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Department of Defense (DOD) investments for aircraft logistics cost billions of dollars annually. Logistics support requires adequate numbers and various kinds of maintenance people, facilities, and spare and repair parts to keep aircraft operationally ready in peacetime and capable of meeting wartime needs. The Air Force's total war reserve requirement for secondary item spares and repair parts amounts to about $2.8 billion--$1.7 billion in assets and $1.1 billion to be funded by fiscal year 1983. Findings/Conclusions: In order to determine war reserve parts requirements, proper planning, coordination, and analysis are needed. The Office of the Secretary of Defense needs better coordination within, between, and among the services. The Air Force needs better coordination of wartime planning within its own department, especially among and within the major commands. The Air Force has not conducted comprehensive studies to find out the true wartime capability of the C-5 or other aircraft. Wartime mission planning for noncombatant aircraft should also have more careful analysis. The Air Force has recently changed attrition rates for six tactical fighter aircraft, but overall attrition rates for the fighters seem to be too low based on experience in past wars. Recommendations: The Secretary of Defense should strengthen coordination of wartime planning activities and require the Air Force to: reevaluate the ability of all aircraft to meet their wartime mission before committing money for reserve parts, training, and other logistics support items; assess the impact of the reduced strategic airlift mission on other services which depend on certain aircraft to move combat equipment; take steps to ensure that non-engaged aircraft have specific mission plans during wartime; reevaluate the assumption that aircraft lost by attrition will be immediately replaced by non-engaged aircraft; incorporate the new attrition rates for strategic airlift aircraft, reduce war reserve parts requirements for C-5s and

C-141s accordingly, and reassess attrition rates for other combat aircraft; and reassess the feasibility of modifying wartime requirements planning procedures using more realistic approaches for computing needs for war reserve parts and giving consideration to using sorties and type of mission as a basis for requirements. The Congress should require the Air Force to submit detailed plans on future war reserve requests for strategic airlift. (HTW)

6633

REPORT BY THE

Comptroller General

OF THE UNITED STATES

Determining Requirements For War Reserve Spares And Repair Parts-- Importance Of The Wartime Planning Process

This report deals with the Air Force's coordination of overall strategic wartime planning with logistics support and operations, and the planning factors involved which significantly affected materiel requirements for war. It points out that a number of the underlying planning assumptions need to be reassessed and changed to improve the effectiveness of wartime logistics support.

LCD-78-407A
JUNE 6, 1978

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-133396

The Honorable John C. Stennis
Chairman, Subcommittee on Defense
Committee on Appropriations
United States Senate

Dear Mr. Chairman:

A Senate Appropriations Committee report (95-325, July 1, 1977) contained a request asking us to review the Department of Defense's war reserve procurement program. The report mentioned that this study will build on previous GAO reviews of this subject.

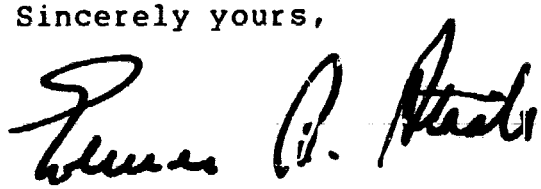
In discussions with representatives from your office in August 1977, we agreed to review certain aspects of each service's war reserve program separately, rather than evaluate the entire program all at one time. It was agreed that this course of action would respond to the Committee's request for GAO assistance in this area.

This is the unclassified version of our SECRET report (LCD-78-407). It deals with the Air Force's coordination of overall strategic wartime planning with logistics support and operations, and the planning factors involved which significantly affected materiel requirements for war. It points out that a number of the underlying planning assumptions need to be reassessed and changed to improve the effectiveness of wartime logistics support. Since most of the classified material deleted involved statistics, it does not detract from the message and readability in this version.

As you requested, we asked the Department of Defense on March 13, 1978, to provide official written comments on this report. We requested that the Department furnish comments within 45 days. As of the date of this report, Defense comments have not been received. However, we met with Air Force officials and have made changes in the report, where appropriate, reflecting their comments.

As arranged with your office, we are sending copies of this report to the Secretary of Defense; the Secretary of the Air Force; and the Director, Office of Management and Budget. We will also provide copies to the House Committee on Government Operations, the Senate Committee on Governmental Affairs, the House Committee on Appropriations, and the House and Senate Committees on Armed Services. Copies will also be available to other interested parties who request them.

Sincerely yours,



Comptroller General
of the United States

D I G E S T

Defense investments for aircraft logistics cost billions of dollars annually. Logistics support requires adequate numbers and various kinds of maintenance people, facilities, and spare and repair parts, so that aircraft are operationally ready in peacetime and able to surge to wartime strengths.

This report deals with the Air Force's $2.8 billion requirement for aircraft war reserve spare and repair parts--referred to here as war reserve parts. The Congress has funded $1.7 billion for this requirement and the Office of the Secretary of Defense has recommended full funding of the $1.1 billion deficit by 1983.

Wartime planning involves a series of assumptions and related factors which the Office of the Secretary of Defense and Air Force Headquarters analyze and translate into a total wartime flying hour program. The Air Force Logistics Command, in turn, converts the flying hour program into specific wartime logistics support requirements. Decisions made at the beginning of the planning process cause the enormous logistics support requirements, including the $2.8 billion for Air Force war reserve parts.

Proper planning and coordination, keen analysis, and clearcut decisions are needed to determine war reserve parts requirements accurately, because many subjective assumptions are used to measure aircraft wartime capabilities. The planning process and a number of underlying assumptions need to be reassessed, and changes need to be made to improve the accuracy and effectiveness of wartime logistics support planning.

