Secretaries are concerned with establishing policies and objectives within their respective departments that will contribute to the attainment of the overall national objectives as specified by the President. However, the specification of national security goals also influences the development of transportation goals insofar as the nation's transport system is expected to support the Department of Defense (DOD). This may be, unfortunately, a one-way street. While national transportation policy includes a commitment to meet the needs of national defense, defense policy is often developed with little regard for the availability of adequate transport resources. The result is that the transportation system must often react to, rather than evolve with, DOD policy since it is not until national transportation policy is implemented that the specific needs of one sector relative to the other are actively considered. The intended objective should be to utilize the nation's transportation resources so as to meet the needs of both. However, the actual results may be quite different, as the following examples will readily illustrate.

Design on the Army's new M1 tank was begun in 1973. The full production run calls for 7,058 vehicles to be manufactured at a unit cost of $2.68 million. It was not until mid-1981 that the

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[7] Edwin T. Haefele, Transport and National Goals (Washington, D.C.: The Brookings Institute, 1969), p. 193.

Army rigorously addressed the transport problems inherent in the movement of the 60 ton behemoth. The Pentagon noted that a standard rail car could only handle one M1, so the proposed solution is to build stronger, more expensive flatcars. By 1987, officials expect to move 569 of the new cars at a projected cost of $82 million.[8] Similarly, air transportation is constrained in that the C5 air-lifter can only carry one vehicle, effectively limiting the weapon's usefulness as a part of a Rapid Deployment Force (RDF).[9]

A second example of disequilibrium between defense transportation requirements and the civilian transport system is found in the U.S. maritime industry. Though the federal government has spent over $8 billion on maritime subsidies covering construction and operating costs since 1936,[10] the entire Merchant Marine today contains only 520 ships, of which only 300 are compatible with military cargo.[11] In fact, two subsidized lines went bankrupt in 1978, a year in which $706 million was spent overall for building

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[8]"Costly New M1 Tank Fails More Army Tests; Price Keeps Increasing," The Wall Street Journal (April 20, 1981), 1.

[9]Phil Patton, "Battle Over the New U.S. Tank," New York Times Magazine (June 1, 1980), 30.

[10]Bruce P. Schloch, "The Case for Viable Marine Subsidies," Defense Transportation Journal (February 1981), 16.

[11]Major John G. O'Hara, "Strategic Mobility--We Still Have a Long Way to Go," Defense Transportation Journal (August 1981), 29.

and operating costs by the government.[12] It is clear that foreign competition and the increasing age of the U.S. fleet have been contributing causes of this decline.[13] Of the estimated 1,500 vessels plying the world's liner trades today, only 190 fly the Stars and Stripes. Significantly, the average age of those American vessels is 17 years, more than twice that of the British, Swedish, West German, and Japanese fleets.[14] The situation within the maritime industry has deteriorated to the point that the Commander of the Military Sealift Command (MSC) recently stated that

> The present United States strategic sealift fleet is not capable of supporting the "one-and-one-half war" contingency, or even a major "one-war" requirement in its present condition.[15]

As these illustrations show, the results of our national transportation policy can be totally at odds with the objectives of national defense. However, this is not always the case. Historically, the goals established for our air transportation system have been very supportive of, and compatible with, defense needs.

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[12] Schloch, p. 16.

[13] Ibid.

[14] O'Hara, p. 12.

[15] Ibid.

Strategic Airlift

The entire concept of strategic airlift (i.e. between the United States and overseas areas) was formulated with the start of World War II.[16] Since the military had little long-range air transport experience, the domestic airline community was pressed into service to fill the void. Though operating under the auspices of the Army's Air Transport Command and the Naval Air Transport Service, the carriers used their own equipment and facilities to provide the capability for long-haul, rapid movement of men and equipment so desperately needed. In essence, the airlines themselves built and operated the wartime strategic airlift organizations. Though under the control of the military services, management responsibilities were retained in Washington and were not delegated to theater commanders.[17] From 1942 to 1945, the combined operations flew over 4.1 billion passenger miles and in excess of 1 billion ton miles,[18] firmly establishing the strategic airlift function as an integral part of America's national defense forces.

Following the war, the Military Air Transport Service (MATS) became the permanent strategic air movement arm of the United States

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[16]Stanley H. Brewer and James E. Rosenzweig, Military Airlift and Its Relationship to the Commercial Air Cargo Industry (Seattle: University of Washington, 1967), p. 9.

[17]Frederick C. Thayer, Jr., Air Transport Policy and National Security (Chapel Hill: The University of North Carolina Press, 1963), pp. 43-44.

[18]Reginald M. Cleveland, Air Transport at War (New York: Harper & Brothers Publishers, 1946), p. 316.

military establishment. The mission of MATS was basically that of a commercial airline, transporting passengers and cargo on scheduled flights.[19] However, the government quickly realized that available capacity was far less than that required in time of war and, in 1951, the Civil Reserve Air Fleet (CRAF) program was initiated whereby civilian air carrier aircraft were identified by tail number and allocated for national defense at three levels of need.[20] (These employment options will be delineated in more detail later.) This arrangement has remained virtually unchanged over the years, retaining essentially the same form today.

As technological advances in aircraft design during the 1950's and 60's resulted in faster and larger airplanes, the importance of strategic airlift increased. In 1965, Congress directed that MATS become a major command named "Military Airlift Command" (MAC), and be placed on a par with other Air Force combat elements. In 1977, the command was designated a specified command by the President. As such, the MAC Commander-in-Chief reports to the Secretary of Defense and the President through the Joint Chiefs of Staff (JCS) during wartime, periods of crisis, JCS exercises, and as otherwise needed to insure airlift support to other military

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[19]"Military Airlift Command," Defense Transportation Journal (February 1983), 21.

[20]John Wilson Perry, "CRAF, Deregulation, and Fuel Costs," Defense Transportation Journal (August 1981), 6.

forces around the world.[21] The MAC airlift fleet as of December 1, 1982 is shown in Table 1. Note that the bulk of the strategic airlift fleet is comprised of the C-5 which provides wide-body capability, and the C-141, a narrow-body aircraft. Other airplanes listed either support tactical airlift requirements (i.e. the C-130), or are used for specific purposes other than routine airlift.

As mentioned previously, the CRAF/MAC relationship is basically the same today as it was in the 1950's. There is no legislative basis for the CRAF; its success depends to a large degree upon the cooperation of the airline industry.[22] To foster that spirit of voluntary participation, as well as to familiarize civil carriers with the handling of military passengers and cargo, MAC awards yearly contracts to CRAF participants for the provision of international air services. For Fiscal Year (FY) 1984, $225 million worth of airlift will be provided for MAC by 16 carriers.[23] The CRAF as of November 1, 1983 is depicted in Table 2. By far the largest and most important portion of the CRAF is the Long-Range International Segment. This element supports MAC worldwide strategic operations, and requires aircraft that are capable of extended over-water operations with a productive payload. Present requirements dictate that all cargo-capable aircraft with a San Francisco-Honolulu range capability be accepted. The Short-Range

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[21]"Military Airlift Command," p. 21.

[22]Brewer and Rosenzweig, p. 21.

[23]"MAC Awards 16 Carriers $225 Million in Contracts," Air

TABLE 1

MILITARY AIRLIFT COMMAND AIRCRAFT

Type	Number	Note	Type	Number	Note
C-5	77	A	C-137	5	C
C-141	268	A	C-140	11	C
C-130	257	B	C-135	13	C
C-6A	1	C	C-9	23	D
CT-39	112	C	HC-130	28	E
C-12	5	C	WC-130	13	E

Notes: A. Strategic Airlift Aircraft

B. Tactical Airlift Aircraft

C. Special Mission Aircraft (Presidential Airlift, Executive Transport, etc.)

D. Aeromedical Evacuation

E. Special Operations

F. Does not include rotary wing aircraft.

G. Numbers are total active aircraft inventories.

Source: Defense Transportation Journal, February 1983, p. 24.

TABLE 2

THE CIVIL RESERVE AIR FLEET

Aircraft Type	Operational Segment				
	Domestic	Alaskan	Short-Range International	Long-Range International Passenger	Long-Range International Cargo
DC9-30F	3				
L100	11	5			
L188C	11				
B737-200C		5			
B727-C/QC	3		1		
DC8-50F			13		
B707					13
DC8				9	48
B747				111	36
DC10				66	12
L1011				26	
Total Aircraft	28	10	14	212	109

Source: MAC HQ Form 312, Monthly Civil Reserve Air Fleet (CRAF) Capability Summary, November 1, 1983.

International Segment handles cargo and passenger airlift for intra-theater movements and short-haul operations from the Continental United States (CONUS) to places such as Greenland and Iceland. The Domestic portion supports the CONUS DOD supply distribution systems of the Air Force Logistics Command (LOGAIR), and the Naval Supply Systems Command (QUICKTRANS). Finally, the Alaskan Segment provides airlift support for both the Alaskan Air Command and the Distant Early Warning (DEW) line system.[24]

Participation in the CRAF involves a commitment on the part of the carriers to respond to varying emergency situations incrementally, based on three levels of need. Stage I may be employed by the Commander-In-Chief of MAC (CINCMAC) to maintain cargo and passenger backlogs at MAC air bases within acceptable limits. Carriers have 24 hours to make an aircraft available for missions. As of November 1, 1983 Stage I consists of 49 cargo and two passenger aircraft in the Long-Range International Segment. Stage II is for expanded airlift, approved for use by the Secretary of Defense in providing capability for a contingency not warranting a declaration of national emergency. As in Stage I, carriers have 24 hours to make an aircraft available. As of November 1, 1983, 49 cargo and 23 passenger aircraft in the Long-Range Segment and

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Force Times (October 3, 1983), 14.

[24]Background Paper on the Civil Reserve Air Fleet (CRAF) Program. Scott AFB, IL: Headquarters MAC/XPW, 1982. P. 1.

28 cargo aircraft in the Domestic Segment are identified for Stage II requirements. Stage III may be implemented by the Secretary of Defense, only after a national emergency is declared by the President or Congress. Carriers have 48 hours to respond to this call, which involves the commitment of all long-range cargo aircraft. Even though Stage III utilizes all CRAF long-haul resources, it is still not sufficient to meet wartime air cargo requirements, a shortcoming that will be discussed in more detail later.[25] The carriers providing those aircraft as of November 1, 1983 are presented in Table 3.

Presently, the U.S. wartime airlift requirement for military cargo is 66 million ton miles/day (MTM/D), a figure that takes account of our sealift capability and the prepositioning of equipment overseas. (This need reflects current governmental concern with conditions in the Middle East and northern Europe. Clearly, there are any number of alternative scenarios that are possible, albeit less likely.) Organic strategic aircraft (C5A/C141B, Active and Reserve) provide 17.8 MTM/D capability, while the CRAF contributes an additional 11.3 MTM/D. The purchase of 44 KC-10s (an aerial tanker/transport based on the DC-10) and 50 C-5Bs will provide another 19.4 MTM/D. Finally, the recently approved CRAF Enhancement Program, which will be discussed more fully in a subsequent chapter, will result in 3.4 MTM/D capability. Thus,

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[25]Ibid., p. 2.

TABLE 3

CARRIERS PARTICIPATING IN THE CIVIL RESERVE AIR FLEET

Segment	
Domestic	
Evergreen International	
Fleming	
IASCO	
Interstate	
Transamerican	
Zantop	
Alaskan	
Alaska International	
Wien	
Short-Range International	
Eastern	
United	
Long-Range International	
Airlift	Overseas National
American	Pan American
American Trans Air	Rich International
Arrow	South Pacific
Capitol	Transamerican
Evergreen	Trans World
Flying Tiger	United
Global	World
Jet Charter	Zantop
Northwest Orient	

Source: HQ MAC Form 312, Monthly Civil Reserve Air Fleet (CRAF) Capability Summary, November 1, 1983.

out of the 66 million ton miles/day that must be moved in time of war, the U.S. can hope to support only 51.9 million ton miles/day in the foreseeable future, leaving a 14.1 million ton miles/day shortfall.[26]

Problem Statement

The fundamental problem is the concern that national defense considerations have been subjugated in favor of other interests in the determination of our national air transportation policy. The purpose of this research is to determine whether or not our present air transportation policy has resulted in an unbalanced condition wherein our long-range aviation assets are being suboptimally utilized to the detriment of America's strategic airlift response capability.

Limitations on the Scope of the Study

Certain related topics will not be within the purview of this dissertation. On-going efforts to integrate North Atlantic Treaty Organization (NATO) and Republic of Korea civil transports into CRAF contingency planning will not be discussed. Issues relating to specific considerations regarding other modes of transportation and national policy will not be addressed in any

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[26]Briefing on the Civil Reserve Air Fleet, Presented by Headquarters MAC/XP, May 24 and June 7, 1983 in Washington, D.C.

depth. In addition, tactical airlift policies, the system of logistical support within the United States (LOGAIR and QUICKTRANS), and the short-range segments of the CRAF will not be directly covered. Also, no mention will be made of existing programs dealing with the wartime requisition of those aviation resources not committed to the CRAF. Finally, the research will not be couched in terms of a particular wartime scenario or plan. Most current discussion centers around the ton-mile figures presented earlier, but this study will emphasize the more general nature of defense/commercial aviation relations without direct regard for the world political situation as it exists today.

Importance of the Research

The results of this research will be of extreme importance to the academic community and national transportation policy formulators, since one of the fundamental tenets of our stated aviation policy has been, and is, to support the needs of national defense. Indeed, as noted earlier, the Civil Aeronautics Act of 1938, the Federal Aviation Act of 1958, and the Airline Deregulation Act of 1978, all contain words to that effect. Prior to the 1978 Act, the needs of the air carriers and our national defense requirements tended, for the most part, to coincide. Since deregulation, however, the needs of the airlines have become diametrically opposed to those of our strategic airlift system. Whereas the latter continues to rely on large, long-range aircraft, the former are moving

towards smaller airplanes flying shorter routes. As Table 4 shows, orders for U.S. commercial aircraft have declined dramatically since 1978. Significantly, long-haul, widebody aircraft account for only 7.5% of all orders placed in 1982 whereas that figure was almost 30% in 1979. The resultant turmoil is forcing total reevaluation of our national aviation policy with respect to both the formulation and implementation of defense related goals. As previously noted, this dissertation will examine the ability of national policy at various levels to specify those goals with regard to intercontinental air transport and strategic airlift, and to ultimately provide for their attainment. There are implications for research into other aspects of transportation/DOD policy formulation as well. Indeed, it raises some fundamental questions concerning the respective roles of government and industry in the accomplishment of national goals in a competitive society.

The dissertation will be of interest to both the military and business communities too. The needs of the aviation industry are inexorably linked to national defense requirements. As aircraft development costs have increased, it has become critically important that the military and civilian airlift segments collaborate on a jointly acceptable state-of-the-art heavy-lift aircraft. The C-5 debacle of the late 60's and early 70's is well known, and has served to overshadow the true worth of that aircraft. The allocation of increasingly scarce resources to a similar project in the future will demand the combined participation of both parties.

TABLE 4

NUMBER OF ORDERS PLACED WITH U.S. COMMERCIAL AIRCRAFT MANUFACTURERS, 1977-1982

Manufacturer	1977	1978	1979	1980	1981	1982
Boeing						
747	42	83	79	49	30	14
727	134	131	110	82	52	11
737	38	146	76	106	129	72
757		40	42	72	27	2
767		84	51	31	7	4
Lockheed						
L1011	5	30	30	16	2	--
McDonnell-Douglas						
DC10	29	43	34	12	3	0
DC9	51	66	49	20	17	84
Total Orders	299	623	471	388	266	187
Percentage of B747, L1011, DC10 Orders	25	25	30	20	13	7.5

Source: 1977-1982 Annual Reports for Boeing, Lockheed, and McDonnell-Douglas Corporations.

The commonality issue will also be examined in the context of cargo handling systems. A side-by-side comparison of military and civilian equipment and techniques will provide valuable insights into ways of improving the interface between the two.

Study Outline

This chapter has presented an overview of the relationship between civilian and military air transport requirements. Chapter II will specify the theoretical model and methodology to be used in the study. Chapter III will present an examination of the relationship between national defense and the civil aviation system as it has historically been perceived by Congress. The data analysis and resultant findings will be provided in Chapter IV, while Chapter V will include a more comprehensive discussion of those results and their implications both for national defense and the commercial aviation industry. Finally, Chapter VI will relate the findings back to the conceptual model, and will discuss the implications for both further research and national aviation policy formulation.

CHAPTER II

THEORETICAL MODEL AND METHODOLOGY

Conceptual Model

The defense-air transport industry interaction is illustrated in Figure 2, and it is this model that will serve as the framework for this research. National security and transportation goals spring from the national priorities specified by the President (see Figure 1, page 3). From these, policies for each of the two areas are developed. With respect to air transportation, the Congress has realized the significant implications that a strong civil aviation system has for national defense. The Civil Aviation Act of 1938 states as a primary principle:

> The encouragement and development of an air transportation system properly adapted to the present and future needs of the foreign and domestic commerce of the United States, of the Postal Service, and of the national defense.[27]

This commitment is carried forward in the declaration of policy for the Federal Aviation Act of 1958, which charges the Civil Aeronautics Board (CAB) with considering, among other things:

> The development and maintenance of a sound regulatory environment which is responsive to the needs of the public and in

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[27] Civil Aeronaturics Act, Statutes at Large, Vol. 52, Section 2(a), 1938.

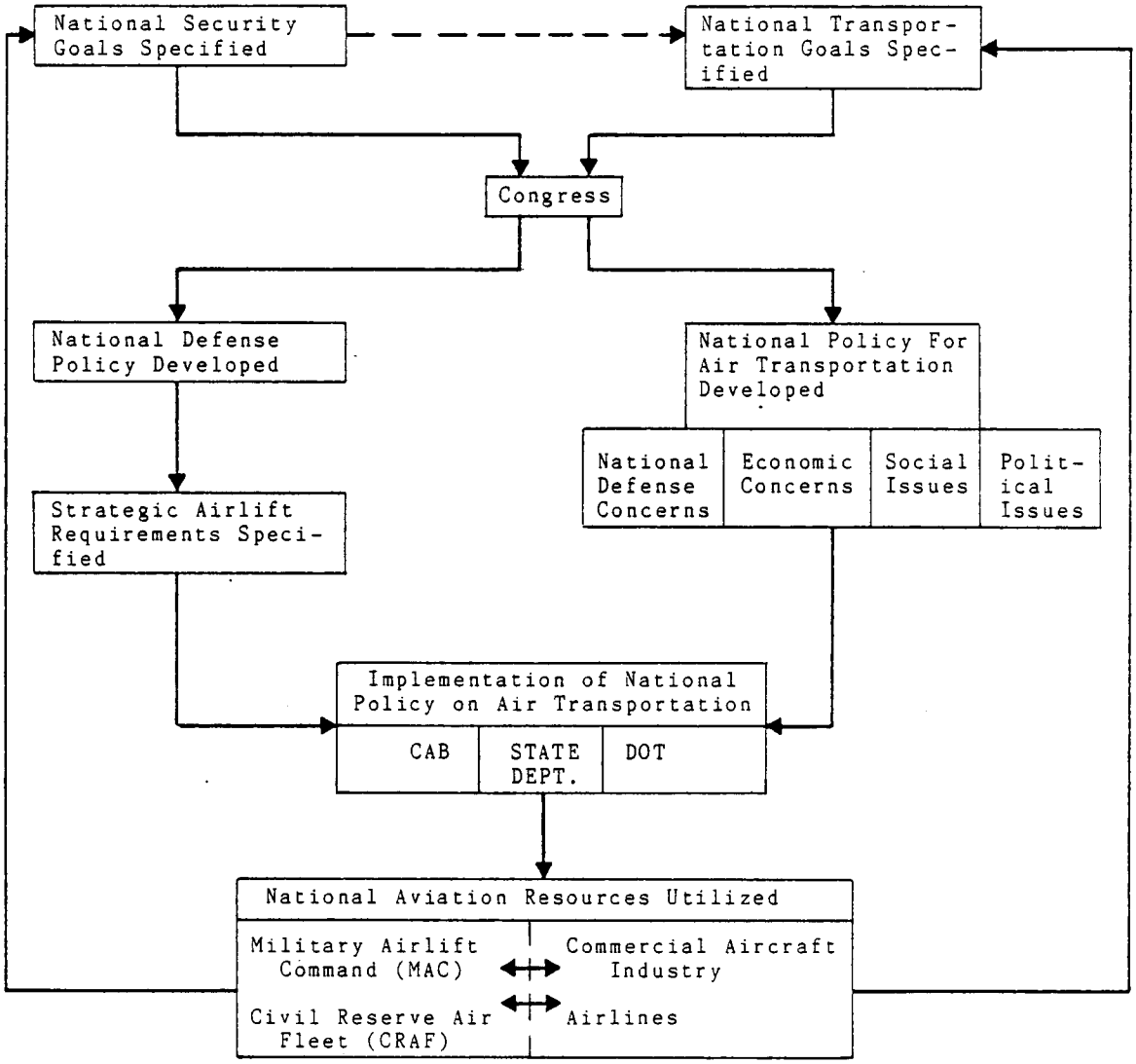


Figure 2. Conceptual model of air transport policy formulation and implementation.

> which decisions are reached promptly in order to facilitate adaptation of the air transportation system to the present and future needs of the domestic and foreign commerce of the United States, the Postal Service, and the national defense.[28]

This policy remains in force today, having been incorporated verbatim into the Airline Deregulation Act of 1978.[29] Thus, national defense considerations influence national air transportation goals and policy from the earliest stages of their formulation. National air transportation policy should address defense, economic, social, and political concerns, with actual implementation meshing DOD requirements into that overall framework. Specifically, the objective should be, as in the overall model presented in Figure 1, page 3, to utilize our long-distance aviation resources in such a way as to optimally satisfy both national air transportation goals and the goals specified by national defense considerations.

Hypotheses

The major research hypotheses to be tested are presented below. The primary purpose of this research is to test the premise that our national air transportation policy has fostered the suboptimal utilization of our long-range aviation resources and is,

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[28] Federal Aviation Act, Statutes at Large, Vol. 72, Section 102(a), 1958.

[29] Airline Deregulation Act, Statutes at Large, Vol. 92, Section 102(a)5, 1978.

therefore, no longer responsive to the needs of national defense. Since data pertaining to this issue are not readily quantifiable, the hypotheses that follow will be used to provide a more rigorous basis for accepting or rejecting the overall contention. The intent of this analysis will be to examine several pertinent aspects of the commercial aviation/strategic airlift relationship as it has developed under existing policy guidelines.

Hypothesis 1 The deregulation of the airline industry has adversely affected the U.S. strategic response capability.

The rationale for this hypothesis is that deregulation reflected a change in our national policy that was effected to meet economic, social and (to a lesser extent) political goals. However, as the airline industry responds to, and is affected by, that increased operational freedom, the air carriers themselves are becoming less able to meet national defense requirements.

Hypothesis 1(a) The composition of the U.S. airliner fleet is shifting away from aircraft capable of fulfilling intercontinental airlift requirements.

The new aircraft being ordered by the airlines today include the Boeing 757 and 767, the Airbus, and advanced versions of the DC9 and Boeing 737. All have two engines and are therefore not permitted to make extended overwater flights. This means that they are virtually unusable in the long-haul segments of the CRAF. Since these airplanes are being used to replace aging craft such as the Boeing 707 and DC8, it is believed that the U.S. strategic response

capability will decline as the acquisition of new aircraft takes place.

Hypothesis 1(b) The number of foreign air carriers serving the United States has increased significantly since 1978.

Hypothesis 1(c) Foreign flag airlines have experienced a larger increase in market share (passenger and cargo) than U.S. flag carriers.

Deregulation implicitly assumes that international aviation is a competitive industry. Since most foreign flag airlines are government controlled to some degree, U.S. carriers can find themselves facing conditions that are decidedly non-competitive in nature. Because of this, it is thought that American carriers have, in actuality, profited less under deregulation than have foreign airlines. The concern here is that our present policy may have a deleterious effect on our strategic airlift capability by reducing international market opportunities and, by implication, the need for long-range aircraft.

Hypothesis 2 Design differences between civilian and military transport aircraft and cargo handling systems are potential limitations in time of war.

Hypothesis 2(a) There are not enough military materials handling resources to support a full CRAF/MAC mobilization.

Hypothesis 2(b) The military does not have enough ground handling equipment to handle a full CRAF/MAC mobilization.

Hypothesis 2(c) There are not enough qualified flight crews to support both a full CRAF activation and a call-up of Air Force Reserve/Air National Guard personnel.

The justification for these hypotheses is that past aviation policy statements have failed to encourage the development of aircraft acceptable to both commercial and military air transport applications. Although there is a high degree of commonality between military and civilian transport aircraft and materials handling systems, there are indications that existing design differences could impede our rapid response to wartime surge requirements.

Hypothesis 3 The airlines and the air frame manufacturers cannot afford to bear the cost and risk factors associated with the development of future generation heavylift, long-haul cargo transports.

Hypothesis 3(a) American commercial aircraft manufacturers are losing market share to foreign competition.