The Office of the Secretary of Defense needs to better coordinate its wartime planning within, between, and among the services. It does not have a focal point to coordinate wartime planning so each service can benefit from a comparison with wartime assumptions of other services and related factors, which impact on war reserve parts. The Air Force also needs to better coordinate its wartime planning in its own department, especially among and within its major commands. Its Military Airlift Command and Logistics Command use different attrition rates to estimate war reserve requirements and mission capability for the same aircraft. The Military Airlift Command assumes minimal maintenance in computing the wartime capability of its aircraft, but assumes maximum maintenance in computing a wartime maintenance personnel shortage for the same aircraft. (See pp. 7 to 9.)

The Air Force should make sure that each aircraft can attain its wartime mission by thoroughly analyzing its aircraft planning assumptions. The C-5 strategic airlift aircraft cannot meet the planned wartime flying hours because Air Force assumptions did not take some important factors into account. This significantly overstates the C-5's war reserve parts and other logistics support requirements, including aircrew training, because the computation is based on estimated flying hours. The Air Force has not done any comprehensive studies to find out the true wartime capability of the C-5 or any other aircraft. The Air Force should at least apply the basic wartime planning assumptions and related factors to all aircraft to see if the wartime flying hour programs can be met. (See pp. 13 to 23.)

Wartime mission planning for noncombatant aircraft deserves more careful analysis because flying hours for training and other noncombat missions comprise a large part of the total wartime flying hour program. For example, a large percent of the A-7D, F-4D, F-4E, and F-15A aircraft will

continue to fly noncombat missions at peacetime rates during the initial stages of a conflict. (See pp. 24 to 27.)

The Air Force should revise its wartime attrition rates for all aircraft. Recently, the rates were changed for six tactical fighter aircraft, but attrition rates experienced in past wars suggest the overall attrition rates for these fighters are too low. Air Force officials are planning to incorporate attrition rates for C-5 and C-141 aircraft, but have no plans to revise attrition rates for other aircraft. A comprehensive attrition study should be undertaken as soon as possible for all aircraft and flying hour programs, and war reserve parts requirements should be adjusted accordingly. (See pp. 34 to 36.)

The Air Force could further reduce wartime logistics support requirements for maintenance personnel, facilities, and parts, if more realistic methods for computing requirements were used. One alternative method would be to compute these requirements on a sortie and type-of-mission basis, rather than by flying hours. Air Force and contractor studies confirm that this method is more realistic. Millions could be saved and better logistics support provided if this method were used or if other methods were considered. (See pp. 41 to 46.)

RECOMMENDATIONS

To simplify the large task of coordinating the key assumptions and related factors affecting war reserve requirements, the Secretary of Defense should strengthen coordination of wartime planning activities at the Office of the Secretary of Defense, Air Force Headquarters, and major commands. The matters discussed in this report on wartime logistics factors may be of interest to other military services and may ultimately impact their planning. (See p. 10.)

Tear Sheet

The Secretary of Defense should also require the Air Force to:

--Reevaluate the ability of all aircraft, especially the strategic airlift aircraft, to meet their wartime mission before committing large sums of money for war reserve parts, aircrew training, and other logistics support items which may not be needed. (See p. 28.)

--Assess the impact of the reduced strategic airlift mission on the other services which depend on aircraft like the C-5 to move combat equipment. This reduced mission capability could increase the use of sealift and the prepositioning of war reserves materials. (See p. 28.)

--Take steps to ensure that non-engaged aircraft have specific mission plans during wartime, because these aircraft affect the war reserve parts requirement. (See p. 28.)

--Reevaluate the Air Force's assumption that aircraft lost by attrition will be immediately replaced by non-engaged aircraft, because the alternatives would seriously affect war reserve parts requirements. (See p. 39.)

--Incorporate the new attrition rates for strategic airlift aircraft and reduce the war reserve parts requirements for C-5s and C-141s, accordingly. In addition, attrition rates for all other combat aircraft other than the six tactical fighter aircraft should be reassessed as soon as possible, so the Air Force can adjust the war reserve parts requirements before these parts are purchased. (See p. 39.)

--Reassess the feasibility of modifying wartime requirements planning procedures to recognize more realistic approaches for computing war reserve parts requirements. This task should begin with seriously considering using sorties and type of mission rather than total flying hours as a basis for these requirements, because for certain aircraft the requirements can be substantially reduced without affecting mission capability or degrading readiness, and better logistics support can be provided to other aircraft. (See p. 49.)

RECOMMENDATION TO THE CONGRESS

The Congress should require the Air Force to submit detailed plans on future war reserve requests for strategic airlift. This data should help the Congress decide which weapons systems need logistics support funding the most. If the Congress determines that the Air Force has not realistically defined the capability of strategic airlift from the data presented, it should defer further logistics support funding requests for these aircraft until the Air Force adequately does so. (See p. 29.)

AGENCY COMMENTS

In a March 13, 1978, letter, GAO asked the Secretary of Defense to comment on this report within 45 days. Defense officials said the draft report contained highly complex issues which impact the whole structure of Air Force wartime support planning. Because of the wide implications involved, the Air Force has been tasked to develop a detailed analysis of the issues presented For these reasons, Defense felt it needed more time to provide GAO with an adequate response.

As of the date of this report, Defense comments have not been received. To meet the Committee's needs, GAO is issuing

this report without Defense's written comments. However, GAO met with Air Force officials and made changes in the report reflecting their comments.

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ABBREVIATIONS

BLSS	Base Level Self-Sufficiency
DOD	Department of Defense
GAO	General Accounting Office
NATO	North Atlantic Treaty Organization
OSD	Office of the Secretary of Defense
WRSK	War Readiness Spares Kits

CHAPTER 1

INTRODUCTION

The Department of Defense (DOD) annually invests billions of dollars procuring war reserve materiel for its Armed Forces. War reserves are required in addition to peacetime assets to support planned wartime activities until wartime consumption can be satisfied from production. DOD buys this materiel so that it will have enough onhand to support any military actions necessary to protect the security or vital interests of the United States.

The Air Force plays a large role in strengthening the security of our Nation. Logistics support for aircraft during peacetime is necessary to ensure that key weapons systems are always combat ready. During wartime, they must be able to surge to higher levels if those aircraft expect to act as an effective strikeforce. Therefore, accurate logistics support planning must be treated as an integral part of the Air Force's planning and program development. Many wartime planning assumptions are made which affect the level of wartime flying activity required to combat the predicted threat. The level of activity is used for estimating logistics support requirements, and, therefore, any assumptions made about it affects these requirements and funding requests for war reserves.

This report deals with some of the key issues the Air Force must fully consider in determining requirements for war reserve materiel. We directed our work at determining (1) the major wartime factors which affect Air Force war reserves, (2) how realistic they were, and (3) the extent to which they affect the war reserve requirement. This report illustrates the importance of coordinating strategic wartime planning with logistical support and operations at both the DOD and Air Force level. It identifies areas where improvements in these processes could provide more effective use of wartime resources.

APPROPRIATIONS FOR SPARES AND REPAIR PARTS

The Air Force's total war reserve requirement for secondary item spares and repair parts amounts to about $2.8 billion--$1.7 billion worth in assets and a $1.1 billion worth to be funded by fiscal year 1983, based on the fiscal year 1979 budget. The Air Force, as part of the total U.S. and North Atlantic Treaty Organization (NATO)

forces, must be able to defend Europe against the Warsaw Pact, and participates to a lesser degree in other worldwide scenarios.

The Air Force allocates available funds on a priority basis. Peacetime operations are funded first, War Readiness Spares Kits (WRSK) and Base Level Self Sufficiency (BLSS) requirements are funded second, and other war reserve requirements are funded third. The latter category is normally referred to as the "sustaining" portion of war reserves, and includes those requirements necessary to sustain wartime materiel use after the first 30 days, until production equals consumption.

The following table shows the amounts of peacetime and war reserve funds received and/or requested in recent years for these types of spares.

Fiscal year	Amount
	(millions)
1976	$ 553.8
a/1976 TQ	122.1
1977	842.7
1978	796.0
1979 (est.)	881.7
	$3,196.3

a/Three month transition period prior to adoption of new Federal fiscal year beginning on Oct. 1, 1976.

Funding request data is shown on the following page for key aircraft for fiscal year 1978.

Aircraft type	Fiscal year 1978 Peacetime operations	WRSK/BLSS	Sustaining war reserves	Total
	millions of dollars			
A-7	$ 7.0			
C-5	17.8			
C-141	6.0			
F-15	163.6		DELETED	
F-111	36.5			
Common/other (note a)	329.9			
Total	$560.8	$204.0	$ 66.5	$831.3

a/These dollars represent procurement of those items applicable to more than one weapon system, and also include weapon systems with low dollar value requirements.

Most WRSK/BLSS and sustaining war reserve funding will be used to reduce deficits in war reserve stocks caused by deferral of such procurement in prior years.

SCOPE OF REVIEW

We made this review to assess the Air Force's coordination of overall strategic wartime planning with logistics support and operations, and the planning factors involved which significantly affect materiel requirements for war. To the extent we could, we reviewed pertinent wartime policies, procedures, and practices relating to strategic planning.

We also obtained and reviewed various briefing documents and studies on aircraft attrition and on alternative ways to compute maintenance requirements. We discussed these matters with Joint Chiefs of Staff, DOD, and Air Force officials.

The primary locations visited during our review included:

--Joint Chiefs of Staff, DOD, and Air Force Headquarters, Washington, D.C.

--Air Force Logistics Command, Wright-Patterson Air Force Base, Ohio.

--Military Airlift Command, Scott Air Force Base, Illinois.

--Tactical Air Command, Langley Air Force Base, Virginia.

To understand their role in the wartime planning process as it relates to computations for war reserve requirements, we also talked to various item managers located at the Warner Robins, Georgia, and San Antonio, Texas, Air Logistics Centers.

The Air Force did not provide us with certain information relating to its ability to meet wartime flying hour rates for strategic airlift. Therefore, we could not completely evaluate the capability of these aircraft and their impact on war readiness materiel. We did, however, arrive at our best estimate of this capability from the limited data available.

CHAPTER 2

MAJOR ISSUES AFFECTING PLANS FOR WARTIME LOGISTICS SUPPORT

The Air Force must assess the important issues which can and do impact on its wartime logistics requirements, and determine whether reasonable options have been considered for meeting various threats and mission objectives, while operating within current funding constraints. These considerations are not only important to the Air Force but also affect the other services, which will depend on the Air Force for tactical, strategic, and logistics support. The capability of military airlift to transport troops and equipment to any potential conflict source in the world, and the services' reliance on it for this support is an illustration.

A high degree of planning and coordination is needed among various Air Force activities responsible for determining how to best meet the proposed threat. Without the proper planning and coordination, it would be difficult for the Air Force to determine where to apply its available funds to support and maintain the weapons systems needing them the most. The planning and coordination of logistics support must be every bit as thorough as other important analyses, such as threat assessment and wargaming. Hard decisions must be made and logistics plans carried through realistically so that requirements are adequately determined and funds are not wasted.