The rationale for these hypotheses is, again, that our present national aviation policy has failed to encourage a common transport aircraft for civilian and military applications. Today, the costs of developing and producing a new long-range transport aircraft are rapidly exceeding the private sector's available resources. This is particularly significant in view of increasing

competition from abroad, and the fact that the commercial air cargo industry is not large enough to support the design of an all-cargo aircraft for civilian needs alone. It is therefore believed that future heavylift cargo airplanes will have to be acceptable for both military and civilian applications.

Methodology

In order to accept or reject the major premises posed at the beginning of the last section, a two-phase program of descriptive research and hypothesis testing was adopted. The first phase consisted of two parts intended to set the stage for further analysis. Congressional reasoning underlying the formulation of the Civil Aeronautics Act, the Federal Aviation Act, and the Airline Deregulation Act were considered in Part A, as were the doctrinal issues that led to the development of the CRAF concept. The objective in Part A was to establish the nature of the relationship that Congress intended to develop between national defense and commercial aviation. Part B then examined the nature of the Defense/Commercial aviation relationship as it exists today. The effects of Deregulation on America's long-haul carriers were addressed, as were present wartime airlift requirements and the current CRAF/MAC partnership. Thus, Phase I served to delineate the aviation/defense relationship as it should be and as it actually is.

The model depicted in Figure 2 shows national air transportation policy as being developed to support economic, social,

political, and defense concerns. The premise cited above posits that national defense concerns are being subordinated to, or ignored in favor of, the other three considerations. This is an admittedly amorphous statement that does not easily lend itself to direct quantitative analysis. Therefore, Phase II consisted of testing the previously detailed hypotheses as sub-issues in an effort to measure the extent to which defense needs are actively being considered in policy-making. Based on the results obtained here, conclusions could be reached which directly related to the acceptance/rejection of the major postulation.

Analysis of the Data

H1: The deregulation of the airline industry has adversely affected the U.S. strategic response capability.

H1 was conditionally tested utilizing a narrative evaluation of the airline industry's response to deregulation. Specifically, factors such as increased foreign competition, shrinking route structures, and smaller aircraft were examined in order to determine their effect on our strategic airlift capability. The intent of this analysis was to suggest the extent to which our present aviation policy is or is not meeting the needs of national defense.

H1a: The composition of the U.S. airliner fleet is shifting away from aircraft capable of fulfilling intercontinental airlift requirements.

H1a lends itself to a more rigorous analysis, and served to support the findings in H1. The number of intercontinental aircraft as a percentage of the U.S. airliner fleet before deregulation was examined, and that figure compared to a similar number based on current fleet composition. A test of significance at the .05 level was utilized to accept or reject this hypothesis.

H1b: The number of foreign air carriers serving the United States has increased significantly since 1978.

H1c: Foreign flag airlines have experienced a larger increase in market share (passenger and cargo) than U.S. flag carriers.

H1b and H1c were, again, examined in narrative fashion so that certain fundamental differences in management procedures and philosophies that exist among international air carriers could be clarified. The intent of this analysis was to suggest that there are differences between the objectives set by American carriers, and those established by foreign flag airlines.

In addition, these sub-hypotheses were also used to quantitatively test for acceptance or rejection of H1. In the first instance, the number of foreign carriers serving U.S. points prior to 1978 was compared to the number providing service today.

In the second case, percentage increases in passenger and cargo market share to and from the U.S. were derived for both foreign airlines as a group and American international carriers as a group. Tests of significance at the .05 level were then administered to accept or reject each hypothesis.

H2: Design differences between civilian and military transport aircraft and cargo handling systems are potential limitations in time of war.

H2 encompassed a descriptive analysis of both military and civilian cargo handling systems, in which the two were compared, and important differences highlighted. Three minor hypotheses were utilized to provide a quantitative measure of the significance of these differences.

H2a: There are not enough military materials handling resources to support a full CRAF/MAC mobilization.

H2b: The military does not have enough ground handling equipment to support a full CRAF/MAC mobilization.

H2c: There are not enough qualified flight crews to support both a full CRAF activation and a call-up of military Reserve/National Guard personnel.

H2a, H2b, and H2c were examined using tests of significance at the .05 level. In the first case, the number of military cargo pallets and loading vehicles presently on hand was determined, and

this figure compared to the number of like items required in the case of a full CRAF/MAC mobilization. In the second instance, a similar analysis compared the on-hand versus required figures for passenger boarding stairs and aircraft servicing vehicles. Finally, the number of qualified flight crews required for a full MAC/CRAF mobilization was evaluated against the number available after all Air Force Reserve and Air National Guard requirements are met.

H3: The airlines and the air frame manufacturers cannot afford to bear the cost and risk factors associated with the development of future generation heavylift, long-haul cargo transports.

H3 incorporated both a narrative analysis and a more formal statistical examination. The latter was used to compare the costs (at the .05 level of significance) of developing and producing a totally new long-range aircraft against the total worth of the firm(s) that make them. The former provided a subjective measure of the risk factors impacting both the manufacturers and the airlines when the decision is made to produce a totally new aircraft.

H3a: American commercial aircraft manufacturers are losing market share to foreign competition.

H3a provided a more rigorous basis for accepting or rejecting H3. The historical share of the commercial aircraft market enjoyed by American manufacturers was compared with that held by foreign manufacturers. A similar analysis was made of the figures existing today, and the two differences compared (at the .05 level

of significance) in order to accept or reject the hypothesis.

Data Sources

Data were obtained from a review of current literature and technical reports, as well as field interviews conducted with personnel at Headquarters MAC. Primary sources for the descriptive portion of the research (Phase I) were civilian academic libraries, the Air Force Institute of Technology (AFIT), and Department of Defense (DOD) repositories such as the Defense Technical Information Center (DTIC). Field interviews provided some information for Phase I, and were also used to obtain the hard data necessary to perform the hypothesis testing in Phase II. Finally, telephonic interviews were conducted with personnel at the Civil Aeronautics Board, the Federal Aviation Agency, the Department of Transportation, and the Department of Commerce.

Population Analyzed

With respect to issues regarding the airlines, the population analyzed consisted of those carriers comprising the Long-Range International Segment of the CRAF (see Table 3, page 14). Similarly, only MAC's intercontinental airlift resources (C141/C5 aircraft and support equipment) were considered in the course of this investigation.

In order to provide a frame of reference for further consideration of these issues, Chapter III will trace the national

defense-commercial aviation partnership as it has developed over the years. The objective of this historical review will be to establish the nature of that relationship as it was (and is) perceived by Congress. Once that Congressional intent has been clarified, the following chapters will evaluate the partnership as it actually functions today.

CHAPTER III

THE DEFENSE-COMMERCIAL AVIATION PARTNERSHIP

Congressional Intent

1917-1938

The government did not begin to deal with aviation matters on a focussed basis until 1926. In fact, within the Congress itself, established congressional committees were relied upon to handle those issues that pertained to their respective areas; for example, the Committee on the Post Office and Post Roads dealt with air mail concerns, the Committee on Military Affairs with military air issues, etc.[30] However, there were several bills introduced by individual members of Congress as early as 1917 that sought to create a single Department of Aeronautics within the government that would handle all aviation matters. For instance, Senate Bill 80, introduced in that year, proposed the establishment of such an agency to supervise and promote all matters pertaining to aeronautics in relation to the Army and Navy. In addition, the Department was to endeavor to improve and develop the science of flying as was deemed desirable in the public interest, to extend commerce, and to achieve other such

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[30]U.S. Congress, House, Committee on Rules, The Creation of a Committee on Aeronautics, Hearings Before the Committee on Rules on H. Res. 105, 65th Cong., 2d sess., 1917, p. 4.

ends as were found practical for the general betterment of the country.[31] It is interesting to note, parenthetically, that national defense concerned policymakers even then. Indeed, military aviators provided most of our early commercial air services, transporting all air mail from 1918-1926, and part of it through August of 1927.[32] However, the bills introduced to regulate civil aviation prior to 1926 failed to pass one or the other Houses of Congress, although they did serve to focus the attention of the Congress on aviation and the desirability and necessity of developing commercial and military uses for those resources.[33]

The Airmail Act of 1925, also known as the Kelly Act, made possible the awarding of contracts to private carriers for the transport of air mail. Though concerned primarily with establishing compensation levels for mail transport, the act also sought to "encourage commercial aviation."[34] This legislation, together with the Air Commerce Act of 1926, formed the foundation for civil air transportation in the United States. The Air Commerce Act did not contain a policy statement with regard to air carriers or

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[31]U.S. Congress, Senate, Committee on Military Affairs, The Creation of a Department of Aeronautics, Hearings Before a Subcommittee of the Senate Committee on Military Affairs on S. 80, 65th Cong., 2d sess., 1917, p. 3.

[32]Charles S. Rhyne, The Civil Aeronautics Act Annotated (Washington, D.C.: National Law Book Company, 1939), p. 18.

[33]Ibid.

[34]Air Mail Act of 1925, Statutes at Large, 43, Section 1, 1925.

national defense, per se. However, Congressional proceedings contain numerous references to national defense. For example, in 1925, House Report No. 1262 stated that the purpose of the legislation was to encourage and protect civil air navigation in order to develop our air commerce, provide an auxiliary air fleet and personnel in time of war, develop a new manufacturing industry, and give the U.S. the increased economic prosperity resulting from faster methods of transportation.[35] The Committee went on to note that European countries had realized the vital relationship between the development of civil aviation and adequate national defense capabilities. Furthermore, these nations found that, unless military aviation was to bear the entire cost of maintaining aircraft industries and supporting aviation development generally, commercial air navigation had to be encouraged. Rather than provide direct subsidies to air common carriers as was being done abroad, the report recommended that the government provide air navigation aids similar to those furnished to water carriers.[36] Thus, the final Act charged the Department of Commerce with promoting air commerce by encouraging the development of civil airports, establishing airways and other air navigation facilities (aerial lighthouses, signal and radio directional finding stations, radio communication facilities, etc.),

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[35]U.S. , Congress, House, Report on the Civil Air Navigation Bill, H. Rept. 1262, 68th Cong., 2d sess., 1925, p. 9.

[36]Ibid., pp. 10-11.

issuing air worthiness certificates, licensing pilots, and promulgating rules for air traffic.[37] The Bureau of Air Commerce was established within the Department to oversee this task, the first such agency concerned solely with aviation matters. Both of these early Acts were passed primarily to make the business of air mail transport more attractive to private firms by insuring the presence of adequate navigational aids. A perhaps more significant result was the birth of the concept of government involvement in the promotion of commercial aviation. In addition, the close ties between civilian and military aviation were maintained by an amendment to the Air Commerce Act, also passed in 1926. Public Resolution 46 gave the President the authority to detail officers of the Army Air Corps to duty under the Secretary of Commerce in connection with the work of promoting civil aviation as provided for in the parent legislation.[38]

Up to this point, the intention of Congress had been to concentrate on the development of the commercial air transport industry. This does not mean that national defense concerns were being ignored. In fact, Congress noted that the successful conduct of commercial aviation and the improvements in aircraft which would

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[37] Air Commerce Act of 1926, Statutes at Large, 44, Section 172, 1926.

[38] U.S., Congress, Senate and House, An Addition to the Air Commerce Act of 1926, Public Resolution 46, 69th Cong., 1st sess., 1926.

result from the civil sector would be of great service not only to the Army and Navy, but to the defense of the whole country.[39] Therefore, it appears that Congress believed the military would benefit from, for example, the growth in air navigation facilities and airports as much as the air carriers, and felt no need to further specify national defense considerations in our air policy such as it was at that time. Thus, two major points emerge concerning Congressional intent regarding the relationship of civilian and military aviation requirements. The first is the underlying concern for fostering the growth of military air capability; the second is the belief that the needs of the two were closely intertwined. That is, by meeting the needs of the former, the latter would develop as well.

References to defense requirements occurred sporadically during Congressional proceedings over the ensuing years, as evidenced by hearings held in 1934 concerning House bill 9599. This bill attempted to strengthen the Air Commerce Act by providing for increased federal support to private aviation and cited national defense considerations as one reason for doing so.[40] Similarly, in 1937, Mr. James B. Eastman, Chairman of the Interstate Commerce Commission, provided testimony in which he stated that the history

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[39]U.S., Congress, House, Report on Civil Aviation, H. Rept. 572, 69th Cong., 1st sess., 1926, p. 8.

[40]U.S., Congress, House, Committee on Interstate and Foreign Commerce, Civil Aeronautics, Hearings Before a Sub-committee of the House Committee on Interstate and Foreign Commerce on H.R. 9599, 73d Cong., 2d sess., 1934, p. 6.

of the development of commercial air transport in the United States indicated that the inception was primarily for considerations of national defense. He went on to say that insufficiently organized productive capacity in the manufacture of aircraft, together with a scarcity of trained personnel, experienced during World War I, were two important reasons why civil aeronautical development appeared not only desirable, but necessary.[41]

In 1933, the incoming administration began a comprehensive examination of air mail contract procedures. A Congressional committee headed by Senator Black, came to the conclusion that the contracts were collusive and contrary to law, and that the Postmaster General had illegally extended some of the contracts past their date of expiration. The end result was that all contracts were cancelled, and the Army once again assumed responsibility for air mail movement.[42] The resultant turmoil focussed attention on aviation in general, and forced Congress to pass the Air Mail Act of 1934. In brief, the Act repealed existing legislation regulating the transportation of domestic air mail, and made air mail carriers subject to the control of three federal agencies: the Post Office Department awarded contracts and determined routes and schedules; the Interstate Commerce Commission fixed rates; and the Bureau of

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[41]U.S., Congress, House, Committee on Interstate and Foreign Commerce, Amending the Interstate Commerce Act. Hearings Before the Committee on Interstate and Foreign Commerce on H.R. 5234, 75th Cong., 2d Sess., 1937, p. 18.

[42]Rhyne, p. 28.

Air Commerce licensed aircraft and personnel, operated the airways, and enforced safety regulation.[43] In addition, the Act provided for the creation of a Federal Aviation Commission that was charged with studying national aviation policy. The Commission subsequently recommended that a separate organization be created to control the airline industry, either as a new independent body or within the existing structure of the Interstate Commerce Commission.[44] Though the Act attempted to address the weakness of the original legislation, it was, by its very nature, temporary. Non-air mail carriers were left entirely without control, except for safety regulations promulgated by the Department of Commerce.[45] Thus, the time was right for new legislation, and, on March 26, 1934, Senator McCarran introduced his first of a series of bills containing provisions for the economic regulation of the air carrier industry, and the creation of an independent aviation commission to administer the provisions of the act.[46] Over the next four years, hearings were held in both houses of Congress, and concerns for national defense expressed by several of those who offered testimony. In 1934, Colonel J. Carroll Cone, Assistant Director of Aeronautics, Department of Commerce, stated that no nation could afford to maintain a peace-time air force large enough to meet wartime needs, and offered support for a bill then being considered that would have subsidized

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[43] Ibid., p. 28.

[44] Kane and Vose, pp. 5-12.

[45] Rhyne, p. 31.

[46] Ibid., p. 27.

students enrolled in civilian flying schools. The purpose of this legislation was to promote private aviation while providing a pool of trained pilots available in time of war.[47] Similarly, in 1938, Mr. David L. Behncke, President of the Airline Pilots Association of America, told a Congressional hearing that airline pilots provided a valuable reserve for wartime needs, and noted that the cost of developing air transportation, considering its air defense value, was a very cheap investment in national security.[48] During the same proceedings, Colonel Edgar S. Gorrell, President of the Air Transport Association, also cited the importance for national defense of fostering a sound airline industry.[49] And in 1938, a Senate report found that airline competition was being carried to an extreme which tended to undermine the financial stability of the carriers and jeopardized the maintenance of transportation facilities and services appropriate to the needs of commerce and required in the public interest and for national defense.[50]

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[47]U.S., Congress, Senate, Commerce Committee, Encouraging Civil Aviation in the United States, Hearings before a subcommittee of the Commerce Committee on S. 2991, 73rd Cong., 2d sess., 1934, p. 13.

[48]U.S., Congress, House, Committee on Interstate and Foreign Commerce, Creating a Civil Aeronautics Authority, Hearings before the House Committee on Interstate and Foreign Commerce on H. 9738, 75th Cong., 3d sess., 1938, p. 245.

[49]Ibid., p. 243.

[50]U.S., Congress, Senate, Committee on Interstate and Foreign Commerce, Report on the Civil Aeronautics Act of 1938, S. Rept. 1661, 75th Cong., 3d sess., 1938, p. 2.

The efforts of Senator McCarran, together with those of Congressman Lea, culminated in the passage of the Civil Aeronautics Act of 1938. Of prime importance to this research was the statement, for the first time, of a national aviation policy incorporated into the Act. That declaration of policy is partially quoted here:

> In the exercise and performance of its powers and duties under this Act, the Authority shall consider the following, among other things, as being in the public interest, and in accordance with the public convenience and necessity--
>
> (a) The encouragement and development of an air-transportation system properly adapted to the present and future needs of the foreign and domestic commerce of the United States, of the Postal Service, and of the national defense;
>
> (d) Competition to the extent necessary to assure the sound development of an air-transportation system properly adapted to the needs of the foreign and domestic commerce of the United States, of the Postal Service, and of the national defense.[51]

Furthermore, the Act recognized that obtaining air rights to foreign countries was a State Department responsibility, an acknowledgement that was restated in both the Federal Aviation and Airline De-regulation Acts. Specifically, the Secretary of State was charged only with advising the Civil Aeronautics Authority of, and consulting the Authority on, the negotiation of any agreements with foreign governments for the establishment or development of air navigation, to include air routes and services.[52]

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[51] The Civil Aeronautics Act, Section 2 (a and d).

[52] Rhyne, p. v.

In attempting to discern the Congressional intent with regard to the provisions concerning national defense, the following quote from Senator McCarran is very revealing:

> America's commercial future from a standpoint of transportation rests, to a large extent, on civil aviation; indeed not only is commercial aerial transport to play a vital part in our national development, but likewise it is to become a forceful agency for national defense.
>
> Every commercial air line is destined to be a vital factor in the emergency of war; every pilot engaged in civil aviation is a trained, skilled, experienced and seasoned soldier in the nation's cause.[53]

It is clear that Senator McCarran understood the implications for national defense embodied in a sound civil aviation sector. Congress, in its wisdom, specified that our national aviation system should be developed with concern being given to military as well as civilian issues. However, since national defense considerations are not addressed further, the Congressional intent seems to have been to meet those needs by addressing the requirements of the commercial air transport industry. In other words, Congress continued to view the attainment of national defense goals as one objective of our national policy, but chose to rely upon the growth and development of the private sector as the best way to achieve those goals. As pointed out in the discussion of early aviation legislation, meeting the needs of the civil sector was

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[53] The Civil Aeronautics Act, Section 802.

perceived to be the most advantageous way of satisfying national defense requirements.

1939-1958

Congressional policy changed very little over the next two decades. In 1943, the House of Representatives Committee on Interstate and Foreign Commerce issued a report concerning an amendment to the Civil Aeronautics Act so as to aid and encourage the development of civil aviation.[54] The Committee specified a national policy for aeronautics that would recognize the common air carrier system as the merchant marine of the air, a resource available at all times to serve as a vital transport auxiliary to the armed forces in time of national crisis. In addition, the Committee felt that the entire air transportation system should be available for mobilization and use in the movement of military personnel and equipment in a national emergency. Finally, the policy statement included a recommendation that a healthy relationship be fostered between government and private enterprise, citing the close ties between the two in meeting wartime air transport requirements.[55] In essence, the Committee proposed a new declaration of policy that specifically recognized the potentialities of civil aeronautics as a means for (among other

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[54]U.S., Congress, House, Committee on Interstate and Foreign Commerce, Report on Amending the Civil Aeronautics Act of 1938, H. Rept. 124, 78th Cong., 1st sess., 1943, p. 1.

[55]Ibid., p. 6.

objectives) increasing national defense capabilities. To reflect that concern, Congress recommended that our policy be to develop and regulate civil aeronautics subject to unified national planning and control.[56]

Similarly, the Attorney General, in a report to Congress in 1945, stated that the fullest development of air transportation was important to both the general welfare of the population and to the security of the nation. The report noted that the military importance of air transport in peacetime, as well as in war, gave an urgency and primacy to all policies that encouraged the development of an extensive air transportation industry. This industry would serve to maintain manufacturing capacity, to train air personnel and ground forces, and to provide a flexible means of quick transport which could be of crucial importance in a military emergency. The report concluded by stating that the first objective of U.S. air policy should be the maximum development of this new mode of transport.[57]

Further evidence of the Congressional intent to ensure a civil air fleet capable of meeting defense needs came in 1947, when the Congressional Aviation Policy Board was created. This Board

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[56]Ibid., p. 23.

[57]U.S. Congress, Senate, Report to Congress by the Attorney General on International Air Transport Policy, S. Rept. 784, 79th Cong., 1st sess., 1945, p. 1.

was formed as a result of concern in Congress over national security and the threatened bankruptcy of the aircraft industry and the civil air carriers in the U.S.[58] The Board was charged with studying the current and future needs of American aviation, including commercial air transportation and the utilization of aircraft by the armed services; the nature, type and extent of aircraft and air transportation industries that were desirable or essential to our national security and welfare; methods for encouraging needed developments in the aviation and air transport industries; and the organization and procedures of the government that would assist it in handling aviation matters efficiently and in the public interest.[59] The Board's report, issued in 1948, stated their belief that a strong, stable, and modern civil aviation component was essential to air power for national security.[60] More specifically, the Board recommended that the domestic and foreign air commerce of the U.S. be fostered and promoted by whatever means appeared most practical until the civil air carriers were strong enough to constitute an adequate logistical air arm for the National Defense Establishment in time of war.[61] The report specifically

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[58]U.S., Congress, Senate, Aviation Policy Board, Report to Congress on National Aviation Policy, S. Rept. 949, 80th Cong., 2d sess., 1948, p. 1.

[59]U.S., Congress, House, An Act to Provide for Establishment of a Temporary Congressional Aviation Policy Board, Pub. L.287, 80th Cong., 1st sess., 1947, p. 1.

[60]Senate Report 949, p. 4.

[61]Ibid., p. 5.

made note of the fact that it was economically impractical to maintain a peacetime air force capable of providing absolute security, recommending instead the operation of as many transport aircraft as possible in commercial service. These aircraft would then be available to provide a reasonable reserve for contingency situations.[62] In addition to providing a powerful fleet capable of immediate response, an expanded civil air transport industry would serve as a continuing market for aircraft manufacturers through normal replacement requirements.[63]

In 1950, Congress declared its policy to be the promotion of an improved transport aircraft, in the interest of safety, the national air transport system, and the national defense.[64] Also in that year, Congress amended the Civil Aeronautics Act by adding Title XII--Security Provisions. This Title gave the President the power to direct the Secretary of Commerce and the Civil Aeronautics Board to use civil aircraft to the maximum extent necessary in a national emergency.[65] A more significant event occurred in 1953, when President Eisenhower requested the Air Coordinating Committee

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[62]Ibid., p. 15.

[63]Ibid., p. 16.

[64]U.S., Congress, Senate, An Act to Promote the Development of Improved Transport Aircraft by Providing for the Operation, Testing and Modification Thereof, Pub. L. 867, 81st Cong., 2d sess., 1950, p. 1.

[65]U.S., Congress, Senate, An Act to Amend the Civil Aeronautics Act of 1938, as Amended, to Authorize the Civil Aeronautics Board and the Secretary of Commerce to Undertake Security Measures

to conduct a comprehensive review of America's aviation policy.[66] The Committee issued its report in 1954, heavily stressing the military implications of a sound civilian air transportation system. Several of their recommendations are presented below:

Concerning air cargo. Military and civil agencies should cooperate early in the development cycle of all new all-cargo aircraft, in order to produce aircraft responsive as nearly as possible to both civil and military requirements. The low ton-mile cost aircraft so developed should be made available by the manufacturers to civil operators at the earliest possible date consistent with military requirements. As to new military aircraft, the cooperation recommended herein should be limited to the incorporation of design features, in commercially adaptable aircraft, which would make them acceptable for civilian use without impairing their military usefulness.[67]

Concerning aviation mobilization planning. Transport air power has gained such importance as a factor in United States defense capabilities, that it is essential to winning a modern war if one is forced upon us.[68]

Relative to the Regulation and Control of Air Commerce, and for Other Purposes, Pub. L. 778, 81st Cong., 2d sess., 1950, p. 1.

[66]Civil Air Policy, A Report by the Air Coordinating Committee (Washington, D.C.: U.S. Government Printing Office, 1954, p. II.

[67]Ibid., p. 24.

[68]Ibid., p. 49.

The long range mobilization requirement for expansion of civil airlift capabilities should not be permitted to lead to unsound promotional and regulatory policies for civil aviation, since an industry growing on an economically sound basis provides the most effective way of achieving a high level of readiness without excessive cost to the taxpayer and excessive government regulation.[69]

For long range mobilization planning purposes there is an open-end requirement for expansion of transport air power limited only by (1) what the taxpayer can afford for military transport capabilities in being, and (2) sound promotional policies for civil transport capabilities.[70]

Concerning the aircraft manufacturing industry. Civil transport aircraft should incorporate provisions to facilitate the ready installation of equipment essential to military use, to the extent this is possible without appreciable penalty in weight or efficiency.

There should be an increasingly closer liaison between the civil and military agencies of the government regarding the design, development, testing and approval of new and improved air transport aircraft. This should include cross-representation on military type inspection and civil type certification boards.[71]

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[69] Ibid.

[70] Ibid.

[71] Ibid., p. 64.

This report was intended for Presidential use as a guide to executive decision-making on aviation matters. The document was significant in that it clearly stated a far-reaching policy of strengthening our strategic airlift response capability by promoting the growth of the civil air carriers. In addition, the joint civil/military development of new transport aircraft was offered as a cost-effective way of insuring a ready supply of commercial aircraft easily adapted to the needs of the military in time of crisis. Unfortunately, these constructive recommendations were either ignored completely, or only partially effected.[72]

During the mid 1950s, both the public and the federal government became increasingly alarmed at the rising number of mid-air collisions involving airliners. Up until this time, there existed two separate air traffic control systems: one for the military, and one for the civil sector. In 1956, President Eisenhower directed the completion of a study on aviation facilities. The Curtis Report, as the final document was known, was issued in 1957, and called for the consolidation of the two separate systems into a common one under a separate agency. This report, together with increasing public concern for the safety of the flying populace, ultimately led to the passage of the Federal Aviation Act of 1958. This legislation reenacted the Civil

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[72]U.S., Congress, House, Committee on Armed Services, Report on Military Air Transportation, S. Rept. 2011, 85th Cong., 2d sess., 1958, p. 10.

Aeronautics Act of 1938 in a substantially changed form, and was created to correct two shortcomings experienced under the Civil Aviation Act:

1. Diffusion of authority for the general regulation of civil aeronautics, together with a subordination of aviation interests within the government; and

2. a lack of clear statutory authority for centralized airspace management and essentially related activities.[73]

The Civil Aeronautics Board retained all responsibilities for economic regulation of the air carriers. However, all matters pertaining to airway management and safety were transferred to a separate Federal Aviation Agency.[74]

The Declaration of Policy for the Federal Aviation Act is substantially the same as the one contained in the 1938 Act, with the CAB being directed to consider (among other things) as being in the public interest, and in accordance with the public convenience and necessity:

> the development and maintenance of a sound regulatory environment which is responsive to the needs of the public and in which decisions are reached promptly in order to facilitate adaptation of the air transportation system to the present and future needs of the domestic and foreign commerce of the United States, the Postal Service, and the national defense.[75]

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[73]U.S., Congress, Senate, Committee on Interstate and Foreign Commerce, Report on Establishing an Independent Federal Aviation Agency, S. Rept. 1811, 85th Cong., 2d sess., 1958, p. 10.

[74]Ibid., p. 5.

[75]Federal Aviation Act of 1958.

Similarly, the Administrator of the Federal Aviation Agency was charged with: "(a) (regulating) air commerce in such manner as to best promote its development and safety and fulfill the requirements of national defense."[76]

The important thing to realize is that this legislation was the result of concerns for aviation safety, and essentially dealt with the centralization of air traffic control (civilian and military) under one agency.[77] The national policy did not change and was, in fact, restated almost verbatim from the Act of 1938. However, as the previous discussion on Congressional activity during the years from 1939 to 1958 illustrated, that body repeatedly stated its intention to insure adequate wartime airlift capability by supporting and promoting a competitive civilian air carrier industry. The following examples clearly show the Congressional desire for building up the commercial carriers by diverting MATS traffic to the civil sector. A Congressional Report issued in 1955 recommended the movement of commercial-type military traffic by civilian air carriers whenever possible, so as to encourage the expansion of the industry. This report went on to call for the restricting of MATS peacetime operations to persons and cargo that

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[76]Ibid., Section 103(a).

[77]U.S., Congress, Senate, Committee on Interstate and Foreign Commerce, Hearings on a Bill to Establish an Independent Federal Aviation Agency to Provide for the Safe and Efficient Use of Airspace by Both Civil and Military Aircraft, and to Provide for the Regulation and Promotion of Civil Aviation in Such Manner

had been carefully evaluated as to military necessity, permitting MATS transport only after the commercial carriers had been utilized to the fullest possible extent.[78] Similarly, an Appropriations Committee study recommended that the Air Force give attention to handling its air transport business in such a way as to assist in keeping the airlines in a reasonably sound financial and operating condition.[79] Finally, in 1958, the Congress stated that MATS should concentrate on moving outsize and special (hard-core) cargoes, leaving to the civil air carriers the primary responsibility for the transport of passengers and the more conventional kinds of military supplies.[80] Thus, the implication continued to be, as it was when the Act of 1938 was passed, that the airlift needs of national defense paralleled those of America's airlines, and that the sustained and continued growth of the air carrier industry was the best means of insuring an adequate wartime airlift capability.

1959-1978

In 1960, the Special Subcommittee on National Military Airlift of the House Committee on Armed Services issued a report that

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as to Best Foster Its Development and Safety. Hearings Before a Subcommittee of the House Committee on Interstate and Foreign Commerce on S. 3880, 85th Cong., 2d sess., 1958, p. 21.

[78]House Report 2011, p. 35.

[79]Ibid., p. 39.

[80]Ibid., p. 5.

was highly critical of our strategic airlift capability. Calling that capability seriously inadequate,[81] the subcommittee issued several recommendations. First, a new turbine powered cargo aircraft should be developed and should, to the maximum extent possible, be compatible with the economic transport of civilian cargo by the airlines; second, that the MATS fleet be modernized; third, that the CRAF fleet be upgraded. More specifically, the subcommittee found the CRAF program to be unresponsive to military requirements in the following respects. First, CRAF participants were bound only by a contractual arrangement to perform in times of emergency; second, only one of the (then) current CRAF members had perfected a labor agreement that would forego work stoppages in the event that services were required to support a military requirement; third, there was no incentive for a carrier to be a CRAF participant; fourth, there was no arrangement to provide for the contingency of a partial (versus a full) CRAF activation.[82]

Also in 1960, the President asked for, and received, a report from the Department of Defense on the role of MATS in both peacetime and war. As a result of that report, the President delineated a plan for airlift improvement entitled "Presidentially Approved Courses of Action."[83] These two actions set the tone for

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[81]U.S., Congress, Senate, Report of the Special Subcommittee on National Military Airlift, H. Rpt. 53, 86th Cong., 2d sess., 1960, p. 4031.

[82]Ibid., p. 4032.

[83]U.S., Congress, House, Report on Military Airlift, H.

a joint Congressional/Presidential interest in strategic airlift improvement that was to last for the remainder of the decade. The results of that governmental collaboration were quickly evident. In 1963, the subcommittee noted that all CRAF carriers had obtained a labor agreement ensuring adequate manpower in the event of activation. Furthermore, MATS had implemented an improved rate structure for obtaining peacetime airlift that provided an incentive for the airlines to participate in the CRAF. Finally, provision had been made for three levels of CRAF activation, a system still in use today.[84] By 1966, the C141 had been developed and was beginning to enter the Air Force inventory, the C5A was on the drawing boards, and the CRAF included 78 cargo jets (as of October 1, 1965) as opposed to only one at the end of FY1961. As a result, the subcommittee was able to report that we had increased our strategic airlift capability by more than 100% over 1960 levels.[85] It is worth restating here that all of this Congressional interest in airlift was still rooted in the idea of MATS transporting only those items that had to move on military aircraft (hard-core materials). The air carriers were still being relied upon to move the bulk of the commercial-type equipment.

Rept. 59, 91st Cong., 2d sess., 1970, p. 9255.

[84]U.S., Congress, House, Report on National Military Airlift, H. Rept. 29, 88th Cong., 2d sess., 1963, p. 5.

[85]U.S., Congress, House, Report on National Military Airlift, H. Rept. 62, 89th Cong., 2d sess., 1966, p. 7178.

Thus, in their 1970 report, the subcommittee noted that we still had a shortfall in available airlift, because the CRAF had no outsize cargo handling capability.[86]

In 1974, a study by the Department of Commerce emphasized the importance of our international carriers in terms of national interest considerations. The report noted that a viable system of U.S. airlines serving international routes was in the public interest, specifically citing the national security implications of CRAF augmentation to military strategic airlift resources. The study went on to state that the ability to respond rapidly to contingencies would be an increasingly important aspect of the defense and national security posture of the United States, but, because of the heavy costs, that requirement could not be provided by active and reserve military forces alone.[87] Special reliance would have to be placed on augmentation of military forces with sizable commercial airlift and sealift resources. The report highlighted the potential value of aircrews familiar with international operations and with the airline maintenance, communications, and meteorological facilities that were already in place around the world.[88]

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[86]U.S., Congress, House, House Rept. 59, p. 9249.

[87]U.S., Department of Commerce, Study on the National Interest Aspects of the Private International Air Carrier System of the United States, 93rd Cong., 2d sess., 1974, p. 1.

[88]Ibid., p. 3.

Similarly, Congressional interest in strategic airlift also remained high during the mid-1970s. The Research and Development Subcommittee of the House Committee on Armed Services recommended in 1975 that Congress consider government participation in the development of the next generation cargo aircraft. The subcommittee felt that such a commitment would be in keeping with the existing policy of continued modernization of airlift forces; would provide for design objectives to satisfy both civil and military requirements; and would furnish the cargo airlift capability to meet projected strategic requirements.[89] The subcommittee, however, refused to support a suggestion by the carriers that more peacetime cargo be diverted to them from MAC as an impetus to civil cargo fleet expansion. Congressional feeling was that such a policy would be counter-productive, wasteful of energy and economic resources, and would ignore the training aspects that resulted as a by-product of MAC's peacetime airlift.[90]

Governmental moves to deregulate the U.S. airline industry also began in the mid 1970s. In 1977, two similar bills, S. 292 and S. 689, were introduced into the Senate. The former intended to amend the Federal Aviation Act of 1958 to bring about the phased

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[89]U.S., Congress, House, Report on the Posture of Military Airlift, H. Rept. 40, 94th Cong., 2d sess., 1976, p. 9.

[90]Ibid., p. 10.

and progressive transition to an air transportation system which would rely on competitive market forces to determine the variety, quality, and price of interstate and overseas air services.[91] The latter had the same intention, and the two were combined to form the Airline Deregulation Act of 1978. One significant difference between the two, however, was the recognition in S. 292 of the inequities inherent in foreign air commerce. The bill directed the CAB to consider to be in the public interest the economic regulation of foreign air transportation so as to recognize the existence of market realities such as government controlled carriers, restrictive foreign laws and practices, bilateral agreements governing competition over specific routes, etc.[92] Unfortunately, this policy was not adopted in the final Act.

Both the Civil Aeronautics Act and the Federal Aviation Act provided for the comprehensive regulation of price and entry in order to ensure the development of a competitive commercial aviation system responsive to the national interest. The Deregulation Act was born out of a Congressional realization that CAB implementation of that mandate had, over the years, evolved into a system that

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[91]U.S., Congress, Senate. An Act to Amend the Federal Aviation Act of 1958 to Bring About the Phased and Progressive Transition to an Air Transportation System Which Will Rely on Competitive Market Forces to Determine the Variety, Quality, and Price of Interstate and Overseas Air Services, and for Other Purposes, 95th Cong., 1st sess., 1977, p. 1.

[92]Ibid., p. 7.

effectively discouraged competition at every turn.[93] The carriers were not profitting because they had to compete in a market where price competition was discouraged, forcing the use of costly frills and service amenities as the means of differentiating one carrier from another. Similarly, the public had been denied savings which might have been realized as a result of higher load factors, price competition, and less restrictive charter rules. In short, the airlines had little incentive to keep costs down, and to operate efficiently.[94] Thus, Congress sought to indicate its commitment to a competitive airline industry by depriving the CAB of some of its discretion so that anti-competitive practices could not re-emerge in the future.[95] Congressional intent was, then, to have the CAB regulate in such a way as to place primary emphasis on competition, with a competitive airline industry being a goal in itself. In other words, the CAB was charged with protecting competition, not competitors.[96]

The legislation as it was finally enacted had several objectives: first, to allow competitive market forces to govern

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[93]U.S., Congress, Senate, Report on Amending the Federal Aviation Act of 1958, S. Rept. 631, 95th Cong., 1st sess., 1978, p. 2.

[94]U.S., Congress, Senate, Committee on Commerce, Science, and Transportation, Regulatory Reform in Air Transportation, Hearings Before a Subcommittee of the Committee on Commerce, Science, and Transportation on S. 292 and S. 689, 95th Cong., 1st sess., 1977, p. 2.

[95]Senate Report 631, p. 4.

[96]Ibid., p. 52.

the industry, rather than government bureaucracy; second, the easing of restrictions to entry and route acquisition/expansion; third, the use of competitive pricing to set fares and rates; fourth, increased flexibility in route abandonment; fifth, protection for small communities against any subsequent loss of air services.[97] With this Act, Congressional intent took a different turn. In the Acts of 1938 and 1958, government promotion and support of the carriers was mandated in order to benefit the public. With the present law, Congress eliminated much of that direction, relying instead on competitive pressures to guide the industry towards that same goal.

National defense issues were not directly considered in arriving at this new policy of deregulation. Thus, the national policy today, as incorporated in the Airline Deregulation Act of 1978, remains essentially the same as it did in 1958. The CAB is charged with considering, among other things, as being in the public interest, and in accordance with the public convenience and necessity:

> the development and maintenance of a sound regulatory environment which is responsive to the needs of the public and in which decisions are reached promptly in order to facilitate adaption of the air transportation

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[97] U.S., Congress, House, Presidential Message Transmitting Proposals for the Reduction of Federal Regulation of the Domestic Commercial Airline Industry, H. Doc. 92, 95th Cong., 1st sess., 1977, p. 2.

> system to the present and future needs of the domestic and foreign commerce of the United States, the Postal Service, and the national defense;[98]
>
> the encouragement and development of an air transportation system properly adapted to the present and future needs of the foreign and domestic commerce of the United States, of the Postal Service, and of the national defense;[99]
>
> competition to the extent necessary to assure the sound development of an air transportation system properly adapted to the needs of the foreign and domestic commerce of the United States, of the Postal Service, and of the national defense.[100]

Once again, Congress has retained the position underlying previous aviation legislation that a sound commercial air transport system would insure an adequate reserve of airlift capability in the event of war. This is, in fact, the one thread that connects all the major aviation acts discussed. Congress has intended that the airlines should provide the bulk of our wartime airlift, rather than building a military air transport arm large enough to meet contingency needs. Clearly, history has shown this approach to be a sound one. Economic regulation and promotion fostered the controlled growth and expansion of the airline industry. As the carriers grew, and aircraft technology improved, they demanded larger and more powerful aircraft with which to serve their expanding route structures. The trend towards bigger and faster

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[98] Airline Deregulation Act, Section 102(a)5.

[99] Ibid., Section 102(c)1.

[100] Ibid., Section 102(c)4.

transport airplanes coincided perfectly with DOD requirements for increased wartime airlift capacity. Similarly, military transport aircraft requirements tended to coincide with those of the airlines. The parallel development of military and civilian wide-body aircraft, for example, provided a great deal of shared information and technology. In addition, the Air Force has been able to adapt several civil transport aircraft to support military requirements. In sum, then, Congressional activity up to 1978 resulted in the development of the largest, safest, and most extensive commercial airline industry in the world, a system based on private ownership yet responsive to the needs of national defense. Though the 1978 Act signalled a change in Congressional thinking concerning how best to foster civil aviation, the overriding view (as stated in the policy statements of all three Acts) has been, and continues to be, that, by advancing the cause of commercial air transport, we automatically improve our national defense capability.

CHAPTER IV

ANALYSIS AND FINDINGS

This chapter presents the analysis and findings of the research. The issues being examined necessitated the use of population data so that statistical sampling techniques in their purest sense were not applicable. However, to provide a more rigorous analytical structure, each hypothesis was considered as a momentary look at (or sample from) a much larger distribution which, for convenience, was viewed as a normal distribution.[101] Thus, each hypothesis could then be treated utilizing a cumulative standard normal distribution with each respective mean and variance known.[102] To reiterate, several sub-hypotheses have been examined in order to provide the collective evidence necessary to accept or reject each of three major hypotheses.

Hypothesis 1

Hypothesis 1(a)

The composition of the U.S. airliner fleet is shifting away from aircraft capable of fulfilling intercontinental airlift requirements.

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[101] Interview conducted on December 1, 1983 with Richard Sanders, Ph.D., Department of Statistics, The University of Tennessee, Knoxville, Tennessee.

[102] Harold L. Hays, Statistics (New York: CBS College Publishing, Inc., 1981), p. 210.

Presentation of the Data

Hypothesis 1(a) was tested by examining the U.S. jet airliner fleet on a year-by-year basis from 1972 through 1982. Aircraft considered to be capable of meeting long-haul airlift needs were all of those with four engines, plus the DC10 and the L1011. The number of airplanes in this category were summed, and compared with the total fleet in order to determine the percentage of our transport fleet that could support the Long-Range International Segment of the CRAF. The results are presented in Table 5, and graphically presented in Figure 3.

Interpretation of the Findings

The findings accept Hypothesis 1(a). Overall, the number of long-range aircraft has declined, both in absolute numbers, and as a percentage of our total fleet. Breaking the data into two groups (1972-1978, and 1979-1982), and analyzing the mean number of long-range aircraft in each group (805.57 and 671.75, respectively) produces a test statistic of $Z_0=3.936$. Since this value exceeds the value of $Z_{.05}=1.96$ for an upper one-tail test, the null hypothesis of equality is rejected in favor of the alternative that more long-range aircraft were present in the U.S. airliner fleet between 1972-1978 than 1979-1982. As airlines acquired more wide-body airplanes during the 70s, older B707/720s, DC8s, and Convair 880/990s were gradually replaced since capacity could now be maintained or even increased with fewer air frames.

TABLE 5

TOTAL JET TRANSPORTS IN AIRLINE OPERATIONS

	72	73	74	75	76	77	78	79	80	81	82
Four Engine											
B707	342	316	281	264	240	225	201	175	146	66	55
B720	57	45	35	29	25	18	14	7	3	2	1
B747	106	111	104	98	105	108	115	131	144	147	144
CV880/990	49	45	5							6	3
DC8	256	233	206	210	211	193	178	188	142	144	151
	810	750	631	601	581	544	508	501*	441	365	354
Three Engine											
B727	683	733	747	792	820	865	931	1029	1092	1096	1110
DC10	59	91	108	125	125	127	133	140	153	161	166
L1011	17	48	68	77	77	77	82	87	102	106	111
	759	872	923	994	1022	1069	1146	1256	1347	1363	1387
Two Engine											
B737	153	152	150	147	152	160	173	206	220	236	290
DC9	335	340	334	341	352	362	370	381	394	447	509
BAC111	58	31	36	30	31	31	30	28	27	27	36
F28									5	9	11
A300						2	6	12	19	25	30
B757											2
B767											13
	546	523	520	518	535	555	579	631	665	744	891
TOTALS	2115	2145	2074	2113	2138	2168	2233	2388	2455	2472	2632
Aircraft Suitable for Long-Range CRAF[a]	886	889	807	803	783	748	723	728	696	632	631
Amount of Change (First Derivative)		+3	-82	-4	-20	-35	-25	+5	-32	-64	-1
Rate of Change (Second Derivative)			+85	-78	+16	+15	-10	-30	+37	+32	-63
Percent of Total Fleet	41.9	41.5	38.9	38.0	36.6	34.5	32.4	30.5	28.4	25.6	24.0

*Does not include Concorde Aircraft operated by Braniff.

[a]Includes all Four-Engine, plus DC10 and L1011 aircraft.

Source: Census of U.S. Civil Aircraft, 1972-73 (Table 14), 1974 and 1976. 1978, 1980, 1981 and 1982, 1983.

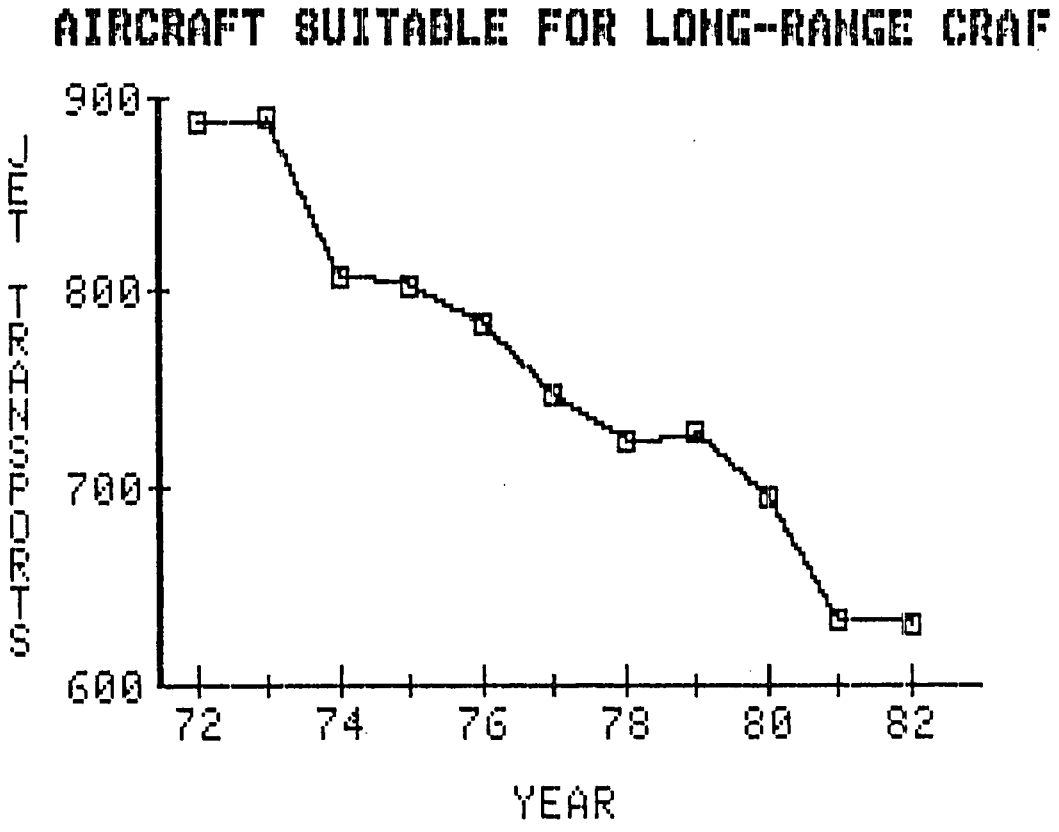


Figure 3. Number of aircraft suitable for inclusion in the long-range international segment of the CRAF.

This retirement accelerated in the late 1970s and early 1980s as the airlines were faced with meeting the stringent new U.S. government noise requirements which become effective December 31, 1984.[103] In order to comply with this pending legislation, carriers will have to either reengine those older aircraft (where that is possible), or cease flying them. Coincidentally, the growth of regional and feeder airlines in the late 70s resulted in increased demand for the smaller planes. The result is a shift in fleet composition away from long-range aircraft, towards smaller short-range planes.

Hypothesis 1(b)

The number of foreign flag air carriers serving the United States has increased significantly since 1978.

Presentation of the Data

U.S. and foreign flag carriers holding and exercising CAB international route authority (Property and Mail; Persons and Property; Persons, Property, and Mail; and/or Property only) in 1978 were compared with those performing in 1982. Carriers holding charter authority only were not considered, nor were those foreign carriers holding an authority but not serving the United States under the award. In addition, only those airlines providing service

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[103] Aviation Week and Space Technology (May 3, 1982), 25.

to and from the continental United States were included. The results are presented in Table 6.

Intepretation of the Findings

The findings reject Hypothesis 1(b). In 1978, there were 88 foreign carriers serving the United States, while 91 provided service in 1982. In order to make this analysis more meaningful, these figures were compared as proportions of the total international service provided by both U.S. and foreign carriers. Thus, in 1978, there were a total of 110 carriers (22 U.S.) serving offshore points from the United States, of which 80% were foreign flag. Similarly, 123 airlines offered the same services in 1982, with non-U.S. carriers comprising 74% of that group. Analyzing these two proportions in a two-sided test results in a test statistic of $Z_0=1.091$. Since $-Z_{.025}=-1.96<Z_0<Z_{.025}=1.96$, the null hypothesis of no difference in the two proortions cannot be rejected. In other words, the increase in the number of U.S. carriers in foreign service has more than offset the slight rise in foreign carriers serving American points. Perhaps of more significance is the fact that 16 foreign carriers initiated U.S. routes between 1978 and 1982, while 13 ceased U.S. operations during the same period. These findings do ignore the important question of service frequency, however, a matter that will be more fully addressed below.