With all the many facets involved in Air Force logistics, intense planning and coordination at all Air Force levels becomes paramount. The reasonableness of wartime planning assumptions themselves can have a major impact on Air Force war material requirements. Appendix I shows what is involved in planning for wartime logistics support.

KEY ISSUES AFFECTING WAR RESERVE REQUIREMENTS

Undoubtedly, there are a multitude of assumptions and related factors, too numerous to mention, which can have an effect on how much materiel the Air Force needs for war. Although it was not practical for us to examine all of the pertinent factors affecting requirements, we did look at a number of key issues which need to be fully addressed if wartime planning and coordination is to be effective. They are discussed on the following page.

--Aircraft attrition in wartime reduces the number of aircraft during any conflict. Although it is difficult to predict with certainty what attrition rates might be in future conflicts, this factor should be fully evaluated to realistically determine the optimum level of war reserve spares during wartime, and to reflect an increase in spare parts requirements based on the anticipated wartime surge in flying hours per aircraft.

--Serious questions remain unanswered on whether certain aircraft, namely airlift aircraft, will be able to meet the projected wartime flying hour rates necessary to sustain their wartime role. This factor can substantially impact on how much logistics support would be necessary to maintain such aircraft in a ready condition. Any aircraft not available on D-Day decreases the total number of hours and sorties which can be flown, and, therefore, reduces wartime depot maintenance needs, including spares and repair parts, planned for those aircraft.

--For high surge aircraft, such as the C-5 and C-141, adequate consideration must be given to various conditions which could prevent such aircraft from meeting their utilization rates. To attain these rates, the Air Force must realistically assess certain factors, particularly how much time is required to on-load and off-load supplies and materiel, to refuel, and to maintain the aircraft on the ground. Further, will the necessary NATO bases, aircrews, and maintenance crews be available when needed in the required numbers? Has adequate attention been given to plans to stretch the C-141 aircraft from fiscal years 1980 through 1982, and to modify the C-5 wing structure which also reduces aircraft availability?

--Maintenance requirements during wartime are computed on the assumption that, as flying hours increase, the need for spares and repair parts increases proportionately. This assumption seems unrealistic since parts do not, in reality, fail proportionately to these increases. Air Force studies and logistics models suggest that other alternatives, such as using engineering estimates and sorties, are better and more realistic for computing maintenance requirements. Savings in reduced requirements for war reserve spares and repair parts could be achieved if these types of realistic approaches were considered and adopted.

Many other factors could be considered when requirements for war reserve spares and repair parts are computed. They include:

Mission types	Budgetary constraints
Mission priority	Failure rates
Mission delay time	Direct repair time
Number of sorties	Repair crew size
Sortie length	Inspection frequency
Sortie leadtime	Battle damage
Aircraft type	Spare parts availability
Flight size	Weather history
Launch time	

The above illustrates the many different factors which could logically impact on requirements for war reserve materiel. Adequate consideration of these factors in the planning process, together with coordination at the responsible Air Force level, is essential to establish realistic requirements for war reserves.

IMPROVED COORDINATION NEEDED IN WARTIME PLANNING

Coordinating the many facets of wartime planning which impact on war materiel requirements is not a simple task. When differences and shortfalls exist in the service's planning process, estimates for wartime logistics requirements may not be reliable. Strengthening coordination at all levels would greatly enhance the reliability of the Air Force's and other services' estimates for war reserves--a problem which the Office of the Secretary of Defense (OSD) has recognized for some time.

We identified several areas in the Air Force's wartime planning process which need improved coordination. The major Air Force commands, for example, use different planning assumptions and factors for estimating logistics requirements. Certain key planning factors, such as the use of different aircraft attrition rates, were not fully coordinated. We found that:

--The Air Force Logistics Command and Military Airlift Command used different attrition rates in planning different segments of wartime support for the same strategic airlift aircraft. The Logistics Command, at the direction of Air Force Headquarters, used

DELETED rate for estimating depot maintenance and war reserve requirements for the C-5 and C-141 aircraft. On the other hand, the Military Airlift Command planning group, based on the Saber Hall 1/ attrition studies used DELETED rate in computing mission capabilities of the same two aircraft. Attrition rates affect the number of aircraft available for logistics support. If the Logistics Command is using the correct rate DELETED then the Airlift Command is understating the fleet capability of the aircraft. If the Airlift Command is using the correct rate DELETED then the Logistics Command is overstating depot maintenance and war reserve requirements. Chapter 4 contains a discussion on using different attrition rates and the impact on war reserve materiel requirements.

--The Military Airlift Command intelligence group was not asked to provide input to the Saber Haul studies even though they have practical experience and valuable expertise in threat assessment of the airlift mission. In addition, the intelligence group was not aware that studies were made in this area even though the Airlift Command planning group used the studies in computing mission capabilities for the C-5 and C-141.

--The Tactical Air Command, Military Airlift Command, and Logistics Command, used different methods to project wartime logistics support requirements. The Tactical Air Command projects wartime maintenance requirements based on number of sorties. The Military Airlift Command and Logistics Command base their wartime maintenance requirements on flying hours. If the Tactical Air Command is using the most accurate method, then the Military Airlift Command and the Logistics Command maintenance requirements could be overstated. If, on the other hand, the Military Airlift Command and Logistics Command are using the most accurate method, then the Tactical Air Command could have understated their requirements. Chapter 5 contains a discussion of flying hours and sorties as a basis for projecting wartime maintenance manhours.