TABLE 6

U.S. INTERNATIONAL AND FOREIGN FLAG CARRIERS
SERVING THE CONTINENTAL UNITED STATES

Country	Carrier	1978	1982
United States	Air Florida	*	*
	Alaska	*	*
	American	*	*
	Arrow		*
	Allegheny	*	
	Braniff	*	
	Capitol		*
	Continental	*	*
	Conner		*
	Delta	*	*
	Eastern	*	*
	Evergreen		*
	Flying Tiger	*	*
	Frontier	*	*
	Hughes Air West	*	
	Guy America		*
	National	*	
	Northwest Orient	*	*
	North Central	*	
	Ozark		*
	Pacific Southwest		*
	Pan American	*	*
	Piedmont		*
	Pilgrim		*
	Republic		*
	Southeast	*	
	Southern	*	
	Texas International	*	*
	Transamerican		*
	Trans World	*	*
	United	*	*
	U.S. Air		*
	Western	*	*
	Wien Air Alaska	*	
	World		*
	Airlift	*	*
	Challenge		*
	Seaboard	*	
	Rich International		*
Total U.S. Carriers		22	31
Argentina	Aerolineas Argentinas	*	*
	Transporte Aereo Rioplatense	*	*
	Aerotransporte Entre Rios	*	
Australia	Qantas	*	*
Bahamas	Bahamasair	*	*
Barbados	Caribbean Airways	*	*
	Caribwest	*	
Belgium	Sabena	*	*
Bolivia	Lloyd Aero Boliviano	*	*
	Transportes Aereos Bolivianos		*

TABLE 6 (continued)

Country	Carrier	1978	1982
Canada	Air Canada	*	*
	CP Air	*	*
	Nordair	*	*
	Norcanair	*	*
	Pacific Western	*	*
	Torontair		*
	Eastern Provincial	*	
Chile	Fast Air Carrier		*
	LAN Chile	*	*
China	CAAC		*
Columbia	Aerotal		*
	ARCA		*
	Avianca	*	*
	LAC		*
	SAM	*	*
	TAMPA		*
	Aerocondor	*	
Costa Rica	LACSA	*	*
	Servicio de Carga Aerea		*
Czechoslovakia	Ceskoslovenske Aerolinie (CSA)	*	*
Denmark	Scandinavian Airlines System	*	*
Dominican Republic	Dominicana	*	*
Ecuador	Andes	*	*
	Ecuatoriana	*	*
	AECA		*
El Salvador	Aerolineas El Salvador	*	*
	TACA	*	*
Finland	Finnair	*	*
France	Air France	*	*
	UTA	*	*
Germany	Lufthansa	*	*
	LTU		*
Greece	Olympic	*	*
Guatemala	Aviateca	*	*
Guyana	Guyana Airways	*	*
Haiti	Air Haiti	*	*
Honduras	SAHSA	*	*
	TAN	*	*
Iceland	Icelandair	*	*
India	Air India	*	*
Iran	Iran Air	*	
Ireland	Aer Lingus	*	*
Israel	El Al	*	*
Italy	Alitalia	*	*
Jamaica	Air Jamaica	*	*
Japan	Japan Air Lines	*	*
Jordan	Alia	*	*
Korea	Korean Air Lines	*	*
Lebanon	Trans-Mediterranean	*	*
Luxembourg	Cargolux		*
Mexico	Aero Mexico	*	*
	Mexicana	*	*
Morocco	Royal Air Maroc	*	*
Netherlands	KLM	*	*
Netherlands Antilles	ALM	*	*
	Caribbean Air Transport	*	*
New Zealand	Air New Zealand	*	*
Nicaragua	LANICA	*	
Nigeria	Nigeria Airways	*	*
Pakistan	Pakistan International	*	*

TABLE 6 (continued)

Country	Carrier	1978	1982
Panama	Air Panama	*	*
	INAIR	*	*
Paraguay	LAP		*
Peru	Aero Peru	*	*
	Faucett	*	*
	Aeronaves del Peru	*	*
Philippines	Philippine Air Lines	*	*
Poland	LOT	*	
Portugal	TAP	*	*
Romania	Tarom	*	*
Saudia Arabia	Saudia		*
Singapore	Singapore Airlines	*	*
South Africa	South African Airways	*	*
Spain	Iberia	*	*
Surinam	Surinam Airways	*	*
Switzerland	Swissair	*	*
	SATA	*	
Syria	Syrianair	*	
Taiwan	China Airlines	*	*
Thailand	Thai Airways International		*
Trinidad & Tobago	BWIA International	*	*
Union Africain et Malagache	Air Afrique	*	*
United Kingdom	British Airways	*	*
	British Caledonian	*	*
	Cayman Airways	*	*
	Heavylift Cargo		*
	Belize Airways	*	
	Laker Airways	*	
USSR[a]	Aeroflot	*	*
Venezuela	VIASA	*	*
	Transcarga	*	
Yugoslavia	Jugoslovenski Aerotransport (JAT)	*	*
Zaire	Air Zaire	*	
Total Foreign Carriers		88	91
TOTAL CARRIERS		110	122

[a]Includes only those carriers holding and utilizing CAB Route Authority.

[b]Operating privileges withdrawn by Order 82-1-6 until further order of the Board.

Sources: U.S. Civil Aeronautics Board, List of foreign air carriers holding Section 402 permits issued by the Civil Aeronautics Board for 1978 and 1982, provided by the CAB.

U.S. Civil Aeronautics Board, Reports to Congress, 1978 and 1980/81.

Hypothesis 1(c)

Foreign flag airlines have experienced a larger increase in market share (passenger and cargo) than U.S. flag carriers.

Presentation of the Data

Hypothesis 1(c) was tested by examining the market share of American international passenger and cargo traffic handled by U.S. carriers from 1973 through 1982. The data are shown in Table 7, and presented graphically in Figure 4.

Interpretation of the Findings

The findings accept Hypothesis 1(c). The data were divided into two groups (1973-1978, and 1979-1982), and the mean market share computed for each group in both passenger (51.45% and 49.05%) and cargo (37.70% and 33.45%, respectively) movement. The means within each market were then compared for significant differences. In the passenger area, this analysis resulted in a test statistic of $Z_0=2.749$. Since $Z_0>Z_{.0.5}=1.64$ in an upper one-tailed test, the null hypothesis of equality can be rejected in favor of the alternative that the U.S. share of international passenger traffic was larger between 1972-1978 than that experienced during the period 1979-1982. A similar analysis for the cargo market resulted in $Z_0=5.28$ which is also greater than $Z_{.05}=1.64$. Thus, once again, the null hypothesis of equality can be rejected in favor of the alternative that U.S. carriers moved more cargo between 1972-1978 than they did between 1979-1982. Though the percentage drop in

TABLE 7

U.S. CARRIER MARKET SHARE OF AMERICAN INTERNATIONAL PASSENGER AND CARGO TRAFFIC

Year	Passengers/ Pounds (000)	U.S. Flag Share (%)	Amount of Change	Rate of Change
		Passenger Movement		
1973	26659	54.8		
1974	26056	53.2	-1.6	
1975	25828	50.1	-3.1	+1.5
1976	27100	50.3	+ .2	-3.3
1977	28505	50.4	+ .1	+ .1
1978	32803	49.9	- .5	+ .6
1979	37348	49.0	- .9	+1.4
1980	39478	49.0	0	- .9
1981	40753	48.6	- .4	+ .4
1982	39499	49.6	+1.0	-1.4
		Cargo Movement		
1973	2354	39.1		
1974	2617	37.7	-1.4	
1975	2443	37.9	+ .2	-1.6
1976	2706	37.3	- .6	+ .8
1977	3091	36.1	-1.2	+1.8
1978	3656	38.1	+2.0	+3.2
1979	3684	34.5	-3.6	+5.6
1980	3600	34.8	+ .3	-3.9
1981	3840	32.2	-2.6	+2.9
1982	3743	32.3	+ .1	-2.7

Source: U.S. Civil Aeronautics Board, Reports to Congress, FY 78, FY 79 and FY 80/81.

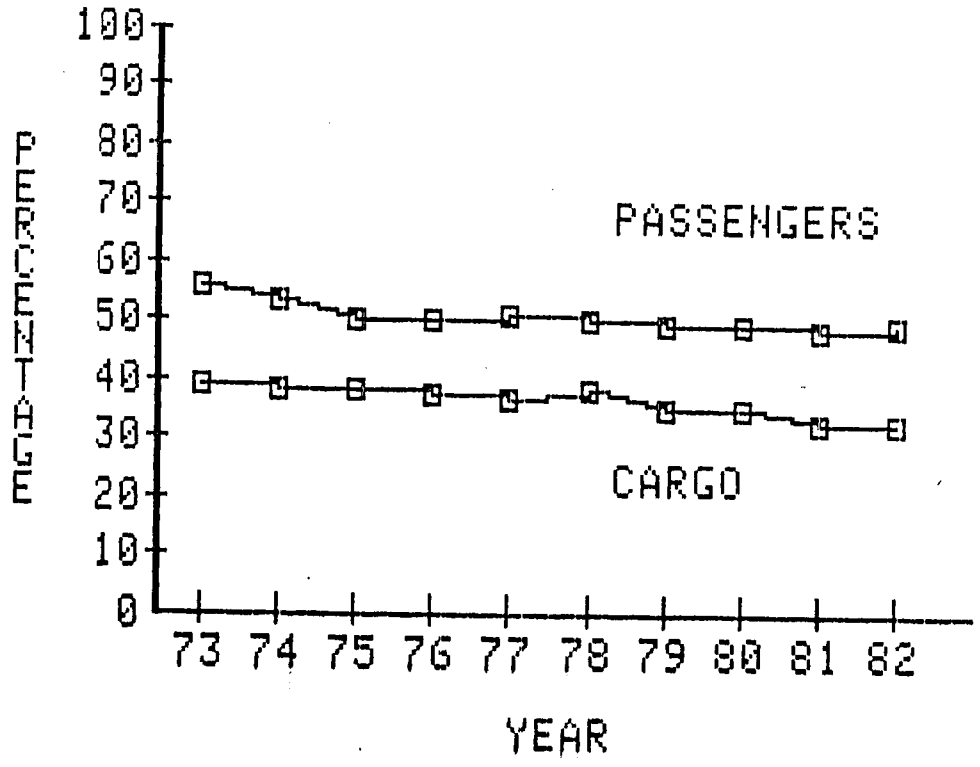


Figure 4. U.S. carrier market share of American international air traffic.

passengers handled is relatively small, the decline began at a time when total passengers flown actually increased. Between 1978 and 1979, the number of American international travelers increased by 13.86 percent, while U.S. carrier market share declined .9%. The fact that market share did not fall further can be attributed to managerial decisions on the part of carriers such as United, Air Florida, Braniff, and Continental to enter various foreign markets for the first time. Of more concern is the precipitous drop in the share of cargo to and from the United States that was moved on U.S. airlines. Though cargo volume between 1978 and 1982 was relatively stable, our carriers experienced a 5.8% drop in market share during the same period.

Hypothesis 1

The deregulation of the airline industry has adversely affected the U.S. strategic response capability.

Based on the acceptance of Hypotheses 1(a) and 1(c), Hypothesis 1 is conditionally accepted. A rival interpretation of the trend data presented is that deregulation has not significantly impacted those trends. However, the results of the hypotheses tests, when considered in concert with additional exploratory research, suggest that a conditional acceptance of the major hypothesis is warranted. Deregulation introduced the element of competition into airline operations. New, smaller carriers entered the domestic market, forcing the established airlines to restructure routes and

streamline operations. For the long-haul carriers, this meant adding frequencies, shortening routes, and closely monitoring expenses. To a great extent, these changes obviated the need for large fleets of long range aircraft. This, together with rising fuel prices and pending noise restrictions, led to the rapid retirement of older aircraft that were suitable for long distance airlift. In their place, smaller, more efficient planes are being purchased, although these are unsuitable for inclusion in the Long-Range International Segment of the CRAF.

In the international arena, deregulation has had several deleterious effects, the most notable of which is the loss of market share in both passenger and cargo movement discussed earlier. Although Hypothesis 1(b) was rejected, the increased competition resulting from foreign flag carriers has made itself felt despite the unchanged number of those airlines serving the United States. For example, Pan American has made the decision to withdraw from the cargo market to the extent that they have sold all of their B747 freighters. Although four have gone to Flying Tigers,[104] the other two have gone, or are going, to Japan Airlines,[105] and are therefore lost forever to the CRAF.

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[104] 1982 Annual Report, Pan American World Airways, Inc. (New York: Pan American World Airways, Inc., 1983), p. 4.

[105] Aviation News Digest (August 12, 1983), 4.

Clearly, changes have occurred within the airline industry that have adversely affected the U.S. strategic airlift capability. What is unclear, is the role of deregulation in causing these problems. As shown in the analysis of Hypotheses 1(a) and 1(c), an absolute reliance on before/after comparisons in this case may lead one to overstate the impact of that policy decision. Figures 3 and 4, pages 65 and 73, show that downward trends in U.S. air carrier fleet composition, passenger market share and cargo market share existed prior to 1978. Thus, while deregulatory actions have certainly had an impact on the civilian/military air transport relationship, it is simply too soon to accurately assess the severity of those effects alone on that partnership.

Hypothesis 2

Hypothesis 2(a)

There are not enough military materials handling resources to support a full CRAF/MAC mobilization.

Presentation of the Data

The wartime requirements for various types of materials handling equipment (MHE) were compared with the quantities available. The results are depicted in Table 8.

Interpretation of the Data

The findings accept Hypothesis 2(a). Of the 2,701 total pieces of mechanized MHE required during time of war, only 1,697

TABLE 8

MATERIALS HANDLING EQUIPMENT (MHE) AVAILABILITY

Equipment Type	Requirement	MAC Assigned	Other Commands	Shortfall
40K Loader[a]	198	147	29	22
25K Loader[b]	533	172	100	261
25K TAC Loader[c]	72	57	0	15
10K Std Forklift[d]	990	475	256	259
10K AT Forklift[e]	441	134	45	262
4K Forklift[f]	335	164	85	86
Wide-body Loader[g]	82	33	0	49
Container Lift Trucks[h]	50	0	0	50
Total Vehicles	2701	1182	515	1004
Aircraft Pallets[i]	1220052	20347	80890	18815

[a]Aircraft loader with a lifting capacity of 40,000 lbs, capable of handling up to five military pallets.

[b]Aircraft loader with a lifting capacity of 25,000 lbs, capable of handling up to three military pallats.

[c]Aircraft loader with a lifting capacity of 25,000 lbs, capable of handling up to three military pallets. Modification via a detachable kit extends the deck front and rear to accommodate two additional pallets.

[d]Forklift utilized on ramp areas, or in warehouses, with a 10,000 lb. lifting capacity.

[e]Forklift capable of operation on unimproved surfaces, also with a 10,000 lifting capability.

[f]Warehouse forklift with a 4,000 lb lifting capacity.

[g]Elevator loader used as interface between military loading vehicles and commercial wide-body aircraft.

[h]Vehicles capable of handling aircraft freight containers.

[i]Aluminum over balsawood sandwich construction; measures 88" x 108" x 2½' and has a 10,000 lb load capacity.

Sources: U.S. Air Force, Point Paper on MHE Funding and Capability, HQ MAC/TRXF, July 25, 1983; U.S. Air Force, Analysis of Materials Handling Equipment for Lower Lobes of Wide-Bodied Aircraft (Sabre Readiness-KILO), Assistant Chief of Staff, USAF, December 1979.

are available. This equates to a 37% shortfall, a figure that is probably conservative given the fact that 515 pieces are available only from non-MAC sources. Similarly, out of the 120,052 aircraft pallets necessary to satisfy contingency needs, only 101,237 are on-hand, a 16% deficit. In addition, these figures are for units assigned, and do not reflect any consideration for maintenance or combat losses.

Hypothesis 2(b)

The military does not have enough ground handling equipment to cope with a full CRAF/MAC mobilization.

Presentation of the Data

The numbers of truck-mounted passenger boarding stairs, latrine servicing trucks, and water trucks that are authorized were compared with the numbers of each assigned to MAC units world-wide. The data are presented in Table 9.

Interpretation of the Data

The data reject Hypothesis 2(b). Recent procurement activity by Headquarters MAC has resulted in the filling of all authorizations with new vehicles. Since this equipment is, essentially, new, MAC officials do not believe that a contingency shortfall exists with respect to aerial ground support equipment.

TABLE 9

GROUND SUPPORT EQUIPMENT

	Authorized	Assigned
Passenger Boarding Stairs[a]	111	113
Latrine Servicing Trucks[b]	77	77
Water Trucks[c]	43	45
TOTALS	231	235

Source: Interview with Lieutenant Colonel Ganger, HQ MAC/TRXF, August 15, 1983.

[a]Truck-mounted stairs compatible with narrow and wide-bodied commercial aircraft as well as the C5.

[b]Equipment capable of servicing latrine facilities aboard both civilian and military aircraft.

[c]Equipment capable of providing potable water to both civilian and military aircraft.

Hypothesis 2(c)

There are not enough qualified flight crews to support both a full CRAF activation and a call-up of Reserve/National Guard personnel.

Presentation of the Data

The contract each carrier signs with the Air Force preparatory to providing peacetime contract airlift services stipulates that a minimum of four crews per aircraft will be maintained in the event of CRAF activation, even after Reserve and National Guard forces are recalled. The crew ratios for each CRAF aircraft maintained by a participating carrier were compared with this four crew requirement. The data are shown in Table 10.

Interpretation of the Data

The data reject Hypothesis 2(c). The average crew-ratio for all carriers surveyed is 5.46. If this is compared with the desired level of four crews per aircraft, the analysis provides a test statistic of $Z_0=.7676$. Utilizing a two-tailed test, $-Z_{.025}=1.96<Z_0<Z_{.025}=1.96$, so the null hypothesis of equality cannot be rejected. With two exceptions, each carrier participating in the Long-Range International Segment of the CRAF has sufficient crew members to satisfy the needs of a full scale military mobilization that includes CRAF activation.

TABLE 10

AIRCREW MANNING OF CARRIERS PARTICIPATING IN THE LONG-RANGE INTERNATIONAL SEGMENT OF THE CRAF AS OF JUNE 1, 1983[a]

Carrier	Number of Aircraft Committed by Type					Crew Ratios
	DC8	B747	DC10	B707	L1011	
Airlift	2					4.75
American		14				12.5
			20			6.2
American Trans Air				1		3
Arrow	6					4
				6		4
Capitol	3					5
			1			5
Continental			2			8
			10			5
Evergreen	2					7
Flying Tiger		17				7
	17					4
Global				3		7
Northwest		29				6.4
			22			6.4
Overseas National	3					4
Pan American		43				7
			11			5
					12	5
Rich	1					2
Transamerican		3				6
			3			4
	12					4
TWA		18				6
					14	6
United		18				6.3
			11			6.3
	5					6.3
World		2				5
			8			5
	4					5
Zantop	1					2

[a]Ratio of crews per aircraft.

Source: Survey conducted by Mr. William Beveridge, HQ MAC/XPW, June 23, 1983.

Hypothesis 2

Design differences between civilian and military transport aircraft and cargo handling systems are potential limitations in time of war.

As noted previously, civil and military cargo aircraft and freight handling systems are not identical. A quick examination of the critical differences between the two will serve to put subsequent comments into perspective. With the exception of the L-100 aircraft (essentially identical to the C130), none of the commercial aircraft currently in use were designed specifically to transport cargo. Air Force 463L pallets are 88" X 108", with all materials handling equipment being designed to handle them widthwise (i.e., the long edge is perpendicular to the aircraft's line of flight). Narrow body airliners are loaded from the side, whereas all of the MAC aircraft are loaded either through the nose or the tail. Thus, pallets must be first placed into the CRAF airplane, then manually spun 90 degrees before they are pushed down the fuselage. Some B747s are equipped for nose loading, but this requires that the pallets enter the aircraft lengthwise (i.e., the long edge parallel to the line of flight). Hence, they all must be turned 90 degrees before they are put onto a loader. When this is done, military loading vehicles can carry only four pallets versus the five they are designed for. (It is worth noting here that, while military pallets can be transported on civil airplanes, commercial pallets and containers are virtually unusable in military aircraft.) If

the wide body airplane is fitted only with a rear side cargo door, this necessitates carrying out loading/unloading operations in dangerous proximity to the swept-back wing. Another problem is that large pieces of rolling stock or outside cargo are very difficult to handle via civilian aircraft. The narrow fuselage of the DC8 or B707 effectively limits the size and shape of the shipment, as does the nose opening in the wide body. In addition, the lack of a drive-on/drive-off capability proves to be a very limiting factor, especially in the context of a wartime scenario.

The evidence provided by analyzing the sub-hypotheses above accepts Hypothesis 2. The large shortfall in materials handling resources provides the firmest basis for this conclusion. Since military and civilian cargo handling systems are not directly compatible, the shortfall cannot be overcome by utilizing airline resources. In other words, military materials handling resources will have to provide almost all of our contingency requirements. With respect to CRAF activation, the shortage of wide-body loaders is of particular concern, since it is this equipment that allows military loaders to interface with civilian wide body transports. Ground support resources are adequate for contingency situations, and the air carriers who make up the CRAF appear to have enough crews to support a full mobilization. Thus, the basic limitation to an optimal wartime response is the fundamental incompatibility of military and civilian cargo handling systems.

Hypothesis 3

Hypothesis 3(a)

American commercial aircraft manufacturers are losing market share to foreign competition.

Presentation of the Data

Hypothesis 3(a) was tested by examining the composition of jet aircraft orders placed by the world's air carriers. The data do not include airplanes of Soviet manufacture, nor are airline options to purchase considered. The information is presented in Table 11 by aircraft type, and includes all jet airliners ordered from 1972 through 1982.

Interpretation of the Data

Hypothesis 3(a) is rejected. As above, the data were divided into two groups (1972-1977 and 1978-1982), and the mean market shares (86.63% and 81.7%, respectively) compared. The analysis provides a test statistic of Z_0=-1.36 which is greater than $-Z_{.05}$=-1.64. Therefore, the null hypothesis of equality between the two market shares cannot be rejected. Figure 5 is a plot of the market share enjoyed by U.S. manufacturers between 1972 and 1982. A trend line fitted to the data shows a slight drop in share of .46% per year, a decline so small as to be essentially nil. Figure 6 depicts aircraft orders received by both domestic and foreign manufacturers for the same

TABLE 11

TURBO-JET AIRCRAFT ORDERS PLACED ANNUALLY BY THE WORLD'S AIR CARRIERS: 1972-1982

Aircraft Type	Year										
	72	73	74	75	76	77	78	79	80	81	82
U.S. Manufacture											
B707	17	9	5	2	2	10	0				
B727	121	86	95	49	113	134	130	109	81	33	11
B737	14	41	47	33	38	36	145	72	103	124	72
B747	17	31	24	19	14	36	83	79	49	23	14
L1011	13	12	28	0	5	5	26	33	17	1	0
DC9	20	83	41	28	25	51	66	17	20	24	84
DC10	40	34	5	14	16	29	43	34	12	3	0
B757							40	0	72	27	4
B767							84	51	31	7	4
TOTAL	242	296	245	145	213	301	617	395	385	242	189
Foreign Manufacture											
Mercure (French)	10										
Trident (British)	14	15									
F28 (Dutch)	16	8	23	17	13	7	13	12	19	19	22
BAC111 (British)	5	0	5	5	2	0	4	6	0	1	1
Concorde (French/ British)	9							1			
VFW614 (Dutch)			2	3	5						
A300 (European)	7	1	12	13	1	20	69	71	33	28	0
A310 (European)								60	16	14	14
TOTAL	61	24	42	38	21	27	86	150	68	62	37
TOTAL ORDERS	303	320	287	183	234	328	703	545	453	304	226
U.S. Market Share (Percentage)	79.9	92.5	85.4	79.2	91.0	91.8	87.8	72.5	85.0	79.6	83.6

Note 1: Figures do not include aircraft manufactured in the Soviet Union.

Note 2: Figures do not include options to buy.

Sources: ICAO Bulletin, May 1973, May 1974, May 1975, May 1976, June 1977, May 1978, June 1979, June 1980, June 1981, July/August 1982, July 1983.

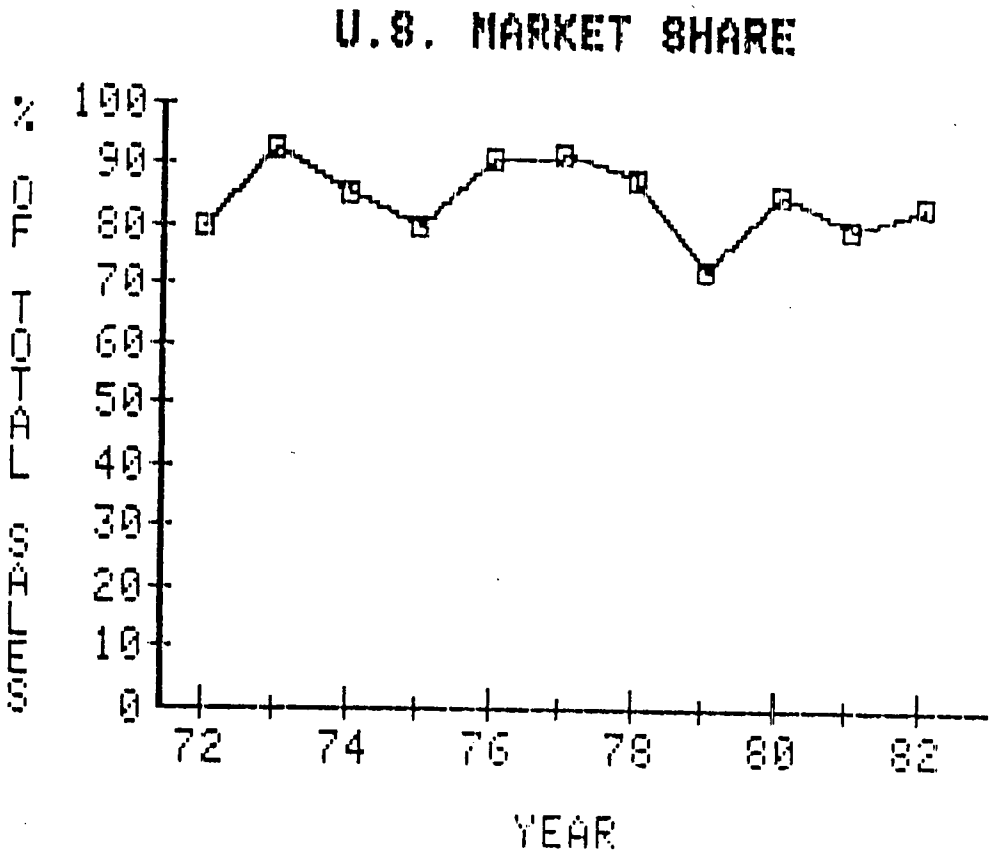


Figure 5. American manufacturers' market share of jet airliner sales: 1972-1982.