1/Saber Haul is a series of C-5 and C-141 attrition studies done by the Air Force Headquarters Studies and Analysis Group.

--Wartime planning assumptions differ between computations for war reserve materiel requirements and computations for wartime maintenance personnel requirements. The Logistics Command computes war reserve materiel on mission essential items only; therefore, it assumes that only mission essential maintenance will be accomplished. The Military Airlift Command, however, assumes that all maintenance done in peacetime will be done in wartime and, therefore, could overstate its wartime maintenance personnel requirements.

--Within the Air Force, assumptions differ between the group responsible for C-5 and C-141 aircraft mission planning and the group responsible for planning below depot level maintenance support for the same aircraft. Mission planners assume DELETED will be done when computing the ability of these aircraft to meet a 12.5 average daily flying hour surge rate. Maintenance planners, on the other hand, assume DELETED will be done when estimating DELETED wartime personnel shortage. Either the aircraft capability or the maintenance personnel requirements will be affected depending upon which assumption is correct.

--The Logistics Command projects they will have a DELETED depot maintenance personnel shortage by the DELETED conflict. This means the Air Force depots will DELETED of the aircraft. The Military Airlift Command does not consider this when computing the ability of C-5 and C-141 aircraft to attain wartime utilization rates. The impact of this and any other shortfall should be evaluated before determining what is needed for an aircraft to meet its wartime mission.

These examples are intended to point out the difficulty in fully coordinating something as subjective and complex as wartime planning. They illustrate that improved coordination is essential in identifying and resolving these types of issues and in establishing a more accurate and comprehensive estimate of wartime requirements. Stronger actions are needed to strengthen coordination of wartime planning activities. More details of these coordination actions are brought out in the remaining chapters of this report.

RECOMMENDATION

To simplify the large task of coordinating the factors which affect war reserve materiel estimates, we recommend that the Secretary of Defense strengthen coordination activities within OSD, Air Force Headquarters, and the major commands of the Air Force.

Strong coordination would help to

--strengthen the planning process,

--emphasize the importance of wartime planning,

--improve the reliability and accuracy of the wartime logistics requirements estimates,

--put all of the identified shortfalls into perspective so that the most critical could be funded first,

--enable the services to more effectively relate war reserve expenditures with readiness, and

--provide a catalyst for the services to take advantage of each other's wartime planning methodologies.

The matters discussed in this report on wartime logistics factors may be of interest to the other military services and may ultimately impact on their planning.

CHAPTER 3

AIRCRAFT MISSION PLANNING AND THE ABILITY TO MEET WARTIME FLYING HOUR PROGRAMS

Flying hour data used to estimate wartime logistics requirements is developed jointly by OSD, Air Force Headquarters, and the operating commands such as the Tactical Air Command and the Military Airlift Command, and is approved by OSD. The operating commands use the approved flying hour data to estimate below-depot maintenance requirements and aircraft mission planning, while the Air Force Logistics Command uses them to estimate depot maintenance and war reserve requirements. Anything which affects the number of flying hours affects war reserve requirements estimates.

RELATIONSHIP BETWEEN FLYING HOUR ACTIVITY AND WAR RESERVE REQUIREMENT

As discussed in chapter 2, total flying hours for each aircraft in the war and mobilization plan is the culmination of the wartime planning process. The number of flying hours depends on an accurate assessment of the threat and an accurate determination of the number of sorties necessary to combat that threat. The chart on the following page is an example of the war and mobilization plan which translates wartime missions for each type of aircraft into total flying hours to be supported.

War and Mobilization Plan for
a Sample Aircraft

	Reactive status M-day (note a)	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6
Mission:							
Total aircraft inventory							
Non-engaged aircraft (note b)							
Training aircraft							
Other aircraft							
Aircraft engaged in conflict (note c)							
Activity of engaged aircraft:							
Sorties (note d)							
Cumulative sorties							
Attrition (percent of sorties)							
Cumulative attrition							
Flying hours:							
Non-engaged aircraft (hours/aircraft/day)							
Engaged aircraft (hours/sortie)							
Total flying hours per month							

DELETED

a/M-day is mobilization day and precedes the actual day hostilities begin (D-day).

b/Non-engaged aircraft are those which will not be flying combat missions. These aircraft will be used for training and replacement of lost aircraft.

c/Engaged aircraft are those which will be flying combat missions.

d/Generally, a sortie is equal to one flight (take-off to landing) of an aircraft.

The total number of non-engaged aircraft, times the utilization rate (DELETED hours/aircraft/day x 30 days), equals the total non-engaged hours. The total number of sorties flown by the engaged aircraft, times the sortie length (DELETED hours), equals the total engaged hours. The bottom line--total flying hours--is the basis for estimating war reserve requirements. Therefore, flying hours for both engaged and non-engaged aircraft affect war reserve requirements. The underlying assumptions of this process are:

--Non-engaged aircraft, including training aircraft, will continue to fly at peacetime rates.

--The wartime flying hours are reasonable and accurate.

--Attrition rates are realistic.

--There is a direct relationship between flying hours and war reserve requirements.

A change in any of these assumptions would affect the total flying hours, and therefore the war reserve requirements. The validity of attrition rates and of basing war reserve requirements on flying hours is discussed in chapters 4 and 5 of this report. The operating commands must have well-coordinated comprehensive mission plans for each aircraft to assure that the aircraft will be able to meet its wartime mission; they must identify and plan for any problems or constraints that may be encountered in trying to meet a wartime mission.