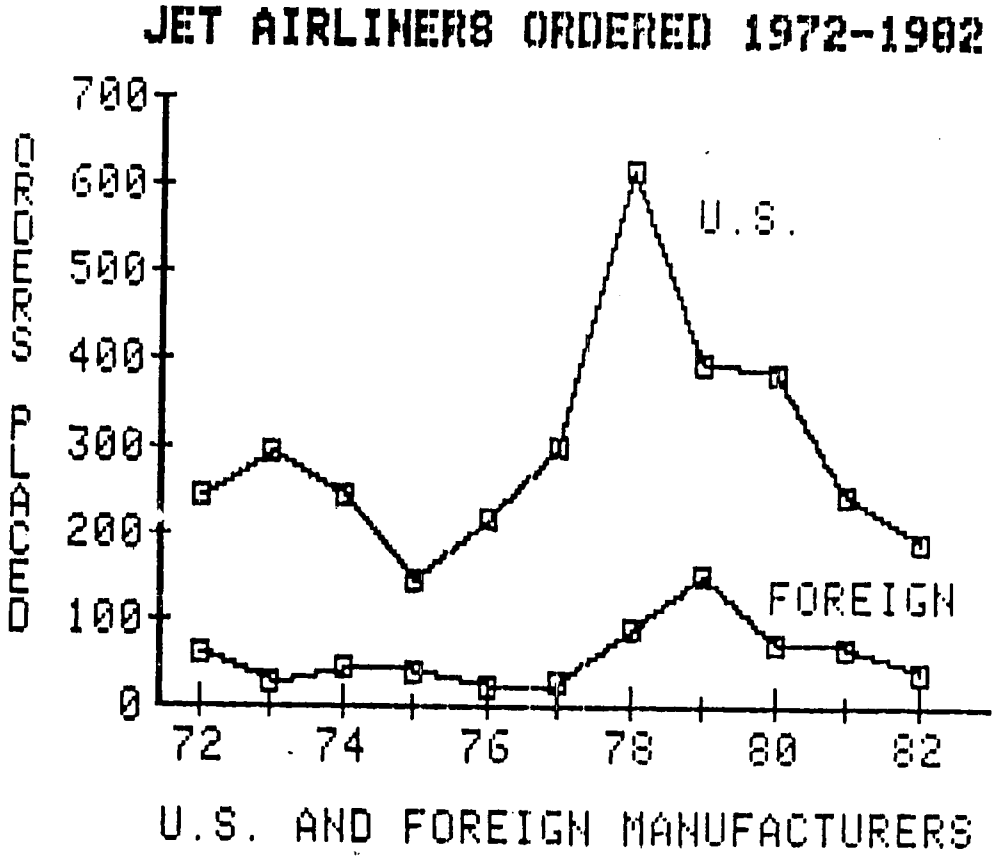


Figure 6. Orders placed for jet airliners: 1972-1982.

period. Trend lines fitted to both sets of points indicate that the American manufacturers could expect an average increase in new orders of 7.7% annually, while foreign aircraft companies could anticipate a 3.6% rise. However, the plot of actual orders placed shows much more fluctuation for the U.S. firms, suggesting that, in light of the market share data discussed earlier, the actual growth rate is closer to 4%. Thus, the conclusion is that U.S. commercial aircraft manufacturers have neither gained nor lost market share during the past decade. However, the changing nature of the foreign competition is of growing concern to both the manufacturers and the airlines, and will be covered in more depth later.

Hypothesis 3

> The airlines and the air frame manufacturers cannot afford to bear the cost and risk factors associated with the development of future generation heavylift, long-haul cargo transports.

Presentation of the Data

Hypothesis 3 was tested by first determining the financial commitments made by the major U.S. manufacturers at points in the development cycle of several different aircraft. This figure was then divided by the net worth of those firms during the same time period in order to derive some quantitative measure of the risk inherent in the introduction of a new airliner (i.e., a percentage representing the ratio of investment to net worth). The results are shown in Table 12.

TABLE 12

AIRLINER DEVELOPMENT COSTS AS A PERCENTAGE OF MANUFACTURER'S NET WORTH

Manufacturer	Airplane	Year	Investment	Net Worth	% of Investment to Net Worth
Douglas	DC8	1952	$40 million	$87.7 million	45.2
Boeing	B707	1954	$16 million	$109.4 million	14.6
Douglas	DC8	1959	$500 million	$138.7 million	360.4
Boeing	B747	1968	$750 million	$810.4 million	92.6
McDonnell-Douglas	DC10	1970	$1 billion	$627.2 million	159.45
Lockheed	L1011	1970	$990 million	$234.8 million	421.7
Boeing	B767	1982	Between $2 & 10 billion	$2.813 billion	Between 75 & 361[a]

[a]The breadth of these figures illustrates the fact that development costs are treated as proprietary information by all manufacturers. The data on the B767 are presented as an illustration of current investment requirements.

Sources: Paul Eddy, Elaine Potter, and Bruce Page, Destination Disaster (New York: Times Newspapers, Inc., 1976), pp. 60 and 94; Moody's Industrial Manual--1958, Part I (New York: Moody's Investors Service, 1958), p. 1285; Moody's Industrial Manual--1964, Part I (New York: Moody's Investors Service, 1964), pp. 80 and 666; Moody's Industrial Manual--1970, Part II (New York: Moody's Investors Service, 1970), p. 120; Moody's Industrial Manual--1973, Part II (New York: Moody's Investors Service, 1973), pp. 330, 2853 and 2854; Moody's Industrial Manual--1983, Part I (New York: Moody's Investors Service, 1983), p. 1112; John Newhouse, The Sporty Game (New York: Alfred A. Knopf, 1982), p. 20.

Interpretation of the Data

Hypothesis 3 is accepted. In 1954, Boeing committed approximately 15% of its net worth to launch the prototype of the B707.[106] In 1968, the company admitted to an initial investment of $750 million (92.55% of their net worth) in the B747, although Pan American Airways officials (Boeing's launch customer for the plane) put the figure at closer to $2 billion (246.8% of the manufactuer's net worth).[107] McDonnell Douglas and Lockheed were similarly committed to the wide body airliner. When the DC10 was rolled out in July 1970, the former had already invested $1 billion (159.45% of their net worth);[108] the latter had $990 million riding on the L1011 (421.71% of the firm's net worth) in January of 1971.[109] The only new aircraft currently in production, the B767, has already involved Boeing heavily, as the figures illustrate.

When viewed in the context of the risks underlying the production and sale of jet airliners, the significance of these numbers becomes apparent. Much of the investment comes at the very beginning of the program. New plants must be built, or old ones refurbished; advanced metalworking tools and machinery must

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[106]Paul Eddy, Elaine Potter, and Bruce Page, Destination Disaster (New York: Random House, Inc., 1976), p. 94.

[107]John Newhouse, The Sporty Game (New York: Alfred A. Knopf, 1982), p. 115.

[108]Ibid., p. 141.

[109]Harold B. Meyers, "The Salvage of the Lockheed

be procured; and engineering costs incurred. Once the program is underway, it must be managed; federal certificates on the new airframe must be obtained; and the sales force must deal with selling a still unborn airplane to the world's airlines.[110] The cash flow on a new airliner peaks shortly after the first batch have been produced, approximately four to five years after the program's inception (roughly the point at which Boeing's 767 project is today). The heavy costs of certification have been absorbed, and the firm has the most costly units (the first ones) still on hand. The breakeven point (if it is attained at all) lies 10 to 14 years beyond the decision to launch the program. Thus, the manufacturer is facing a future that is largely made up of unknowns. If production or certification problems arise, market demand falls, model variations are requested by the carriers, or new competitors emerge, the breakeven point can be pushed out to 20 years, or even out of reach completely.[111]

The preceding discussion points out two inescapable facts. First, a manufacturer must now risk his entire company in order to compete in the airliner market. Second, the degree of uncertainty surrounding that investment is extremely high. Indeed,

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1011," Fortune (June, 1971), 68.

[110] Newhouse, p. 20.

[111] Ibid., p. 21.

the probability of loss seems far greater than that of profit. The ramifications of these issues insofar as they impact considerations for a future long-haul freighter will be presented in the next chapter.

CHAPTER V

DISCUSSION OF FINDINGS

This research had two major objectives. Phase One traced the history of Congressional thought regarding the attainment of defense objectives through our national air transportation policy. Phase Two then examined several aspects of our long-range aviation industry as it is functioning today. In the first phase, the conclusion was that Congressional feeling has been, and continues to be, that defense requirements could best be met by encouraging the growth and development of the civil airlines. This chapter will discuss the findings resulting from Phase Two, and the subsequent implications for America's strategic airlift capability.

Deregulation and Strategic Airlift

Fleet Composition

The decline in the number of aircraft acceptable for inclusion in the CRAF has been a dramatic one, and will continue for the foreseeable future. More and more of the older four-engine narrow body aircraft (which do have intercontinental capabilities) will be retired as the implementation date for the revised government noise regulations draws closer. Given the depressed financial condition of many airlines, managers may elect to cease flying these planes rather than go to the expense of reengining them. In addition, new airplanes such as the B757/767 and the Airbus, are

unable to fulfill long-range trans-oceanic requirements because they have only two engines. Present International Civil Aviation Organization (ICAO) rules require that twin-engine aircraft operate within 90 minutes of a suitable airport,[112] while the U.S. adheres to a more stringent 60 minute rule.[113] Opposition on the part of the Federal Aviation Agency and the International Federation of Air Line Pilots Associations (IFALPA) to any extension of the 60-90 minute rule would seem to preclude a lifting of this limitation in the near future.[114] It is worth adding, parenthetically, that some of these new aircraft have the range capability to fly from the west coast to Honolulu, thus raising the possibility of their use in long-haul military service should wartime requirements necessitate their requisition in spite of existing prohibitions to the contrary. However, because they do not routinely fly overseas, there is no guarantee that these planes will have the on-board navigational instruments needed to support over-water operations. In addition, crews may not be familiar with inter-continental flight procedures. In other words, the strengths inherent in a planned, coordinated airlift reserve as embodied in the CRAF, are lost.

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[112] "Overwater Rule Extension Sought," Aviation Week and Space Technology (April 11, 1983), 30.

[113] "Helms Affirms Overwater Extension Opposition," Aviation Week and Space Technology (September 26, 1983), 44.

[114] Ibid.

Thus, the only aircraft presently in production that can satisfy both passenger and cargo requirements in the Long-Range International Segment of the CRAF is the B747. Lockheed produced their final L1011 in August of 1983,[115] while McDonnell Douglas also announced in August that they were halting DC10 production.[116] Of equal concern is the lack of a cargo-derivative for either the B757 or B767. (Although the airbus does offer a cargo version of the A300/A310, none are presently flown in U.S. cargo service.) Finally, all of the narrow body airliners presently being manufactured are too small for inclusion in the long-distance portion of the CRAF.

In light of the above discussion, and assuming those conditions do not change, our overall strategic airlift capability will continue to decline. Reductions in narrow-body aircraft will no longer be offset by a corresponding rise in wide-body capability. In fact, with the exception of Northwest Orient which ordered three (one a freighter) in May of 1983, most new orders for the B747 are now placed by foreign carriers. Thus, while the distribution of aircraft among our carriers may change (i.e. the Flying Tiger/Pan American trade mentioned earlier), there is no

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[115]"Lockheed Completes Final L1011," Aviation Week and Space Technology (August 22, 1983), 34.

[116]Aviation News Digest (August 12, 1983), 3.

reason to anticipate any increase in the total airlift capability available in time of war.

International Aviation

In 1944, representatives from 54 countries met in Chicago for the purpose of making arrangements that would allow international airlines to develop commercial transportation services.[117] Prior to that time, each carrier was responsible for negotiating with the governments of those countries the airline desired to serve. Since Great Britain and the United States had the most extensive airline industries, they became the primary force in the conference. The former advocated strict international regulation of routes, rates, flight frequencies, and market share because they felt that carriers would establish services far in excess of that warranted by the available traffic. The British feared that airlines flying for reasons of national prestige or political interests would require extensive subsidy which would, in turn, be used to finance uneconomic rate wars.[118] The U.S., on the other hand, wanted complete management discretion regarding aircraft choice and schedules, but was willing to restrict schedules so as to achieve a 65% load factor.[119] In addition, the U.S.

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[117] Nawal K. Taneja, U.S. International Aviation Policy (Lexington, MA: Lexington Books, 1980), p. 8.

[118] Ibid., p. 9.

[119] Ibid.

promulgated a multilateral approach that included allowing any nation's airline to pick up traffic in one foreign country destined for another foreign country. This position gave rise to fears among the other participants that well equipped and experienced U.S. carriers, backed by government subsidy, would dominate the industry.[120] The result was that no formal agreement was reached, and the conference disbanded. However, the United States and Britain met again in 1946 and were able to reach a compromise. The agreement, commonly called Bermuda I after the meeting location, set out the five freedoms of the sky that were to serve as a model for international aviation accords for the next 30 years. They are:

1. The freedom of any nation's commercial aircraft to fly over other nations;

2. The freedom of any nation's commercial aircraft to land in other countries for purposes of taking on fuel or for repairs;

3. The freedom of any nation's airline to deliver passengers and freight from that nation to other countries;

4. The freedom of any nation's airline to pick-up from other countries passengers and freight bound for that nation;

5. The freedom of any nation's airline to pick-up traffic

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[120]Mahlon R. Straszheim, The International Airline Industry (Washington, D.C.: The Brookings Institute, 1969), p. 32.

in one foreign country destined for another foreign country along trunk routes.[121]

The agreement was especially favorable for the United States. There were no provisions for restricting either the frequency or the number of carriers flying between British territories and the United States.[122] The two nations agreed only that capacity should be related to the traffic requirements between the country of origin and the countries of destination; the requirements of through airline operation; and to the traffic requirements of the area through which the airline passed after taking account of local and regional services.[123] In other words, capacity decisions were left up to the carriers involved, subject only to ex post facto review by the concerned governments.[124] Furthermore, geography made 5th freedom rights in North America of less value than in Europe.[125] In fact, it was this provision

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[121]U.S., Statutes at Large, Vol. 60, pt. 2 (1977), "Agreement Between the Government of the United States and the Government of the United Kingdom Relating to Air Services Between Their Respective Territories," p. 1499.

[122]Nawal K. Taneja, The Commercial Airline Industry (Lexington, MA: Lexington Books, 1976), p. 8.

[123]U.S. Statutes at Large, Vol. 60, pt. 2, p. 1515.

[124]Taneja, U.S. International Aviation Policy, p. 23.

[125]The Nation (February 23, 1946), 210.

that allowed the structuring of routes such as Pan American's "Round-the-World" service because the carrier could transport passengers between two foreign countries. However, the U.S. was very lenient in its own granting of route concessions in the years following the signing of the agreement. There were several reasons for the government's magnanimity. First, U.S. superiority in providing air service during those years was so great that serious competition from abroad seemed very distant. Second, liberal American awards were judged to be useful in that the relative improvement of European carriers in relation to the U.S. airlines would encourage a freer, more competitive and less restrictive environment. Finally, favorable concessions were viewed as part of the U.S. aid program directed at rebuilding the western world.[126]

It is important to reiterate that, while this was an agreement between the United States and Great Britain, the Bermuda Accord firmly established the bilateral process as the primary tool by which most nations (including the United States) negotiate air transport agreements with other countries. This process is based largely on political rather than economic considerations, with nations often exchanging air rights for purely diplomatic reasons.[127] As mentioned earlier, Congress has placed the burden

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[126]Straszheim, p. 39.

[127]Ibid., p. 35.

of these negotiations on the Department of State, which means that air routes may be only one of many foreign policy items being considered. Thus, the vested interests of each country often form the basis for national attitudes toward route grants and bilateral bargaining.[128]

As mentioned previously, the Bermuda I agreement served as the world model for international air accords for almost 30 years. However, as the expiration date of the British/American bilateral approached, things began to change. The British, expressing growing concern over the imbalance favoring American carriers between Great Britain and the United States, announced their intention to terminate the Bermuda I agreement in 1977.[129] The British felt that the U.S. carriers covered by that accord (Pan Am, TWA, and National) were getting too much of the North Atlantic business in addition to enjoying fifth freedom rights that decidedly favored them.[130] In order to realign the bilateral with economic reality, the British wanted complete pre-determination of capacity, one airline on each route for each country, and turn-around service on the U.S.-United Kingdom (U.K.) routes with no beyond rights. The U.S., on the other hand, argued for a wide-open

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[128]Ibid., p. 36.

[129]Taneja, U.S. International Aviation Policy, p. 21.

[130]"A British Victory," Time (July 4, 1977), 69.

agreement predicated on open competition and a competitive market structure.[131]

The end result, known as Bermuda II, was initialed just hours before the old agrement (and, by implication, all air services between American and British territories) was due to end. The accord imposed a restriction on the number of U.S. flag carriers serving markets in the U.K., established a mechanism for the British to control capacity, and limited the beyond points to which the U.S. carriers could carry British fill-up traffic.[132] In addition, the British won more new routes between the two countries, and a chance for a greater share of North Atlantic revenues.[133] U.S. carrier managers, perceiving that the new bilateral decidedly favored the British, felt that the government should have allowed U.S.-U.K. air service to cease, and issued permit termination notices to British airlines just to show the British and the world that the U.S. would not be forced into an agreement.[134] On a more positive note, the agreement did introduce more carriers, open up additional markets, and bring out lower fares. In addition, the loss of some fifth freedom traffic rights for points beyond Great Britain was a minor concession, given that larger

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[131]Taneja, U.S. International Aviation Policy, p. 21.

[132]Ibid., p. 22.

[133]"A British Victory," p. 69.

[134]"Pact Seen as Dangerous Precedent," Aviation Week and Space Technology (July 18, 1977), 25.

aircraft capable of longer non-stop legs had nullified much of the justification for those privileges put forth during Bermuda I.[135]

The Bermuda II agreement is more restrictive than Bermuda I. Carriers must now submit schedules to their governments for prescreening, with the affected governments consulting with each other as necessary, prior to beginning service. In addition, airlines have to obtain government approval of proposed fares and rates.[136] As was the case in 1946, the British-American agreement has become the model upon which all international air transport accords are based. Thus, as old bilaterals come up for renegotiation, the U.S. can expect to face a tougher bargaining stance on the part of those countries that now have their own established airlines. It is worth adding, parenthetically, that the Executive Branch of the U.S. government has historically considered bilateral air service agreements to be commercial executive agreements, which do not require Senate ratification. Most other countries in the world view bilaterals as treaties, a perception shared by some members of the Congress. This difference of opinion has led to an on-going disagreement between the two governmental branches as to which agreements should be

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[135]Tanaja, U.S. International Aviation Policy, p. 21.

[136]Ibid., p. 23.

considered treaties and which handled as executive agreements.[137]

Foreign Flag Competition

The nature of intercontinental air transport has changed dramatically since 1978. The purpose of the following discussion will be to examine the international operating environment within which our long-haul carriers must function. As shown in Chapter IV, the absolute number of foreign carriers serving the United States has changed very little as a result of deregulation, while the number of American carriers providing overseas services has grown markedly. Many of these new airlines (and some established ones as well) sought to serve city pairs that had not had direct air service before. Since, as was pointed out above, the exchange of flight services between two nations must be agreed upon in advance by both countries, the end result can be a minimum of two airlines (one from each country) flying a route when there may not be enough traffic to support them both.[138] For instance, United started daily service between Chicago and Tokyo on April 2, 1983, one day after Japan Air Lines began flying the same route thrice weekly.[139]

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[137]Rosalind K. Ellingsworth, "Bermuda Pact Sparks Opposition," Aviation Week and Space Technology (August 1, 1977), 26.

[138]"United/AF Agree on Buy of CRAF DC10," Aviation Week and Space Technology (August 25, 1980), 18.

[139]Harlan S. Byrne, "Airlines Battling Over Pacific Routes As United and Others Challenge Northwest," The Wall Street Journal (March 22, 1983), 35.

The "open skies" policy of the United States made many new cities accessible to foreign operators, effectively eliminating the historical concept of gateway cities, and allowing foreign flag airlines to increase their U.S. frequencies dramatically.

The most potentially serious limitation faced by U.S. international carriers competing in overseas markets is the fact that the vast majority of foreign airlines are controlled totally, or in part, by their respective governments. British Airways, for example, is wholly owned and controlled by the British government,[140] while the German government owns 75% of the stock in Lufthansa.[141] For these carriers, earnings can be a secondary concern, subordinated to political goals such as national prestige. This is a particularly significant concern given the poor financial condition of most of our long-range airlines. The American international carriers had their worst year ever in 1982. Pan American lost $485.3 million, while Flying Tigers and Trans World Airlines posted deficits of $72.5 million and $44.4 million, respectively.[142] Admittedly, these figures can also be attributed to factors such as costly fare wars, rising inflation-fueled operation and capital costs, the U.S. air traffic controllers strike, and a generally depressed travel market. However, it is also clear that, outside

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[140]"British Airways Swung to Profit in 1983," The Wall Street Journal (May 5, 1983), 38.

[141]Aviation News Digest (January 30, 1982), 8.

[142]Aviation News Digest (February 11, 1983), 6-7.

the United States, there is no "free-market" in international air transportation. Instead, it is an industry characterized by foreign government supports and subsidies designed to bolster the performance of each nation's own carrier at the expense of all others, most notably those displaying the American flag.[143] Several illustrations are pertinent.

> In 1981, China Airlines, the Taiwanese national carrier, required 90% capacity with full economy fares at $1200 to pay for a B747 roundtrip to the west coast of America. However, it was selling tickets at $800-900 because it considered the U.S. route its most important one.[144]
>
> As of 1981, the Belgian government had, over a five year period, invested $170.4 million to keep Sabena World Airlines aloft.[145]
>
> The French government pays depreciation and financial costs on the Concorde, as well as 90% of current revenue/expenditure loss. In 1982, these figures equated to $22.7 million and $13.2 million, respectively.[146]

Discrimination against U.S. carriers can take other forms as well. Often, new route awards are of little value to our airlines, because foreign carriers control so much of the feed traffic into and out of their home markets as to prevent the U.S. firm from competing on an equitable basis.[147] In addition, as recently as

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[143]"New International Policy Urged," Aviation Week and Space Technology (May 11, 1981), 32.

[144]Aviation News Digest (January 16, 1981), 2.

[145]Aviation Week and Space Technology (May 11, 1981), 32.

[146]"French Extend Paris-NY Concorde Service for One Year," Aviation Weeks and Space Technology (October 3, 1983), 36.

[147]Aviation Week and Space Technology (May 11, 1981), 32.

mid 1981, Lufthansa, Air France, Alitalia, and Korean Air Lines, all denied our carriers access to their ticketing and reservation systems.[148] Similarly, the managers of many overseas airports view foreign carriers as their primary source of income. This was the case at London-Heathrow, where non-British carriers were paying $10,000 to land a jet, roughly 600% more than at a comparable U.S. facility.[149] The end result is that bilateral agreements often provide lucrative routes to the United States for the foreign airlines in exchange for making marginal or unprofitable markets available to American carriers. For example, U.S. airlines account for only 14% of the air traffic to and from Switzerland; Swissair handles the rest. El Al, the Israeli national carrier, moves 70% of the air trade between the U.S. and Israel, while Philippine Airlines has a 55% market share of the U.S.-Philippines air market.[150] In view of the above discussion, it is not surprising that the U.S. share of international passenger and cargo markets has, in the former case, remained static and, in the latter instance, declined.

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[148] Ibid., p. 31.

[149] "U.S., Britain Agree on Heathrow User Fees," Aviation Week and Space Technology (May 2, 1983), 27.

[150] "U.S. Is Seeking 'Fair' Traffic Share for Overseas Flights," The Wall Street Journal, September 16, 1983, p. 8.

Summary

Domestic deregulation has had a profound effect on the U.S. airline industry. In and of itself, it forced the airlines to operate with, and adjust to, a totally new set of rules. It also served to heighten the detrimental effects of rising costs, a soft travel market, and the air traffic controllers strike. The overall effect was to plunge the industry into its worst financial crisis ever, with the airlines losing $1.3 billion over the past three years.[151] In order to combat those losses, carriers have pruned routes and fleets, ordering smaller aircraft to replace larger ones, or postponing fleet upgrading altogether. (North America now has the oldest commercial fleets, with an average age of 10.6 years. The youngest are in the Middle East, where the average age is 8.2 years.)[152] Similarly, survival for many U.S. airlines has meant restructuring their service mix. Pan Am's move out of the all-cargo market was discussed earlier, while Flying Tiger recently announced a 50% reduction in its cargo flights between the U.S. and Europe as a part of management's plan to emphasize the Asian air-freight market.[153]

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[151]"U.S. Carrier Officials Oppose Reregulation in Spite of Losses," Aviation Week and Space Technology (June 6, 1983), 51.

[152]Michael Feazel, "IATA Airlines Show Little Growth," Aviation Week and Space Technology (July 11, 1983), 25.

[153]"Tiger Unit to Reduce Shipments to Europe, Boost Asian Flights," The Wall Street Journal, September 28, 1983, p. 56.

Clearly, the CRAF is only as strong as the carriers who comprise it. Table 13 depicts the net income for the year ended March 31, 1983 for those airlines participating in the Long Range International Segment of the CRAF. Most of the carriers experienced severe financial problems during the past year, with three firms now flying under the protection of Chapter 11 bankruptcy petitions. Since those hardest hit have been our long-range airlines, our strategic airlift capability has, by association, been adversely affected as well. Braniff's failure deprived the CRAF of two passenger B747s which have not been replaced.[154] Similarly, should Continental ultimately cease operations, our intercontinental wartime airlift capability would immediately fall by two cargo-capable and nine passenger DC10s.[155] The events of the past five years have illustrated the fact that the needs of our long-range airlines no longer parallel those of national defense. Indeed, while the CRAF continues to remain a viable source of contingency airlift support, the first signs of weakness are there. National policy makers must take note of those signs before irreparable damage to our response capability occurs.

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[154]Monthly Civil Reserve Air Fleet (CRAF) Capability Summary as of 1 May 1982 (Scott AFB, IL: HQ MAC, 1982).

[155]Monthly Civil Reserve Air Fleet (CRAF) Capability Summary as of 1 July 1983 (Washington, D.C.: Department of Transportation, 1983).

TABLE 13

NET INCOME EARNED BY CARRIERS PARTICIPATING IN THE LONG-RANGE INTERNATIONAL SEGMENT OF THE CRAF FOR THE YEAR ENDED MARCH 31, 1983

Carrier	Net Income	Remarks
Airlift	-$11.3[a]	Figure is for 1980; Chapter 11 Bankruptcy,
American	- 4.1	June 1981
American Trans Air		Not available
Arrow	- 4.6	
Capitol	- 17.9	
Evergreen	1.7	
Flying Tiger	- 56.9	
Global	- .6	Chapter II Bankruptcy, October 1983
Jet Charter		Not available
Northwest	2.1	
Overseas National		Not available
Pan Am	-437.7	
Rich International		Not available; Chapter 11 Bankruptcy, July 1983
South Pacific		Not available
Transamerican	22.8	
Trans World	- 13.3	
United	26.7	
World	- 61.0	
Zantop	6.0	

[a]In millions of dollars.

Sources: CAB Air Carrier Financial Statistics, March 1983 (Washington, D.C.: U.S. Government Printing Office, 1983); Standard Corporation Descriptions (A-B) (New York: Standard & Poors Corp., 1983), p. 5438; Aviation News Digest (July 15, 1983), 6-7.

Commonality

The idea of developing one cargo airplane for both the airlines and the military is not a new one. As mentioned in Chapter III, the Air Transportation Coordinating Committee recommended in 1954 that we, as a nation, follow that approach. When initial work began on the C141 in the early 1960s, the intention was for it to be built in both civilian and military versions. However, there were no institutional arrangements provided that would have facilitated compromise design trade-offs between the airlines and the DOD. Consequently, the aircraft was developed solely for military requirements, and no commercial ones were ever manufactured.[156] Thus, the airlines obtained cargo aircraft and support systems that satisfied their needs, while the Air Force procured planes and equipment that met their requirements. The result was, and is, two separate systems comprised of aircraft and materials handling equipment that perform essentially the same functions, but in slightly different ways. This, in turn, has necessitated huge investments in duplicative equipment and the costly maintenance of separate spare parts inventories for each system.

In an effort to maintain a strong CRAF, and to add wide-body cargo aircraft to the fleet, the Air Force proposed a plan in 1974

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[156]"Heavylift Aircraft Studied by AF," Aviation Week and Space Technology (August 25, 1980), 51.

for adding convertibility features to new and existing passenger airplanes that would enable them to transport military cargo in time of war. Though initial response from the airlines was positive, Congress failed to appropriate the necessary funds. This lack of Congressional interest was particularly distressing in view of the fact that the airlines were still ordering aircraft acceptable for inclusion in the CRAF, so that required changes could have been made during production. Legislators finally approved $7.5 million in Fiscal Year (FY) 1978, but this figure was based on a flow of 20 aircraft going through the Boeing plant. When only one carrier responded with one B747, the costs became prohibitive, and the program was postponed.[157] In fact, approximately $21 million is now required to update a single older DC10. CRAF Enhancement was revived in 1983 when General Allen, then Commander-in-Chief of MAC, visited various chief executives throughout the airline industry in order to determine their interest in supporting future efforts in that area. Though still interested, these managers felt that an incentive was needed to stimulate active participation in the program. As a result, MAC Headquarters developed alternative approaches to the CRAF Enhancement involving various leasing options. Air Staff and DOD study groups analyzed these alternatives and concluded that current Congressional concerns

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[157] Ibid.

over government leasing programs would preclude their use in implementing a timely CRAF Enhancement program. General Allen, therefore, elected to expeditiously pursue a traditional CRAF Enhancement program.[158] Aircraft modifications under this plan call for strengthening the floor beams and adding a standard cargo door, rails and rollers, and a quick removal feature for the seats. The Air Force pays all costs, including direct retrofit expenses; annual fees for the 12-year duration of a CRAF contract, covering extra fuel consumption due to higher weight and landing fees, maintenance, and tire wear; flight to and from the modification facility (if required); and compensation for the time the aircraft is out of service.[159] In addition, should the airline later sell a modified airplane and suffer a loss as a result of the added weight caused by the CRAF modifications, the government will make up the deficit.[160] The Air Force plans to obligate $84.8 million by the end of FY 1983[161] and approximately $702 million over the next five years to support the program. Strong DOD and Congressional support resulted in the signing of a contract with Pan Am on September 26, 1983 that will ultimately result in the modification of 19 B747s

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[158]Point Paper on CRAF Enhancement (Scott AFB, IL: HQ MAC/XPW, June 8, 1983), p. 2.

[159]"CRAF Retrofit Acceptable to Carriers," Aviation Week and Space Techology (March 2, 1981), 20.

[160]"Three Carriers Accept CRAF Program," Aviation Week and Space Technology (July 4, 1983), 15.

[161]Ibid.

by 1988, increasing our capability by approximately 3.2 million ton miles per day.[162]

The CRAF Enhancement program as presently formulated has several positive features. First, and most important, is the rapid expansion of our military cargo capability. If projected funds are obtained, and the airlines provide sufficient aircraft, the cargo portion of the Long Range International Segment of the CRAF could grow by as many as 22 Boeing 747s, 35-40 DC10s, or some combination thereof. Second, that expansion would come at a per airplane cost that is approximately one sixth the expense of buying and operating a new B747.[163] However, the program is only a short-term solution to the airlift shortfall, and does nothing to address the more basic problem of developing a common air cargo system. A closer examination of B747 loadability will illustrate this concern.

Boeing's approach to loadability differs from that practiced by the Air Force, primarily from the standpoint of loading methodology and clearances. The latter uses a loading model which generalizes cargo shapes of a wide range of vehicles as rectangular boxes, whereas the former attempted individual evaluations of a few, specific units. Civil airlines routinely operate with two

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[162]Telephone interview with Captain Melvin Reeves, Headquarters MAC/XPW, Scott AFB, IL, October 12, 1983.

[163]Aviation Week and Space Technology (July 4, 1983), 15.

inch clearances during loading. This involves palletized or containerized cargo for the most part, rather than drive-on/drive-off military type equipment. The Air Force indicates that less than six inch clearances require special handling and/or waivers to prevent damage to the aircraft structure or cargo. To attain the high percentage of loadability Boeing shows, however, special handling and/or major disassembly (removing rotors, snubbing wheels, loading on special fixtures, etc.) of some items is required. In fact, most of this special handling would result in the C141 being able to carry the equipment. In addition, extra time and manpower are required for disassembly and reassembly. Boeing has loaded a less than actual weight mock-up built-to-scale, but did it with two inch or less clearances in the door. Actual vehicles and pallet combinations could weigh over 45,000 pounds, rendering them too heavy for the automatic pallet handlers and necessitating winching from both fore and aft. Furthermore, reduced door clearances, the need to turn the load while coming through the door, and the additional time required for winching all further complicate an already difficult loading process. In short, loadability of military equipment involves more than just clearances through the doors. Rapid on-and-off loads are essential to the smooth, high-volume traffic flow expected in major contingencies.[164]

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[164]Background Paper on Boeing 747 Loadability (Scott AFB, IL: HQ MAC/XPW, undated), p. 1.

Clearly, drive-on/drive-off capability is a major source of ground-time reduction; it is this capability that no amount of civil airliner modification will be able to provide. Table 14 depicts the load-ability of selected outsize vehicles addressed by Boeing, and compares the capability of the B747 to that provided by the KC10, C141, and the C5.

There are other problems that CRAF Enhancement fails to address as well. First, the dual approach to cargo handling is being perpetuated, encouraging the continued duplication of fixed costs associated with spare parts, support facilities and equipment, and freight terminals and systems. Second, during a full-scale CRAF activation, MAC will, in addition to everything else, have to contend with aircrews who are qualified only on certain civil aircraft types. Finally, changes in the composition of our airliner fleet, together with the increasing age of CRAF-eligible aircraft, portend a decline in the absolute number of resources available for modification.

Several compelling arguments can be made for the development of future state-of-the-art aircraft that will satisfy the needs of both the air carriers and MAC. If present trends within the airline industry continue, the carriers will be either unwilling and/or unable to support a new wide body, long-range cargo aircraft on their own. The air cargo market is simply not large enough to demand the necessary commitment from the airlines that would compel the aircraft manufacturers to build such a plane. However, a joint

TABLE 14

VEHICLE LOADABILITY

Vehicles	B747F	KC10A	C141	C-5
155mm Self-Propelled Howitzer	N	N	N	Y
M-1/M-60 Tank	N	N	N	Y
Combat Engineer Vehicle	N	N	N	Y
Bridge Launcher	N	N	N	Y
Lowbed Semitrailer, 60 ton	N	N	N	Y
Recovery Vehicle	N	N	N	Y
Cavalry Fighting Vehicle	N*	N	N*	Y
Infantry Fighting Vehicle	N*	N	N*	Y
Helicopter, Advanced Scout	S	N	N	Y
Helicopter, Obs, OH-58A	S	N	N*	Y
Helicopter, Obs, OH-58C	S	N	N*	Y
Helicopter, Utility, UH-60A	S	N	S	Y
Helicopter, Attack, AH-64	S	N	S	Y
Trailer Mounted Bakery Plant	Y	Y	Y	Y
Wheel-Mounted Bituminous Drier	Y	N	N	Y
Towed Sheepfoot Roller	Y	S	S	Y
Flame Thrower Service Unit	Y	N	N	Y
5-ton Bolster Truck	S	N	N	Y
5-ton RT Fork Lift RTL10-1	Y	S	Y	Y
5-ton RT Fork Lift M10A	Y	N	N	Y
Telephone Maintenance Truck	S	N	Y	Y
10-ton Truck Tractor	S	N	Y	Y
Truck Tractor, M915	S	N	N	Y
Tractor, Full Track, M9	S	N	N	Y
10-ton Trk Trac w/25-ton low boy	S	N	Y	Y
10-ton Trk Trac w/10-ton flt bed	S	N	Y	Y

Legend: Y = Yes, routine loading procedures
S = Special handling or major disassembly required
N = No, not loadable
* = can be further reduced to make loadable

Source: Background Paper on Boeing 747 Loadability, Scott AFB, IL: Headquarters MAC/XPW, Undated.

project involving both the airlines and the government, with the latter essentially acting as the launch customer for the new aircraft, would provide the impetus for initial production. Conceivably, government participation could result in a production run sufficiently large enough to reduce the cost of the air frame to the airlines. This could, in turn, result in lower prices for, and improved quality of, commercial air freight services with concomitant implications for the air freight industry as a whole. Similarly, MAC (and, by implication, the American taxpayer) could purchase its next generation of strategic aircraft at lower prices. Furthermore, it would benefit from having essentially the same aircraft operated by the airlines and committed to the CRAF.[165] This would go a long way towards resolving many of the commonality issues already discussed, with an accompanying reduction in the overall costs associated with providing an acceptable level of both peacetime and contingency airlift capability. If sales extended to friendly foreign airlines, spare parts availability and maintenance support would be available to MAC on a world-wide basis.

The aircraft should be designed to carry commercial passengers and cargo as well as outsize military cargoes, with advanced technology being used to achieve significantly lower direct

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[165]General Paul K. Carlton, "A Total Airlift System," Aviation Week and Space Technology, as quoted in the Congressional Record (March 21, 1977), 2345.

operating costs and improved fuel efficiency. The military and commercial versions could not be carbon copies but would make extensive use of commonality to reduce costs.[166] For example, commercial airlines don't really need or want the kneeling landing gear necessary to provide rapid drive-on/drive-off capability, and would be reluctant to pay for such an expensive feature.[167] However, the required loading and servicing equipment could be designed to cope with this type of variation.

Lockheed and Boeing have both conducted studies into the feasibility of producing an Advanced Civil/Military Aircraft (ACMA). The former noted that such a project represented a challenging, though attainable goal, citing military reluctance to incorporate economically attractive commercial design compromises into the C5 and C141 as the major obstacle preventing those aircraft from becoming viable alternatives for the airlines.[168] In addition, there is a considerable basis of airline support for a joint venture dependent upon the degree of influence permitted the civil sector in participating on an equal footing with the military.[169] This is, of course, the crux of the issue. Government and military

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[166] John F. Shea, "Route to Airlift Mobility Through Partnership (RAMPART)" (Scott AFB, IL: HQ MAC/XP, undated), p. 1.

[167] Aviation Week and Space Technology (February 23, 1981), 23.

[168] W. T. Garrett, J. R. Atcheson, D. L. Bouguet, W. A. French, C. R. Needles, Issues of Commonality (Marietta, GA: Lockheed-Georgia Company, 1980), pp. 4 and 5.

[169] Aviation Week and Space Technology (February 23, 1981), 51.

planners must be willing to accept some design concessions in exchange for increased commonality with civilian fleets. The C5A was built with several costly features that complicated the design and proved to be of minimal operational value (the swivelling landing gear, for example). The objective should be to obtain an advanced aircraft design capable of satisfying the long-haul cargo airlift needs of both MAC and the airlines. The reconciliation of the commonality issues discussed previously will result in significant cost savings and operational benefits to both sectors, and will provide a stronger, more responsive strategic airlift capability to the nation.

The Commercial Aircraft Industry

As discussed in the previous chapter, the U.S. market share of commercial aircraft sales has changed very little over the past decade. What has changed is the nature and extent of the foreign competition. Prior to 1976, the majority of foreign airliners sold were small, short-range models (for example the British Trident and the Dutch F28) popular primarily with the airlines serving the regions where the airplanes were manufactured. However, Airbus Industrie has made serious inroads into what used to be an American domain: the sale of airliners to the world's air carriers. Airbus is a consortium of French (with a 38% share), German (also holding 38%), British (20%), and Spanish (4%)

aerospace companies,[170] some of which are partly or wholly owned by their respective governments.[171] The consortium itself can make neither profit nor loss. All risk is borne by the partner companies, with the governments supporting a large part of new aircraft launch costs ($700 million to $2 billion). In return, the governments receive $3 million for each unit sold.[172] The firm's product mix includes the A300 and A310 (direct competitors for the B757/767), with a smaller version, the A320 (intended to enter the market now dominated by the B737/DC9) presently on the drawing boards.[173] Management's goal is to develop a Boeing-style family of planes, with future plans including, in addition to the 150-seat A320, a stretched A300 that would serve routes now supported by DC10/L1011 aircraft, and a derivitive of the A310 incorporating four under-wing engines that would appeal to operators serving long thin routes where passenger traffic does not justify a plane as large as the B747.[174] Initial order activity was less than spectacular, (see Table 11, page 85), but in 1977 sales began to grow, and not just on the basis of purchases by European air carriers.

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[170] Robert Ball, "Who's That Chasing After Boeing?" Fortune (April 21, 1980), 138.

[171] Alexander Stuart, "Boeing's New Beauties are a Tough Sell," Fortune (October 18, 1982), 122.

[172] Ibid.

[173] Newhouse, pp. 29-30.

[174] Ball, p. 144.

This expanding influence came at a time when the world's airlines entered an unprecedented period of recession from which they have yet to recover. This, in turn, has meant a shrinking market for new planes, especially among the American carriers. Instead, the emphasis has shifted to the Middle and Far East, with Boeing and Airbus competing for new aircraft orders from Japan Air Lines, Korean Air Lines, Gulf Air, Middle East Airlines, Yemenia, and Alia Royal Jordanian Airlines, among others.[175] The competition has become particularly intense during the past year. For instance, Thai Airways International announced (in September 1982) its intention to purchase two B767s, reversing a decision made in 1980 to buy two A300s. In May 1983, the company cancelled the Boeing order in favor of two Airbus airliners, largely as a result of more favorable terms being advanced by the European manufacturer.[176] This transaction illustrates a crucially important characteristic of airliner sales, namely, that manufacturing costs may have very little, at least initially, to do with selling price. As mentioned earlier, price, although eventually determined by the competition, must initially be based on the estimated cost of producing the three-hundredth or four-hundredth unit.[177] Instead, it is the

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[175] Jeffrey M. Lenorowitz, "Transport Marketing Rivalry Intensifies," Aviation Week and Space Technology (March 21, 1983), 31.

[176] "Thai Air Chooses Airbus Over Boeing in 2-Plane Order," The Wall Street Journal, May 3, 1983, p. 36.

[177] Newhouse, p. 19.

"learning curve" principal that motivates sales, the idea being that labor costs decline with the number of units produced as workers learn their tasks.[178] The reduced demand for new aircraft, together with the rise of Airbus' popularity, has prompted the manufacturers to go to extreme lengths to win a sale. For instance, in the transaction involving Thai Airways, Airbus agreed to purchase three of the carrier's DC8s,[179] a technique employed by all manufacturers as a sales promotion device. In fact, Boeing has had up to 47 unsold secondhand jets during recent months, while McDonnell Douglas has 25 to 30.[180] Similarly, price reductions may be one of the first inducements used to tempt a potential customer. In addition, liberal financing terms, spare parts packages, heavy bribes in countries where such practices are considered essential, and direct government intervention are techniques that have been used to promote sales of one aircraft over another.[181] The objective is to sell more airplanes so that the manufacturer can move down the learning curve as quickly as possible.

Of course, competition for airliner sales has always been vigorous. General Dynamics and Lockheed have been forced from

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[178] Ibid.

[179] The Wall Street Journal, May 3, 1983, p. 36.

[180] Roy J. Harris, Jr., and Normal Thorpe, "Commercial Jet Makers are Trying to Cut Big Stockpile of Used Planes," The Wall Street Journal, July 18, 1983, p. 21.

[181] Newhouse, p. 56.

the field entirely, and both Boeing and McDonnell-Douglas have had financial problems over the years. But the advent of the Airbus has, for the first time, raised a serious challenge to America's domination of the commercial aircraft industry. From the airline's viewpoint, this has been, and is, a good thing, since seller competition can certainly benefit the buyer. Indeed, the management of British Caledonian Airways (a private British carrier) recently ordered seven A320s and optioned three more despite the fact that financial terms offered by both Boeing and Airbus were essentially identical. One reason given for the choice was management's belief that Airbus should be supported as the only non-U.S. competitor in the civil aircraft market.[182] However, the commercial aircraft industry of today has experienced some fundamental changes which may obviate any potential competitive advantages.

Historically, manufacturers have always sought a launch customer for their new aircraft. Pan Am fulfilled that function for Boeing, with large pre-production commitments for both the B707 and the B747, as did Delta for the B757 in 1980.[183] However, Pan Am was able to take delivery of their airplanes on schedule, while Delta is not. The carrier recently delayed the delivery of five

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[182]"British Caledonian Plans to Purchase Seven Airbus A-320s," The Wall Street Journal, October 12, 1983, p. 34.

[183]Newhouse, p. 26

B767s and 30 B757s by 17 and 10 months, respectively.[184] In short, given the present environment and the four-to-five year lead time from aircraft design to initial deliveries, airlines will no longer be willing or able to commit the huge amounts of money required to guarantee the manufacturers an initial flow of orders for a new plane. A second development is the rising importance of foreign carriers, often at the expense of American long-haul firms. These airlines are less inclined to buy U.S. aircraft simply for the sake of having a U.S. fleet, especially when there is an attractive alternative in the form of the Airbus. A further complication is that foreign fleets, with a few exceptions, tend to be smaller than those maintained by U.S. lines, necessitating a more comprehensive sales effort on the part of our manufacturers for fewer per-carrier orders. Finally, for the first time, demand has largely shifted away from long-range aircraft, a trend that was discussed earlier. The sum total of these changes has been to greatly increase the risk faced by any manufacturer considering the production of a new airliner. A quantitative indication of that risk is illustrated by the McDonnell-Douglass MD100, a wide-body transport based on the DC10. Company officials estimate development costs of $700 million will be required to launch the aircraft,[185] an enormous

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[184]"Delta Delays Aircraft Deliveries, Plans Selective Market Growth," Aviation Week and Space Technology (August 29, 1983), 34.

[185]Letter from Douglas Aircraft Company dated September 13, 1983.

figure given the derivative nature of the airplane. The firm had hoped to receive 20 orders by November 1, 1983 so that production authorization could be given. However, the orders did not materialize, and McDonnell-Douglas ceased all work on the project.[186]

The implications for national defense are even bleaker. The air cargo market as it is presently structured is simply not large enough to support the development of a new long-haul freighter, and, with the exception of the B747, no intercontinental civil freighters are now being manufactured. This, in turn, worries MAC officials who, while pleased with the recent progress in the CRAF Enhancement Program, express some concerns regarding the age of the U.S. fleet comprising the CRAF.[187] Alternatively, the existing practice of producing a separate military transport implies that the next generation of MAC aircraft will be developed wholly at government expense. If the $3 billion cost of producing the C5A serves as any indication, maintaining MAC's airlift supremacy into the next century will cost the American public dearly. Perhaps the solution lies in an approach similar to the one used by Airbus Industrie wherein the government absorbs most of the development

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[186]"McDonnell Douglas Halts Transport Projects," Aviation Week and Space Technology (November 21, 1983), 14.

[187]Telephonic interview with Captain Melvin Reeves, HQ MAC/XPW, October 12, 1983.

costs of the new aircraft, and then receives a portion of sales revenues in return. Clearly, the risks associated with developing a state-of-the-art freighter are too great for the manufacturers to bear alone. From the standpoint of both optimizing resource utilization and insuring continued national defense readiness, a joint government/industry effort would result in an aircraft capable of meeting both civilian and military transport needs while minimizing the risks to our commercial aircraft industry.

CHAPTER VI

CONCLUSION

Chapter II presented a conceptual model of air transport policy formulation and implementation that served as the framework for this dissertation. By relating the findings back to this model, implications for both future research and national policy development can be identified.

Findings and the Conceptual Model

In relating the Phase I inquiry back to the aggregate model, the intent of Congress can be clearly seen. The goal has been, and continues to be, to utilize the resources and expertise of the civil aviation sector to meet the contingency airlift needs of the Department of Defense. This policy is in keeping with our democratic ideals, and has served the nation well over the years. As the airlines grew and prospered, they demanded bigger and faster airplanes which the manufacturers were happy to provide. The trend towards larger long-range aircraft benefitted the DOD as well, in the form of a CRAF better able to support trans-oceanic airlift requirements. In short, at least until recently, the Congressional policy was a sound one. With a few exceptions, most notably in the manufacture of military transports, society's resources were being used efficiently. The nation was able to maintain a strategic airlift force responsive to contingency needs without needlessly

building up military fleets or mandating actions on the part of the airlines.

However, the situation has changed since 1978. Though our national policy has remained the same, the manner in which our national aviation resources are utilized has not. The Airline Deregulation Act signed in that year resulted in profound changes within the airline industry, changes eagerly embraced by the carriers but which ultimately accentuated the effects of subsequent environmental events. The Air Traffic Controllers strike, rising fuel costs, and the depressed travel market combined to produce higher operating costs. As bilateral air agreements came up for renewal, the Department of State found itself negotiating with foreign governments who had adopted a much tougher bargaining position with respect to the exchange of air rights with the United States. Thus, American carriers were caught between increased competition on the one hand, and rising costs on the other.

The squeeze has proven to be more than some airlines can manage. Braniff International ceased operations altogether, while Contintental, Global, and Airlift are presently operating under the protection of federal bankruptcy laws. For the other carriers, survival has meant a move to smaller airplanes, shorter routes, and a shift in market emphasis. Insofar as these changes affect the CRAF, our national defense capability is impacted both directly and indirectly. In the former instance, the increased number of two engine aircraft in the air carrier fleet means that there are

fewer planes capable of supporting intercontinental airlift needs. In addition, the weakened financial condition of some firms raises doubts about their long-term survivability and, by implication, the availability of their aircraft in wartime. Finally, management decisions to reorient their company's marketing emphasis can (as in the case of Pan Am's withdrawal from the all-cargo arena) result in a net decline of suitable long-range airlift resources. The CRAF is affected indirectly, as well. For the first time, there is no new state-of-the art long-haul civil airliner in production. The civilian demand for such a craft, particularly a freighter, is minimal, so the manufacturers have no impetus to offer one. Furthermore, the risks associated with embarking on the development of any new airliner are so great that the chances of there being a new commercial wide-body freight transport in the foreseeable future are small. Thus, DOD planners are faced with a CRAF that is, at best, static in number. Though the CRAF Enhancement Program has the potential to add a great deal of capability, it does nothing to resolve the problems associated with having one cargo handling system for the military and a different one for the airlines.