WARTIME MISSION PLANNING FOR ENGAGED AIRCRAFT

We selected the C-5 and C-141 aircraft strategic airlift mission for detailed review because (1) we have in previous studies questioned the ability of these aircraft to attain the planned wartime utilization rate, (2) the mission of these two aircraft is a high priority in the North Atlantic Treaty Organization (NATO) scenario, and (3) war reserve deficits for these two aircraft represent about DELETED percent of the Air Force's total war reserve requirement for all aircraft. We recognize that the mission and planned wartime utilization rates for these aircraft are among the most stringent and difficult to attain. We believe lessons learned in mission planning for these aircraft can be applied to other aircraft.

DOD officials consider additional airlift deployment capability critical in preventing initial enemy advantages, and especially in deterring the actual outbreak of hostilities. Because of the need for additional airlift capability, the Air Force and the Joint Chiefs of Staff decided to increase the wartime utilization rates for the C-5 and C-141. On the surface, increased utilization appears to be an excellent way of increasing our airlift capability.

The Air Force contends that all they need to do is buy more spare parts and train more aircrews in order to attain the increased wartime utilization rates. In our view, however, there are more constraints than war reserves and aircrews. In addition, neither the C-5 nor the C-141 aircraft has ever been able to attain DELETED the daily peacetime utilization rates of 1.8 and 3.25 flying hours, respectively. Some Air Force officials question whether the C-5 and C-141 can surge to seven and four times the daily peacetime utilization rates under their projected wartime mission.

It is essential to make well-coordinated comprehensive mission plans for these as well as all aircraft, to ensure that they can meet their planned wartime missions. This is especially important for the C-5 and C-141 aircraft. If they are unable to meet their planned mission, alternative methods of strategic mobility such as prepositioning and sealift must be examined. Also, the Air Force plans to spend $364.4 million for additional war reserves and $196 million for additional aircrews for the C-5 and C-141.

C-5 and C-141 strategic airlift mission planning

According to Air Force war and mobilization plans, the entire fleet of C-5 and C-141 aircraft should surge to an average 12.5 hours per day for the first 45 days of a conflict, and then sustain a 10-hour-a-day rate after 45 days. This would be nearly 7 times the currently funded peacetime rate of 1.8 hours for the C-5, and about 4 times the rate of 3.25 hours for the C-141. Wartime flying hour programs are based on total hours per month by type of aircraft. For example, the entire engaged fleet of 70 C-5s is expected to fly 26,250 hours in the first month of a conflict, or an average of 12.5 hours a day, leaving the remaining 7 non-engaged for training and replacement. The 234 engaged C-141 aircraft are expected to fly a total of 87,750 hours in the first month, or an average of 12.5 hours a day, leaving the remaining 37 C-141s non-engaged. Factors affecting the average daily use for these aircraft include

--the number of aircraft available for operation when the war begins,

--assumptions regarding wartime attrition,

--assumptions regarding the downtime for repair,

--the round trip distance from the United States and the average speed of the aircraft,

--assumptions regarding time to load and offload,

--assumptions regarding refueling time,

--assumptions regarding the ability of the airfields in Europe to handle the expected volume of air traffic, and

--any unforeseen problems.

Air Force Headquarters and Military Airlift Command officials were unable to explain the basis for the average daily use rate of 12.5 hours. Rather, the increased utilization rate was established by OSD. In addition, we could find no comprehensive study which demonstrates the aircraft's ability to attain the high 12.5 hour-a-day utilization rates.