The end result is that the historical principle of indirectly sustaining the needs of national defense through our civil aviation policy is no longer effective. The needs of the civil aviation sector have shifted away from those of national defense so that there is no longer a direct relationship between

maintaining a strong American airline system and meeting our strategic airlift requirements. When the above discussion is placed within the context of the conceptual model, it becomes evident that national defense needs are being subordinated to economic, social, and political concerns. This, in turn, must adversely affect the attainment of national security objectives. Thus, after almost 45 years, the time has come to reassess and restate our national aviation policy. Congress intends for our airlines to provide contingency airlift support to the DOD, and few would disagree with that position. But policymakers must realize that the civil aviation industry of 1983 is radically different from the one existing in 1938, 1958, or even 1978. Our national aviation policy must take account of the changes that have occurred in the civilian sector if we are to maintain a civil air fleet that does, in actuality, support a strong national defense posture.

Implications for Future Research

This research effort has been confined to an examination of national air transportation policy as it relates to strategic airlift capability. Further research is needed to identify the costs (both monetary and societal) associated with, for example, maintaining two freight handling systems, or developing different cargo aircraft for civilian and military applications. A research effort similar to this one on air transport could be conducted into the national defense/maritime industry relationship. Another area

where more research is needed concerns procedures for designing and procuring new weapons systems. It appears that transportation requirements for advanced weaponry are not considered until the unit is in an advanced state of construction. This means that, as in the case of the M1 tank, available transport resources may be unable to handle the equipment. The trend seems to be toward larger weapons which can only be airlifted on the C5. Given the relatively small number of these aircraft compared to our total airlift capability, it seems inadvisable to increase the number of units which it alone can move. Rather, transportation availability should be considered early in the development cycle so that requisite movement capability can be obtained, either by modifying the weapon itself so that it is transportable by smaller aircraft or by obtaining more advanced transport vehicles. Finally, the entire defense/industry partnership in our democratic society needs to be reassessed. While government involvement in business is anathematic to most Americans, there should be some provision for insuring that the nation's defense capability does not suffer as a result of our competitive ideals.

Implications for National Policy Formulation

This research has shown that the actual results of our national aviation policy are diverging from those that Congress intended to occur. Though military airlift needs have been addressed in detail over the years (for example, the report by the Air

Coordinating Committee in 1954, and the Presidentially Approved Courses of Action in 1960) history has shown that recommendations made in these studies have been virtually ignored. In fact, a draft copy of "A Statement of National Airlift Policy" was forwarded by General James Allen, the Commander-In-Chief of MAC, to the Secretary of Defense for his review on May 20, 1983. As a point of interest, this document is included in Appendix B. However, it is interesting to note that most of the objectives outlined in this latest proposal were previously mentioned in the 1954 report with few results. Rather than developing a separate policy for military airlift, policymakers should strive for a new national aviation policy that actively addresses the needs of national defense. This would imply a willingness on the part of government officials to insure that those needs are met. For example, at present there is insufficient demand for a new wide body freighter in the civil sector alone. If a military need for such a plane is identified, the government could assume some of the costs and risks associated with developing a craft suitable for both military and civilian use. The lower cost could stimulate commercial sales, while contributing to a reduced defense budget as well. Similarly, policymakers must realize that foreign air transport is not a competitive industry, and should adopt a tough bargaining stance in bilateral negotiations that takes account of that fact. In short, there are no easy solutions available. Economic incentives, presently embodied in the CRAF

Enhancement Program, are limited, both in scope and effectiveness. What is called for is a fundamental reassessment of both our present national aviation policy and the processes underlying that policy's formulation and implementation. The state-of-the-art in systems modeling offers policymakers more rigorous procedures for evaluating the effects of a chosen course of action on the welfare of both the system under consideration and the country as a whole. The National Transportation Policy Study Commission, for instance, utilized a dual approach involving the development of various economic scenarios and macroeconomic models to evaluate the potential effects of alternative policy decisions.[188] A similar approach could be taken with respect to examining the more specific issues discussed earlier involving the defense-air transportation interface.

Summary Comments

There is no doubt that the commercial aviation industry has undergone more changes in the past five years than at any other time in its history. It is equally clear that strategic airlift is an increasingly important and vital defense resource. The weapons arrayed against this country are becoming more

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[188] National Transportation Policy Study Commission, National Transportation Policy Through the Year 2000 (Washington, D.C.: U.S. Government Printing Office, 1980), p. 85.

sophisticated, while potential trouble spots are located far from our shores. The ability to quickly move men and equipment into these regions depends on our maintaining a strong, viable, and responsive strategic airlift fleet. If we are to continue relying on the civilian airlines to provide much of that capability, our national aviation policy will have to be actively used as a basis for government action. Our existing policy is largely passive with respect to national defense issues, a situation the nation can no longer tolerate. We must have a robust national air transportation policy that accurately reflects our commitment to, and reliance upon, strategic airlift, while acknowledging the critically important part that our long-haul airlines play in fulfilling that function in wartime. As the free world's preeminent provider of strategic airlift, we, as a nation, can accept nothing less.

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APPENDICES

APPENDIX A

ANNOTATED BIBLIOGRAPHY

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Worldwide Strategic Mobility Conference Proceedings. Washington, D.C., National Defense University, 1977.
Topics of interest include presentations on airlift's contribution to mobility planning, airline contributions to the nations strategic mobility, and air mobility.

Newhouse, John. The Sporty Game. New York: Alfred A. Knoph, 1982.
This work examines the commercial aircraft industry, detailing past successes and present problems.

Conference on Air Transportation Proceedings. Department of Industrial Management: Clemson University, 1977.
Items of importance are presentations entitled: "Airlift:

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Taneja, Nawal K. U.S. International Aviation Policy. Lexington, MA: Lexington Books, 1980.
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Kane, Robert M. and Vose, Allan D. Air Transportation. Dubuque, Iowa: Kendall/Hunt Publishing Company, 1979.
In addition to providing valuable historical information on both air transport and the regulation of air transportation, this book contains both the Federal Aviation Act of 1958 and the Airline Deregulation Act of 1978 in their entirety.

Locklin, D. Philip. Economics of Transportation. Homewood, IL: Richard D. Irwin, Inc., 1972.
This work provides background data on all transportation legislation. In addition, the development of the air carrier industry in the United States is covered, as are the specifics surrounding the evolution of air transportation regulation.

National Transportation Policies Through the Year 2000. National Transportation Policy Study Commission, Washington, D.C.: U.S. Government Printing Office, 1979.
This work is the result of an indepth look at transportation needs, resources, requirements, and policies in the United States through the year 2000. Specific areas addressed are Air Transportation, International Aviation, Capital Requirements Under Various Growth Scenarios, and Air Carriers.

"Military Airlift Command." Air Force Magazine. May 1981.
This article provides a descriptive look at MAC, including type and number of aircraft, organization, technical services provided, budget data, and aircraft procurement information.

Civil Reserve Air Fleet (CRAF) Load Planning Guide. Military Airlift Command, 1981.
This pamphlet presents information needed to plan loads for B747, DC10, L1011, B707 and DC8 aircraft. Part I gives information on basic policies and definitions, specialized loading equipment needed, and passenger baggage loading. Part II provides specific data on CRAF aircraft including exterior dimensions, interior dimensions of cargo areas, and passenger aircraft configurations. It will provide valuable comparative data relative to military aircraft capabilities.

Barber, F.A., Blattner, D.G., Markeeka, B.J., Fligstein, F.J. Design Options Study. Seattle, WA: Boeing Military Airplane Company, 1980.
This study considers a number of desirable military features as applied to a new commercial freighter, and examines the civil operating cost penalties and military life-cycle costs. This data will be invaluable in dealing with the question of developing a heavy-lift aircraft acceptable to both the military and civilian sectors.

NATO Civil Airlift: A Boost to Deterrence in the 1980's. Lewis, Marwood D., Longarzo, William L., Offer, Edwin R., Rendahl, Milton D., Smith, Davey L. Maxwell AFB, AL: Air War College, 1978.
This study identified current and projected NATO civil aircraft available for intertheater airlift, and proposes an effective organization within NATO capable of orchestrating the use of these assets. This information will be very useful in addressing the viability of, and possibilities for, using foreign flag aircraft for CRAF augmentation.

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This work is a chronological history of strategic airlift from World War II to 1976. The primary value of the report is its relative currency compared to other works on the same subject.

Garrett, W.T., Atcheson, J.R., Bouguet, D.L., French, W.A., Needles, C.R. Issues of Commonality. Marietta, GA: Lockheed-Georgia Company, 1980.
This report, like the one from Boeing cited earlier, examines various issues relative to designing a cargo aircraft suitable for both military and civilian uses.

Taylor, Donald C. An Analysis of CONUS Military Organization and Management Requirements for Optimizing the Movement of DOD Air Cargo by Wide-Bodied and Heavy-Logistical Aircraft. Maxwell, AFB, AL: Air University, 1974.
This study evaluates many aspects of the military system which provides airlift support to DOD activities within the continental United States (CONUS). Of primary interest are the sections dealing with ground handling equipment required for civilian aircraft.

"Boeing Proposes 747 Version as Cargo Airlifter." Aviation Week and Space Technology. October 5, 1981.
This article covers a Boeing plan to modify 747s to serve as

military transports. It is important because it illustrates the modifications required to make the aircraft even semi-suitable for full-time military transport duties.

Aviation Week and Space Technology. November 9, 1981.
This issue is devoted to International Air Transport. Subjects covered which are pertinent to the research include the changing airline operating climate, the strengthening air cargo market, plus several articles on current projects relating to new aircraft design and derivatives of existing transports.

"Lockheed Offers Airlift Alternative," Aviation Week and Space Technology. September 21, 1981.
In this article, Lockheed offers to sell 44 additional C5 aircraft to the Air Force at a fixed flyaway price of $4.18 billion. The article is pertinent because it presents many of the reasons that prompted the DOD to select this airplane as the short-term solution to the lack of readily available oversize cargo airlift capacity.

"Big Airlines Struggle to Pull Out of Plunge; Some May Not Make It." The Wall Street Journal. April 22, 1982.
This article discusses the current financial status of several U.S. carriers. In addition, it also notes the declining fortunes of the aircraft manufacturers and cites the possibility of major bankruptcies within the airline industry before improved environmental conditions prevail.

"Slump, Overcapacity Help Keep Many Fares Below Profitable Levels." The Wall Street Journal. April 28, 1982.
This article examines the effects of overcapacity, counter-productive pricing policies, and the air traffic controllers strike on the U.S. airline industry.

"Services Choose C5 Despite 747's plusses." Air Force Times. May 3, 1982.
Here, the selection by the three military services of the C5 over the B747 as the way to meet interim airlift requirements is discussed. Reasons for the decision, and opposing views, are presented.

"Pan Am Has Loss on Operations of $100.1 Million." The Wall Street Journal. April 29, 1982.
First quarter 1982 financial figures are given for Pan Am, Aloha, Air Florida, Piedmont, and Hawaiian Airlines. In addition, each carrier's position is discussed individually.

"Israel Bans El Al Flights on Sabbath, Holidays." The Wall Street Journal. May 3, 1982.
This article notes that El Al, the Israeli national airline,

will no longer be able to take off, fly, or land on Saturdays, the Jewish Sabbath, or any other Jewish holidays. This move will cost the carrier $30-$40 million a year, and is an excellent example of the effects that government control can have on airline operations.

"Airline Deregulation Doesn't Work." The Washington Post. April 8, 1982.
Column by Hobart Rowen discusses the incongruities of the present airline fare situation, and presents arguments to show that deregulation doesn't work.

"U.S. Plans Drive on Airline Discrimination." Aviation Week and Space Technology. May 3, 1982.
This article discusses plans by the U.S. government to formally address the inequities in the international aviation arena. Specific tools to be used to "encourage" a competitive environment include bilateral agreements, the Fair Competitive Practices Act, and Section 301 of the Trade Act of 1974.

"Earnings Skidded 17%, Worst Drop in Years, In the First Quarter." The Wall Street Journal. May 6, 1982.
Article discusses first quarter earnings performance for business as a whole, then goes into more detail by industry. Airlines were among the hardest hit, going from a 1st quarter 81 loss of $185,111,000 to a 1st quarter 82 loss of $556,678,000.

Aviation Week and Space Technology. April 12, 1982.
A study by the CAB finds that market share decline in fare-controlled markets was more than twice as large as in competitive markets, noting that pro-competitive stance in the U.S. is helping american airlines.

Aviation Week and Space Technology. February 15, 1982.
Table provides operating/cost data for wide-body aircraft.

"NATO Airlift Deficiencies Seen in Zaire Evacuation." Aviation Week and Space Technology. May 29, 1978.
Article details the multinational airlift undertaken May 18, 19, and 20, 1978 to rescue European hostages of rebels in southern Zaire. Main importance of the report centers around the point that only the U.S. Air Force has the capability to airlift heavy, bulky cargo in support of NATO requirements.

"DC10 Tanker/Cargo Program Starting." Aviation Week and Space Technology. January 16, 1978.
This article discusses the specifications and capabilities of the Kc10 as both an aerial refueler and a cargo transport.

"USAF Team Studies C5 Cost Overruns." Aviation Week and Space Technology. May 12, 1969.
This article examines the cost overruns on the C5A program, where the cost for 120 aircraft jumped from $3.4 billion to $5.2 billion.

"Senator Says C5N Jeopardizes C17." Air Force Times. May 17, 1982.
Article presents warnings by Congressional leaders that Air Force selection of the C5N could endanger its chances of ever getting a new heavylift aircraft.

Wood, Donald F., and Johnson, James C. Contemporary Transportation. Tulsa, OK: PennWell Publishing Company, 1983.
Textbook of value as a source of background and historical information on both the air carrier industry and airline regulation.

"CAB Defends Its Implementation of International Aviation Policy." Aviation Week and Space Technology. April 6, 1981.
Article in which the CAB defends deregulation in spite of rising losses by U.S. flag carriers.

Feazel, Michael. "Major's 1981 Losses Deepen." Aviation Week and Space Technology. February 8, 1982.
Financial data relative to U.S. airline performance in 1981 is presented.

"New International Policy Urged." Aviation Week and Space Technology. May 11, 1981.
Article delineates the problems facing U.S. international air carriers, citing specific cases of foreign government supports for foreign flag airlines.

"Is the U.S. Sabatoging Its International Airlines?" Business Week. January 26, 1981.
This article examines deregulation as it impacts U.S. international air carriers, and takes the position that the U.S. is undermining that segment of the air transportation industry as a result of that policy.

"U.S. Plans to Reevaluate Procompetition Policy Use." Aviation Week and Space Technology. March 23, 1981.
Article discusses drop in U.S. airlines share of international markets since deregulation, and the resulting rise in traffic carried by foreign flag airlines.

"House Panel Report Hits Military's Airlift Policies." Aviation Week and Space Technology. June 16, 1980.

This article deals with House of Representatives criticism of Air Force airlift policies. Specifically, the question of MAC competing with the airlines is addressed.

"Military Airlift Command." Defense Transportation Journal. February 1983.
This article contains a concise description of MAC, and provides details concerning its missions, organization, aircraft inventory, and CRAF composition.

"United/AF Agree on Buy of CRAF DC10." Aviation Week and Space Technology. August 25, 1980.
This article discusses the agreement between United Airlines and the Air Force regarding the purchase of a CRAF-modified DC10.

"CRAF Retrofits Acceptable to Carriers." Aviation Week and Space Technology. March 2, 1981.
As reported here, the retrofitting of specific equipment on wide-body aircraft in order to provide military cargo handling capability was agreed to by several carriers.

"International Policy Supported by National Air Carrier Association." Aviation Week and Space Technology. May 18, 1981.
This article details the support shown by the NACA for the CAB's deregulation policies relative to international commercial aviation.

"Heavy-lift Aircraft Studied by AF." Aviation Week and Space Technology. February 23, 1981.
This article discusses the Air Force requirement for a heavy-lift aircraft, and details some of the problems associated with attempts to achieve an airplane design acceptable to both civilian carriers and the military.

Endres, Gunter G. World Airline Fleets 1983. Hounslow, Middlesex, England: Airline Publications and Sales Ltd, 1982.
This volume provides fleet composition and cursory background information on airlines throughout the world.

Jane's All the World's Aircraft. London: Jane's Publishing Company, 1979.
This book provides data on Soviet cargo aircraft, and their characteristics. Similar data is presented on the Chinese air fleet.

Aviation News Digest. January 16, 1981.
Pamphlet provides information on the Taiwanese government's direct support of China Airlines.

Aviation News Digest. January 30, 1982.
This issue provides information on the percentage of stock in Lufthansa that is held by the German government.

Aviation News Digest. March 26, 1982.
This issue noted World Airways efforts to defer payments on outstanding debt.

"Drive to Increase U.S. Troop Mobility." Business Week. December 10, 1979.
Article discusses efforts to increase the ability of the U.S. to move military resources quickly and efficiently.

"Conditions That Did In Braniff Could Ground Other Weak Airlines." The Wall Street Journal. May 14, 1982.
Article discusses the conditions that resulted in the bankruptcy of Braniff, noting that the same factors could lead to other carriers failing.
"Senate Votes to Stop Buying C5 Transports."
This article covers the Senate action to stop the purchase of the C5N recently approved by the DOD.

"Aircraft Firms are Hit Hard by Long Slump." The Wall Street Journal. May 4, 1982.
Aircraft manufacturers are suffering serious setbacks as a result of the sagging airline industry. This article discusses the situation at each of the three major American manufacturers.

"Prospect for Defense Contract Boosts Boeing Despite Its Exposure as Braniff Creditor." The Wall Street Journal. May 17, 1982.
Article discusses effect of Braniff bankruptcy on Boeing, citing military contracts a source of future growth and profit.

"Alaska Airlines Loses Second-Rate Status By Making Big Money, But Problems Loom." The Wall Street Journal. May 19, 1982.
This article offers reasons for the success of Alaska Airlines, many of which may be pertinent to the operations of other carriers.

Transportation and National Policy. Washington D.C.: U.S. Government Printing Office, 1942.
This work provides valuable data on the relationship of transportation goals to the achievement of national objectives. Delineates how the former can be used to achieve the latter.

Ruppenthal, Karl M. Transportation Policy: Regulation, Competition, and The Public Interest. Vancouver, British Columbia: Centre for Transportation Studies, University of British Columbia, 1976.
This volume discusses the nature of transportation policy in a competitive society, detailing many of the problems associated with meshing the often conflicting goals of the various transportation factors with those established in the interest of the general public.

Gwilliam, K.M. Transport and Public Policy. London: George Allen & Unwin, Ltd., 1964.
This work discusses the nature of both transportation and public policy, including the goals of each, and goes into some detail on the conflicting nature of the two areas.

Whitson, William W. Foreign Policy and U.S. National Security. New York: Praeger Publishers, 1976.
The author discusses the changing international security environment, and the resultant changes required to update our foreign policy.

Anderson, James E. Public Policy Making. New York: Holt Rinehart & Winston, 1979.
This is a comprehensive book on public policy formulation. It will prove valuable in establishing what public policy is supposed to be, what it should do, and how it should be formulated.

Sharkansky, Ira. Policy Analysis in Political Science. Chicago: Markham Publishing Company, 1970.
This book is a guide to analyzing public policy. It briefly outlines what policy should be, but concentrates on several methods to be used in analyzing a given policy.

Furness, Edgar S. Jr., American Military Policy. New York: Rinehart & Company, Inc., 1957.
This work is largely a historical discussion of American military policy, but it also provides examples of the value of transportation in accomplishing that policy.

O'Conner, Raymond G. American Defense Policy In Perspective. New York: John Wiley & Sons, Inc., 1965.
The author discusses our defense policy over the years, and how it has adapted to changes in the world environment. The growth of logistics as a major component of that policy is discussed in depth, and is the primary value of this work.

"New Airline Casualties Likely but Survivors May Emerge Stronger." Los Angeles Times. May 14, 1982.
Article discusses the unstable nature of the airline

industry, citing problems resulting from deregulation, and offering the suggestion that more carriers may follow Braniff into bankruptcy.

"Senate OKs 747, Not C5." Air Force Times. May 31, 1982.
This report notes that the Senate voted to buy used B747s rather than 55 new C5s as recommended by the Senate Armed Services Committee.

"United Airlines Seeks to Stop Delivery of 20 of 39 Boeing 767s Under $1.8 Billion Order." The Wall Street Journal. May 26, 1982.
This article discusses the issues facing United Airlines as they attempt to upgrade their fleet, and is of value in illustrating the problems facing both the carriers and airframe manufacturers as new aircraft are introduced.

"U.S. Japan Reach 3-Year Aviation Pact, Boosting Service Between the 2 Countries." The Wall Street Journal. June 7, 1982.
This report discusses the new aviation agreement between the U.S. and Japan, and serves to illustrate the complexities associated with such negotiations.

Gregory, William H. "Braniff Bites the Dust." Aviation Week and Space Technology. May 24, 1982.
This editorial discusses the events leading up to Braniff's bankruptcy, and suggests that deregulation (rather than management action) was the primary cause of the carrier's failure.

Marsh, Alton K. "Senate Backs 747 Over C5 Transport." Aviation Week and Space Technology. May 24, 1982.
This report discusses the Senate's rejection of the C5 in favor of the B747, offering pro and con views of the action. Of particular interest is the suggestion that their action may result in more Congressional delay in addressing the airlift shortfall.

Gregory, William H. "Airlift at Stake." Aviation Week and Space Technology. May 31, 1982.
Editorial on the importance of airlift, specifically in light of the Falkland Islands conflict. The author notes that Britain had essentially no airlift support as a result of the past decision to curtail their strategic airlift capability, and criticizes the low priority given in this country to airlift enhancement until combat turns the subject overnight into a hot requirement.

Karr, Albert R. "Airline Deregulation After Braniff's Fall." The Wall Street Journal. June 14, 1982.

The author discusses the airline industry under deregulation, noting that management actions and environmental factors (fuel costs, controllers strike), more than deregulation per se, have contributed to carrier troubles.

Williams, John D. "Pan Am Posts Narrower Loss for 2nd Period." The Wall Street Journal. July 22, 1982.
This report presents the 2nd quarter 1982 financial data for three carriers, and discusses the improving picture at Pan Am in detail.

Harris, Roy J. Jr., "The Outlook for Airlines Improves a Bit." The Wall Street Journal. July 19, 1982.
This article says that conditions may be easing for those carriers that have survived into the third quarter (historically, the most profitable). In addition, the possibility of a fare war truce among the airlines was also noted as a positive indicator of the improving situation.

Rose, Frederick. "Canada, Airbus To Open Talks on A-320 Project." The Wall Street Journal. July 22, 1982.
This report discusses the possibility that Canada will begin producing major airframe components for the Airbus. This article is significant from the standpoint of illustrating the increasing competitive pressure on American aircraft manufacturers.

"A Bitter Clash Over Airlifters." Business Week. July 12, 1982.
This article examines the conflict between Boeing and Lockheed regarding Congressional debate on the C5 versus B747 issue.

Stengel, Richard. "Turbulent Flight for the C5B." Time. August 2, 1982.
This report also deals with the vigorous competition between Boeing and Lockheed as each tries to sell the DOD on their respective airplanes.

"Boeing Earnings Plummeted 49% in 2nd Quarter." The Wall Street Journal. August 3, 1982.
This article discusses the declining fortunes of Boeing as fewer jet transports are ordered.

Ott, James. "Second-Quarter Earnings Reflect Increase." Aviation Week and Space Technology. August 2, 1982.
This is an extensive look at the financial situation facing 11 U.S. carriers as they enter the 3rd quarter of 1982, and provides data for analyzing their respective performances.

"Pan American Plans to Sell L1011 Fleet." Aviation Week and Space Technology. July 26, 1982.
This report notes that Pan Am is planning to sell its fleet of 12 Lockheed L1011s, as well as two of its six B747 freighters. The importance of this action lies in its potential effect on CRAF capacity.

"Air Force Work of $218.4 Million Goes to 8 Airlines." The Wall Street Journal. August 10, 1982.
This report notes that 8 carriers will provide over $218 million worth of international air transportation to MAC in Fiscal Year (FY) 1983.

Gregory, William H. "New Lessons From Combat." Aviation Week and Space Technology. July 19, 1982.
This editorial notes, among other things, that airlift support is critical to combat mission success. The author says that the commercial airlift provided by British contractors was barely adequate to meet situational needs.

"Worldwide Airline Traffic Increased 2.2% for 1981." Aviation Week and Space Technology. August 9, 1982.
This report discusses the traffic growth worldwide, and cites factors that have caused costs to increase faster than yields, resulting in an industry loss of $1 billion.