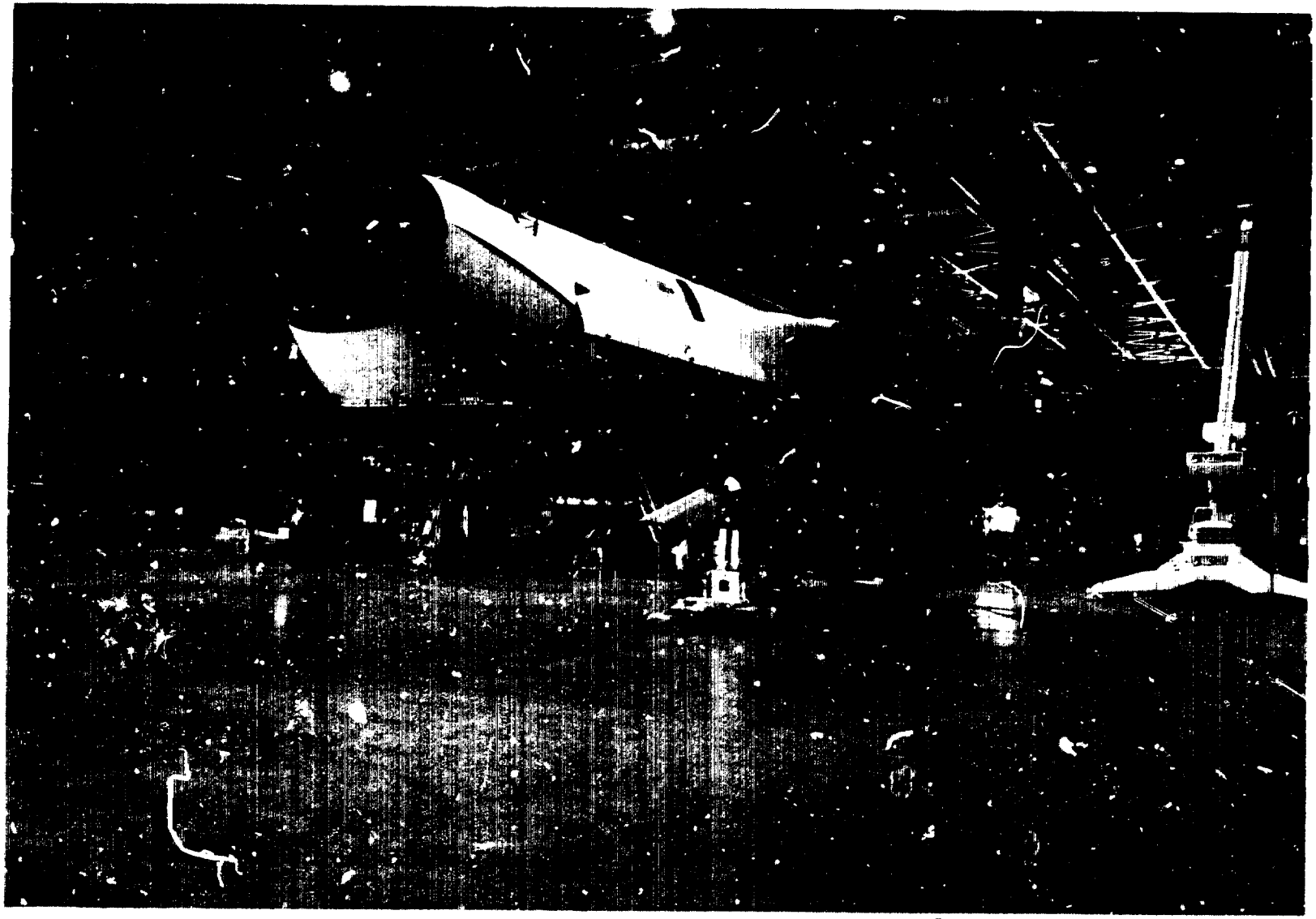
The Air Force has initiated studies which address some of the potential constraints listed above. However, since they were not complete, we could not consider them in our evaluation. More specifically, they related to (1) studies done by the Military Airlift Command showing maximum utilization potential for C-5 and C-141 aircraft, (2) an Air Force Headquarters' airfield survey demonstrating the ability of the airfields in Europe to handle the large number of aircraft, and (3) a ground time study done by Air Force Headquarters with input from the Military Airlift Command for the C-5, which projects how long the aircraft will be on the ground during a typical strategic airlift mission. Air Force officials said because of the task's complexity, the studies will take some time to complete.

Availability of aircraft

The Air Force assumes that 70 of the 77 C-5s and 234 of the 271 C-141s will be available for wartime operations. Although there are 7 C-5 and 37 C-141 aircraft which are either training or nonoperational and may be used during wartime, we believe the number of aircraft the Air Force assumes will be available is overly optimistic.

Under wartime conditions, the number of flyable aircraft can be substantially increased through maximum maintenance effort and by compressing aircraft out of the depots. Air Force officials believe an April 1977 maintenance exercise showed that the number of operationally ready aircraft can exceed peacetime numbers. For example, the exercise demonstrated that 21 out of 25 C-5s, or 84 percent, were operationally ready, as opposed to the normal peacetime rate of 62 percent.

On an average day, about 17 C-5s and 26 C-141s are in the depots for repair and overhaul. Air Force officials estimate they can compress these 43 aircraft out of the depots at the rate of DELETED aircraft after DELETED days, DELETED aircraft after DELETED days, and all 43 aircraft after 34 days. Even using the Air Force's



(PHOTO COURTESY OF THE U.S. AIR FORCE)

C-5 UNDERGOING DEPOT MAINTENANCE

figures, the number of C-5s and C-141s which will be available is substantially less than they projected.

The following chart shows the maximum number of aircraft which could be available at various stages of mobilization, including training and nonoperationally active aircraft, using the Air Force's operationally ready rate and depot compression schedule. These numbers were obtained by taking the total number of aircraft in the inventory and subtracting the number remaining in the depot during each 5-day increment. The difference between the two is then multiplied by the operationally ready rate for each type aircraft to arrive at the number which could be available at each stage of mobilization.

Number of Aircraft Available For Wartime Use (note a)

	Days after mobilization begins							
	M-day	M+5	M+10	M+15	M+20	M+25	M+30	1st month average
Maximum number available:								
C-5				DELETED				
C-141								
Air Force projected number available:								
C-5	70	70	70	70	70	70	70	70
C-141	234	234	234	234	234	234	234	234

a/Using Air Force data not verified by GAO.

This means the available C-5 and C-141 aircraft would have to average DELETED hours, respectively, if they are to attain the total hours required in the early stages of a conflict.

Strategic airlift attrition

The various planning groups are inconsistent in their assumptions regarding aircraft attrition (see ch. 4 for a complete discussion of attrition rates). The Air Force currently assumes that DELETED aircraft will be lost during a conflict, and uses this assumption in determining maintenance and war reserve material requirements. The Air Force Studies and Analysis Group has done a comprehensive examination of airlift aircraft attrition in its Saber Haul studies completed in September 1972 and updated in November 1976 and December 1977. Based on the 1972 study (the only study available to us), the Air Force could lose between DELETED C-5 aircraft and DELETED

C-141 aircraft in the first 30 days of a conflict. We were denied access to the 1976 and 1977 study updates because the Air Force claimed the studies did not represent official Air Force positions.

If the Air Force DELETED rates in determining C-5 and C-141 capability, it would further impact on the ability of these aircraft to attain the planned wartime utilization rates--there would be even fewer aircraft to meet the same total flying hour program. Subsequently, it would affect their estimates of maintenance and war reserve materials needed to support these aircraft. The following chart shows the maximum number of aircraft which could be available at various stages of mobilization, if attrition is included in addition to unavailable aircraft discussed in the previous section.