"C5B Slip." Aviation Week and Space Technology. August 9, 1982.
This report says that the cost of the C5B program as risen an estimated $1.4 billion, while the delivery date of the first aircraft has slipped nine months to 1986.

Gregory, William H. "Safety Net For the Airlines." Aviation Week and Space Technology. August 9, 1982.
The author discusses the condition of international air transport, and suggests that the U.S. government should not abandon all concern over the health of the nation's air transport system. He notes that overseas competition under deregulation could be especially dangerous to the survival of American carriers.

Ingrassia, Lawrence. "Aggressive Management Improves Outlook for Republic Airlines, but Troubles Remain." The Wall Street Journal. September 7, 1982.
This article traces the history of Republic Airlines under deregulation, and notes that it still has some problems to overcome.

"World Airways Loss Widened in 2nd Period To Total $10.8 Million." The Wall Street Journal. August 26, 1982.
Financial troubles at World Airways are discussed, and are

significant from the standpoint of the carrier's participation in the CRAF.

Harris, Roy J. Jr., "Airlines Industry Seen Facing Some Turbulence With 3rd Period Unlikely to Match Flight Plan." The Wall Street Journal. September 10, 1982.
The report notes that 3rd quarter performance of many carriers is less than expected, and discusses some of the reasons behind the sluggish results. In addition, the author states that the threat of insolvency still hangs over some airlines.

"Overseas View of Deregulation." Aviation Week and Space Technology. August 30, 1982.
The President of Philippine Airlines offers comments on the overseas perspective of U.S. attempts to introduce airline deregulation into the global arena. These views tend to emphasize the philosophical differences that often exist between the managements of U.S. and foreign flag carriers.

"Lockheed C5B Wins Senate-Panel Vote in $201 Billion . Defense-Spending Bill." The Wall Street Journal. September 24, 1982.
This report documents the approval by the Senate Appropriations Committee to buy 50 C5Bs instead of the B747.

Morgenthaler, Eric. "Air Florida Fights Rumors of Bankruptcy." The Wall Street Journal. September 30, 1982.
This article deals with the growing problems plaguing Air Florida, and is particularly worthwhile as an example of how quickly the fortunes of an airline can change.

"El Al Board Threatens to Shut Carrier Down." Aviation Week and Space Technology. September 27, 1982.
Article covers the threat by El Al's board of directors to shut the airline down in response to employee resistance to adoption of work rule concessions. This is yet another example of the consequences of government-controlled airlines.

O'Lone, Richard G. "Boeing Rolls Out Its 747-300 Transport." Aviation Week and Space Technology. September 27, 1982.
This article discusses the introduction of Boeing's newest version of the B747. The largest-capacity transport yet developed, the aircraft is also available in a combination passenger/cargo configuration of potential value to the CRAF.

Gregory, William H. "Hindsight and Technical Risk." Aviation Week and Space Technology. October 4, 1982.

The author discusses the decline of the supersonic Concorde as a commercial endeavor. However, the thrust of his editorial is that the aircraft failed largely due to environmental factors coupled with an overly-long production lead time. His point is that the cost of not taking technical risks is higher than the cost of avoiding all risk, an important point as the aircraft of the future are evaluated.

"Commercial Plane Adds Military Cargo Features on Assembly Line." Air Force Times. October 25, 1982.
This report discusses the modification of a United Airlines DC10 to make it capable of handling military cargo under the CRAF Enhancement Program. The importance of this article is that this is the only aircraft to be modified under this program.

Williams, John D. "Pan Am Hopes That A Smaller Work Force And Fewer Flights Will Bring Back Profits." The Wall Street Journal. October 26, 1982.
This report details the efforts of Pan Am to reverse the decline in its fortunes, and is significant since this carrier is the largest single participant in the long-range segment of the CRAF.

Bryne, Harlan S. "The Outlook For Airlines Gets Bleaker." The Wall Street Journal. October 27, 1982.
This article covers the continuing troubles in the airline industry, noting that traffic was lower than projected during the third quarter.

"Airlines' Losses To Widen in '83, Report Indicates." The Wall Street Journal. November 8, 1982.
This report covers the disclosure by the International Air Transport Association (IATA) that financial losses for the world's airlines will be larger in 1983 than ever before. Knut Hammarskjold cites the worldwide recession, rising prices, high interest rates, currency fluctuations, and uneconomic fares as the primary causes.

Muller, Robert L. "British Airways, UK Officials Negotiate Withdrawal of State Aid for the Concorde." The Wall Street Journal. November 10, 1982.
This report notes that the British taxpayer has spent about $1.66 billion over the past 15 years to keep the Concorde flying, another example of the ramifications of foreign government involvement in airline operations.

The Wall Street Journal. December 30, 1982.
Report notes that the airlines are entering their slowest time of the year, and predicts that some may not survive the downturn without continuing to sell assets.

"Boeing Net Fell 26%, Sales 7%, In Third Quarter." The Wall Street Journal. October 26, 1982.
This article chronicles the continuing decline in Boeing's fortunes as the airlines remain unwilling or unable to take delivery of new aircraft.

"Advanced C5s Set For December 1985." Air Force Times. January 17, 1983.
Report notes that the Air Force awarded a $7.82 billion contract to Lockheed for 50 C5Bs and spares, and says that the first aircraft should be delivered in December of 1985.

Kessel, Yoram. "El Al to Resume Passenger Flights Today from Israel after 4-Month Dispute." The Wall Street Journal. January 12, 1983.
This report says that the Israeli Parliament voted to guarantee a $46 million loan to the carrier so that it could resume passenger operations.

Kessler, Felix. "Airbus, Boeing 767 Battle Heats Up." The Wall Street Journal. January 18, 1983.
This article discusses the increasing competition between Boeing and Airbus Industrie as they compete for sales of their respective aircraft. This report is very important as an indicator of how the fortunes of the American aircraft manufactures have shifted over the last few years.

Williams, John. "Pan Am Gets Extension on $82 million Debt Due This Year For 12 Lockheed Jet Planes." The Wall Street Journal. January 20, 1983.
This article notes that Pan Am is still having problems, and discusses the current situation as the firm continues its recovery program.

Castro, Janice. "Boeing Buckles Up For Takeoff." Time. January 24, 1983.
This report discusses the potential market for Boeing's new airliners, suggesting that they may be perfect for the air carriers of today. Of primary interest is the fact that none of these new aircraft are suitable for cargo transport.

Bryne, Harlan. "Airline Industry Faces Another Big Loss, But Some Carriers Are Weathering Storm." The Wall Street Journal. January 25, 1983.
This article discusses the fact that some carriers are prospering in spite of the industry's overall problems. The author sees little improvement in the first quarter of 1983.

"Boeing Net Fell 5.2% in 4th Period, 38% for all of 1982." The Wall Street Journal. February 1, 1983.
Boeing continues to suffer along with the airlines, and says

that only 110 jet transports were ordered in 1982 versus 224 in 1981.

Putka, Gary. "Pan Am Shares Take Off, Apparently Fueled By Short Squeeze and Faith in Economy Upturn." The Wall Street Journal. February 3, 1983.
This report discusses the improved performance of Pan Am stock, and offers reasons to explain the possible turnaround in the fortunes of that firm.

Harris, Ray J. Jr. "Tiger and Banks Explore Ways to Revise Debt." The Wall Street Journal. February 16, 1983.
This article discusses financial problems impacting Tiger International, another CRAF participant.

Greenwald, John. "Turbulence in the Skies." Time. February 21, 1983.
This report chronicles the current situation facing U.S. air carriers, emphasizing the effects of discount fare policies on the profitability of several airlines.

Famiglietti, Leonard. "AF Seeking 21st Century Airlift Craft." Air Force Times. March 14, 1983.
This report notes that the Air Force is conducting a "paper study" for a new aircraft to fill airlift requirements in the 21st century. One significant aspect of this study is the statement that the aircraft should be a joint civil-military development designed to meet the needs of both commercial and military airlift requirements.

"FAA Forecasting Growth In All Sectors of Aviation." Aviation Week and Space Technology. March 7, 1983.
This report presents the FAA's activity forecast for the airlines through 1994. Of primary interest to this research is the projection that fleet growth will be dominated by two-engine, narrow-body aircraft (growing by an average of 61 aircraft per year) and two-engine wide-body aircraft (increasing by an average of 47 aircraft per year).

Byrne, Harlan S. "Airlines Start Battling Over Pacific Routes As United and Others Challenge Northwest." The Wall Street Journal. March 22, 1983.
This article discusses the increasing competition on the air routes of the north Pacific. The report is important because it points out some of the problems faced by U.S. carriers as they attempt to expand their operations and, therefore, compete with foreign airlines.

"Congress May Reconsider Deregulation." Aviation Week and Space Technology. March 14, 1983.
This article discusses the growing debate in the Congress

over deregulation, and presents some of the alternatives being considered by House and Senate leaders to cope with issues such as price wars and declining levels of air service to small communities.

Randolph, Anne. "Fuel Prices, Deregulation Shape Air Cargo Industry." Aviation Week and Space Technology. March 14, 1983.
The author presents projected 5-year growth trends in various markets, and discusses the prospects for several carriers as they cope with various environmental changes.

Kozicharow, Eugene. "Carriers Attempting to Reduce Capacity." Aviation Week and Space Technology. March 14, 1983.
This report covers the efforts being made by U.S. airlines to reduce capacity and stabilize fares so as to improve revenues.

Feazel, Michael. "European Carriers' Fares Expected to Rise Slowly." Aviation Week and Space Technology. March 14, 1983.
The author discusses the airline industry in Europe, noting that carriers there are facing many of the same problems as those based in the United States. Fares are expected to rise more slowly than the rate of inflation, lowering overall profitability and slowing fleet modernization.

"CAB Finds Deregulation Improving Efficiency." Aviation Week and Space Technology. January 31, 1983.
This report discusses the CAB's contention that, despite some drawbacks, deregulation is leading to a more efficient airline system.

Kozicharow, Eugene. "CAB Chief Urges International Panel." Aviation Week and Space Technology. March 21, 1983.
This article details the proposal by CAB chairman Dan McKinnon that a 3-member Civil Aeronautics Administration be created to take over many of the international aviation functions within the Transportation Department, after the CAB sunset in 1985.

Lenorovitz, Jeffrey M. "Transport Marketing Rivalry Intensifies." Aviation Week and Space Technology. March 21, 1983.
This report discusses the intense marketing battle developing among Airbus Industrie, Boeing, and McDonnell Douglas for aircraft orders from airlines in the Middle East and Far East.

"Airlift Command Fulfilling High Priority Cargo Delivery

Mission." Aviation Week and Space Technology. February 7, 1983.
This article discusses MAC operations in support of U.S. military forces in the western Pacific. The report is especially significant in terms of providing similar support via CRAF assets.

Stuart, Alexander. "Boeing's New Beauties Are a Tough Sell." Fortune. October 18, 1982.
The author discusses the present situation at Boeing, particularly in view of the firm's efforts to market two new aircraft.

Ball, Robert. "Airbus Is Rough Competition." Fortune. October 18, 1982.
This report details the success of Airbus Industrie in competing with American airframe manufacturers.

"Japan Opposes Deregulation Despite Bilateral Agreement." Aviation Week and Space Technology. November 8, 1982.
This report details the continued reluctance on the part of the Japanese to accept any form of airline deregulation, despite pressures being brought by the U.S. government.

"U.S. Deregulation Proceeds Despite Concerns." Aviation Week and Space Technology. November 8, 1982.
The article discusses the continuing move towards total deregulation of the airline industry, and presents some of the problems that have resulted from that policy.

"Flying Tigers Plans Route Expansion." Aviation Week and Space Technology. November 8, 1982.
This report documents plans by Tiger International to expand air cargo operations to South America. In addition, the carrier plans to reengine older DC8 freighters in an effort to increase performance and fuel efficiency while reducing engine noise.

"U.S. Carriers Mark Drop in Freight." Aviation Week and Space Technology. November 8, 1982.
This article discusses the circumstances behind the drop in both domestic and international air freight, and shows how several carriers are reacting to that downturn.

"Boeing Planning 747 Freighter Upgrades." Aviation Week and Space Technology. November 8, 1982.
This report documents some of the changes being planned for the 747 freighter, both in the short and long term.

"Airline Problems Enter Third Year." Aviation Week and Space Technology. November 8, 1982.

The article discusses the international airline industry as it enters its third year of slow traffic growth and record losses.

"Sabena Receives New Government Funding." Aviation Week and Space Technology. November 8, 1982.
This report notes that the Belgian government is providing $40 million worth of recapitalization commitments to Sabena Belgian World Airlines.

Kozicharow, Eugene. "U.S. Alters International Aviation Policy." Aviation Week and Space Technology. November 8, 1982.
The article discusses how the U.S. is moving away from blanket endorsement of past liberal bilateral agreements and is hardening its bargaining stance in bilateral and multilateral negotiations, shifts aimed at bringing stability to the international aviation arena.

"Washington Roundup." Aviation Week and Space Technology. January 24, 1983.
This article reports on a proposal to create an independent regulatory body, the U.S. Transportation Commission, that would combine those functions of the Federal Maritime Commission, the Interstate Commerce Commission and the Civil Aeronautics Board that remain in effect on January 1, 1985, the scheduled CAB closing date. The proposed agency would operate with congressional oversight and nullify the scheduled shift of residual CAB duties to the Transportation Department and other agencies.

"Airline Observer." Aviation Week and Space Technology. February 14, 1983.
This article notes that U.S. scheduled airlines registered a 4.4% decrease in domestic and international air freight during 1982, compared to 1981.

"1982 Finances--Major Airlines." Aviation Week and Space Technology. February 14, 1983.
1982 financial data on seven U.S. air carriers is presented, and compared to last years performance.

Kozicharow, Eugene. "FAA Studies Two-Engine Transoceanic Operations." Aviation Week and Space Technology. February 14, 1983.
This article discusses efforts on the part of the FAA to determine whether new-generation, twin-engine aircraft of extended range will be permitted to begin transoceanic service before the end of the 1980s. (Such aircraft are not now permitted to make long-haul overwater flights.)

Gregory, William H. "Keeping a Regulatory Rein." Aviation Week and Space Technology. February 21, 1983.
This editorial cautions against the total removal of regulatory controls, arguing instead for a more conservative plan involving either a Blue Ribbon Commission or a type of overseer approach as a means of maintaining some form of control.

"Lockheed Looks Into Transport Technology Future." Air Force Times. April 11, 1983.
This report presents some of the designs being considered by Lockheed for future heavy-lift aircraft.

"Air Force Plans Big for 'Paper' Plane." Air Force Times. April 18, 1983.
This article discusses some of the justification behind the C17, and notes that it is intended to be "the capstone" of planned airlift improvements.

"Cargo Transports: One Look Into the Future." Air Force Times. April 18, 1983.
Several more advanced Lockheed heavy-lift transport designs are pictured.

"Airline Observer." Aviation Week and Space Technology. April 4, 1983.
This article reports that the Air Transport Association wrote to Defense Secretary Weinberger complaining that the Air Force is not using cargo lift of commercial airlines as it should, and warned that lift procurement practices could seriously erode the mobilization base of the CRAF.

"Overwater Extension Rule Sought." Aviation Week and Space Technology. April 11, 1983.
This article discusses efforts by Boeing and Airbus Industrie to obtain FAA and International Civil Aviation Organization (ICAO) permission for transoceanic operation of range-capable twin-engine aircraft.

"Pan Am Posts Narrowed Loss for 1st Quarter." The Wall Street Journal. April 28, 1983.
This report notes that Pan Am has cut its first quarter 1983 loss over the same period in 1982, and attributes the improved performance to a reduced work force and lower fuel costs.

"UAL Loss Grew On Operations In First Quarter."
Montgomery, Jim. "Air Florida Auditor Cites Risk of Collapse In '82 Report; 1st-Period '83 Loss Shrank." The Wall Street Journal. April 29, 1983.
These articles discuss the financial problems being experienced by two American international carriers.

"FAA Delays Full Autothrottle Use On Swissair's 747-300s." Aviation Week and Space Technology. April 18, 1983.
The importance of this report is that the newest and largest B747 is available as a combi aircraft, capable of combined passenger/cargo loads. The article notes that interior layouts can be changed between combi and all- passenger. However, the changeout is fairly difficult and is not one that should be made often, a factor of great importance to the CRAF.

"Japan Rejects U.S. Bid On Multiple Designations." Aviation Week and Space Technology. April 25, 1983.
This article notes that Japan continues to reject U.S. pressure to loosen its airline regulatory policies. Present Japanese aviation policy calls for limited competition, limited entry and tight price regulation.

Brown, David A. "IFALPA To Seek Stronger 90-Minute Rule." Aviation Week and Space Technology. April 25, 1983.
Detailed here are efforts by the International Federation of Airline Pilots Association (IFALPA) to obtain even stronger controls governing twin-engine aircraft operation over water.

Rotbart, Dean. "Increasing Airline Traffic Surprises Carriers, May Lead to Rise in Fares." The Wall Street Journal. May 2, 1983.
The author notes that passenger levels have increased dramatically over the same period in 1982, and explains why fares will increase as demand grows.

"AF, Lockheed Refute C-5B Overrun Charge." Air Force Times. May 9, 1983.
In this article, Air Force and Lockheed officials dispute charges that the C5B program has already incurred a $566 million overrun. The Air Force maintains that the project (a fixed-price contract for 50 aircraft at $7.8 billion) is actually underbudget.

"Tiger International's First-Period Net Loss More Than Doubled." The Wall Street Journal. May 3, 1983.
This report notes that Tiger International lost $50.7 million in first quarter 1983, but Flying Tigers, the cargo airline, increased its tonnage 17% during the same period.

"Thai Air Chooses Airbus Over Boeing For 2-Plane Order." The Wall Street Journal. May 3, 1983.
This article notes that the Thai international carrier reversed an earlier decision to buy two Boeing 767s in favor of purchasing the Airbus A300-600. This action could have an important effect on future aircraft purchases by other Asian carriers.

Loeb, Margaret. "Capitol Air Hopes Summer Fares, Getting New Equity Will Calm Its Rough Flight." The Wall Street Journal. May 4, 1983.
This article discusses financial problems plaguing Capitol International (a CRAF participant), noting that the carrier lacks substantial assets or lines of credit to offset the downturn in business. The firm must remain profitable beyond the summer and attract new equity if it is to survive.

"British Airways Swung to Profit in Fiscal 1983." The Wall Street Journal. May 5, 1983.
This report notes that the British national carrier made a profit in Fiscal 1983 after two years of losses. The turnaround is attributed to the dropping of some unprofitable routes and the sale of part of its fleet.

Williams, John D. "Most Airlines Had April Traffic Increases But Gains Narrowed From Pace in March." The Wall Street Journal. May 6, 1983.
This article notes that traffic growth was slower in April than in March, with some carriers (Pan Am, TWA, and Air Florida) actually registering declines.

"Corporate Profits Fell 8% in the First Quarter for Sixth Drop in Row." The Wall Street Journal. May 9, 1983.
This report cites cut-rate and promotional fares as the primary reasons for larger carrier deficits in first quarter 1983 than during the same period in 1982. Fifteen airlines lost $536 million this year versus $510 million last year.

"People Express Readying Expansion, London Route." Aviation Week and Space Technology. April 25, 1983.
This article discusses plans by People Express to inaugurate low cost B747 service between London and Newark NJ. Tracing the success or failure of this venture will provide valuable insights into the ability of new carriers to penetrate foreign markets.

"Automated Processing Facility Moves Heavy Volume of Cargo." Aviation Week and Space Technology. April 25, 1983.
This report presents details about the new automated cargo processing facility opened by Korean Airlines at Los Angeles. Of importance to this research is the sophistication present in civilian cargo handling systems today, especially when compared to military processing procedures.

"U.S., Britain Agree On Heathrow User Fees." Aviation Week and Space Technology. May 2, 1983.
This article notes that British have agreed to bring user

fees at Heathrow Airport into line with the actual costs of providing airport services. Airlines serving the airport had contended that they were paying 600% more for services there than at airports in the U.S.

"Capitol Air Negotiating With Investor." Aviation Week and Space Technology. May 2, 1983.
This item discusses the financial problems facing Capitol Air, and presents some first quarter 1983 results for other carriers.

Ott, James. "Eastern Faces Default on Loan Term." Aviation Week and Space Technology. May 2, 1983.
This article notes that Eastern is entering a difficult time through June in which it must rework its loan agreements or go into default of its obligations.

"Trans World Breakup Bid Loses in Proxy Count." Aviation Week and Space Technology. May 2, 1983.
This report notes that efforts on the part of dissident Trans World Corporation stockholders to force management to initiate action towards eventual separation of the airline from the company failed.

APPENDIX B

A STATEMENT OF NATIONAL AIRLIFT POLICY

The United States national airlift capability is provided from military and commercial air carrier resources. Each segment is equally important and interdependent in the fulfillment of national objectives.

National airlift capability, both military and civil, is inadequate to meet the short-term and long-term approved defense requirements.

National objectives dictate that aggressive and continuing action be taken to eliminate this shortfall at the earliest possible time.

Toward this end, the following policy objectives are established:

1. United States policies shall be designed to increase and improve the organic airlift capability of the Military Airlift Command (MAC) as well as maximize the mobilization base of the commercial air carrier industry. The Federal Emergency Management Agency, the Department of Defense, and the Department of Transportation shall provide leadership within the executive branch in conjunction with the air carrier industry to guide the implementation of these actions.

2. The Military Airlift Command must be trained and equipped to handle, among other things, all unique requirements not within the ordinary purview or province of the commercial air carriers. This would include airlift requirements which must move in military aircraft manned and operated by military crews because of special military considerations, security, or because of limiting physical characteristics, such as size, density, or dangerous properties.

3. Readiness of the Military Airlift Command must be maintained while promoting the growth and economic stability of the commercial air carrier industry. The Military Airlift Command must be manned, equipped, and operated in peacetime to insure its capability to meet approved military requirements in wartime, contingencies, and emergencies. A minimum utilization rate shall be established within the Department of Defense which will provide the necessary readiness training to realize this goal.

4. A financially sound commercial air carrier industry must be relied upon to provide capability required beyond that of organic military airlift. Department of Defense requirements for peacetime airlift shall be satisfied by the procurement of airlift from commercial air carriers participating in the Civil Reserve Air Fleet program as follows:

   a. Department of Defense passenger airlift requirements, both international and domestic, shall be satisfied by the procurement of commercial airlift to the extent that such airlift is available and is responsive to the military requirement.

   b. Although purposes of economy alone would dictate the use of military airlift generated by training to meet all peacetime Department of Defense cargo airlift requirements, the interdependence of military and civil capabilities to support contingency and wartime requirements must be recognized. In the broader interest of national security requirements, a level of commercial cargo airlift augmentation is required in peacetime consistent with the need to promote a viable Civil Reserve Air Fleet and provide training within the military airlift system.

5. Short-term airlift capability required to meet contingency requirements which might be considered minor surges shall be provided by increased utilization of aircraft in the organic sector, as well as by the increased utilization of the commercial air carriers regularly providing airlift service to MAC.

6. United States Government policies must provide for continuous modernization of our national aviation industry. These policies should include research and development efforts which could lead to the joint civil-military acquisition of technologically advanced transport aircraft. In addition, these policies must take into consideration additional factors associated with the maintenance in peacetime of a strong and healthy aviation industry which is prepared to meet wartime requirements. These factors include, but are not limited to, leasing arrangements, guaranteed loans, accelerated depreciation, tax adjustments, and other financial considerations, all of which would materially assist in the promotion of a strong U.S. aviation industry.

7. U.S. aviation policy, both international and domestic, shall be designed to strengthen and promote the global position of the U.S. aviation industry and, in turn, enhance the airlift capability of the nation.

APPENDIX C

LIST OF ABBREVIATIONS

ACMA	Advanced Civil/Military Aircraft
AT	All Terrain
CAB	Civil Aeronautics Board
CINCMAC	Commander-In-Chief, Military Aircraft Command
CONUS	Continental United States
CRAF	Civil Reserve Air Fleet
DEW	Distant Early Warning
DOD	Department of Defense
FAA	Federal Aviation Agency
FY	Fiscal Year
IFALPA	International Federation of Airline Pilots Association
JCS	Joint Chiefs of Staff
LOGAIR	Contract airlift utilized by Air Force to meet peacetime logistical needs
MAC	Military Airlift Command
MATS	Military Air Transport Service
MTM/D	Million Ton Miles Per Day
QUICKTRANS	Same as LOGAIR, but contracted by Navy
STD	Standard
TAC	Tactical

VITA

Captain Kent Neill Gourdin was born in San Mateo, California, on September 23, 1947. He attended elementary school in San Carlos, California and was graduated from San Carlos High School in June 1965. The following September he entered the College of San Mateo, and in June 1967 was awarded an Associate Arts degree in History.

He entered the United States Air Force in February 1968, and was selected to return to school under Air Force sponsorship in 1971. He entered The University of Tennessee, Knoxville in that year, and received a Bachelor of Science degree in Business in June 1973. Following his commissioning in September 1973, Captain Gourdin served at various bases in California, Thailand, Korea, and Germany. He returned to The University of Tennessee, Knoxville in June 1980, receiving the Master of Business Administration degree in August 1983 and the Doctor of Business Administration degree in March 1984.

Captain Gourdin will assume teaching duties at the Air Force Institute of Technology School of Systems and Logistics after graduation.