Number of Aircraft Available for Wartime Use After Incorporating Attrition (note a)

	Days after mobilization begins					
	M-day	M+5	M+10	M+20	M+30	1st month average
Maximum number available:						
C-5				DELETED		
C-141						
Air Force estimates:						
C-5	70	70	70	70	70	70
C-141	234	234	234	234	234	234

a/Attrition rates taken from "best estimate" in 1972 Saber Haul study.

The Air Force also plans major modifications of both the C-5 and C-141 aircraft between 1978 and 1987. The plans include modifying the C-5 wing structure and stretching the C-141, plus adding an air refueling capability to the C-141s. As a maximum, 12 C-5s and 30 C-141s would be undergoing modification and would therefore be unavailable for wartime use. The Air Force estimates, however, that about 5 C-5s and 10 C-141s could be recovered from the modification lines should a war break out. This number limits the number of aircraft available.

As the number of aircraft available for wartime operations decreases, the average utilization rate becomes increasingly difficult to attain. The daily utilization rates are already high, and we have not yet considered downtime for maintenance, time to onload/offload and refuel, and unforeseen problems. After considering the number of aircraft still in the depots, not operationally ready, undergoing modification, and lost under combat conditions, there would be an average of DELETED C-5 and DELETED C-141 aircraft which would be available to fly wartime missions during the first 30 days. The C-5s would have to average DELETED flying hours daily and the C-141s DELETED hours daily, to attain the projected wartime flying hour programs during the first month. The Air Force contends that DELETED there would be enough replacement aircraft (7 C-5s and 37 C-141s) so that at least 70 C-5 and 234 C-141 aircraft would be available. This is obviously not the case.

Wartime maintenance

If the C-5 and C-141 aircraft are to fly the maximum hours possible, they will require large amounts of below-depot and depot maintenance. The Air Force currently estimates these requirements at DELETED million and DELETED million maintenance hours, respectively, for both of these aircraft for the first 30 days of a conflict, assuming a 12.5-hour daily flying rate can be achieved. This means that DELETED personnel at the support bases and DELETED personnel at the depots will work fulltime on these two aircraft. As shown below, we do not believe it is possible to do DELETED million hours of maintenance on these aircraft in 1 month and still fly them an average 12.5 hours per day. Either the projected maintenance hours or the flying hours are wrong.

Peacetime and wartime maintenance will differ greatly. Only repairs necessary to keep the aircraft flying will be done. During the early period of a conflict--surge period--noncritical maintenance will be deferred and depot personnel will be compressing aircraft out of the depots as quickly as possible. During the next phase--sustained period--as the level of intensity of the conflict decreases, deferred maintenance will be accomplished. In addition, maintenance personnel will not work as many hours in the sustaining period.

As a result, the aircraft are able to achieve a higher utilization rate or surge rate during the early stages of a conflict, and a lower utilization rate or sustained rate later in the conflict.

The Air Force estimates the C-5 and C-141 will have to spend about 17.0 and 3.5 hours, respectively, at their home bases, undergoing maintenance for each round trip from the United States to Central Europe and back. Based on this and the increase in average daily utilization rates caused by unavailable aircraft and attrition discussed in the previous two sections, it appears the total flying hour program for the DELETED Furthermore, we have not yet allowed for onload/offload time, refueling time, and other unforeseen delays.

Ground times and unforeseen problems

The Military Airlift Command estimates that the round trip flying time for the C-5 and C-141 from the United States to Central Europe and back will take approximately 19.5 hours. They estimate both the onload in the United States and offload in Central Europe will average about 7.0 and 4.1 hours, respectively, and both type aircraft will have to take on fuel at a European recovery base for an average 4 and 1.4 hours ground time, respectively, during the round trip. Based on average onload, offload, and refueling times, each round trip will require about 11 hours of ground time for the C-5 and 5.5 hours for the C-141.

Onload/offload times may be constrained by not having the right material-handling equipment on the base where it is needed. The Military Airlift Command is studying this problem but has not yet drawn any conclusions. The Command did not provide us with the information being developed because the study had not been completed. However, its impact on onload/offload times should not be overlooked in developing a comprehensive mission plan for strategic airlift aircraft.

The C-141 aircraft will not have an air refueling capability until it undergoes the "stretch" modification. The C-5 aircraft always had an air refueling capability. Air refueling saves time and allows the aircraft to take off with a larger payload and less fuel. If the aircraft is required to carry enough fuel to fly nonstop to Central Europe,

it will decrease the amount of cargo that can be shipped. At the time of our review, the Military Airlift Command could not include air refueling in its contingency plans, partly because the C-141 aircraft does not yet have this capability, and DELETED

Other problems may be caused by saturation of bases in Central Europe and subsequent through-put at those bases--the ability of the cargo aircraft to quickly get onto the airfield, find ramp space, unload its cargo, and take off. If a NATO conflict does breakout in Central Europe, there are relatively few bases available to support all of our strategic and tactical aircraft and all the other NATO countries' aircraft as well as our strategic airlift aircraft.

The Air Force has initiated studies intended to address each of these problems; however, they are not yet complete. Since they were incomplete, the Air Force was reluctant to provide us with their interim data or conclusions, and we were unable to include them in our evaluation. The results of these studies should be considered in determining the impact on ground times and the capability of the airlift aircraft--what is the maximum utilization rate which can be attained by the C-5 and C-141 aircraft.

Ability to attain the utilization rates

Air Force planners may be overly optimistic on attaining an average 12.5-hour surge rate and a 10.0-hour sustained rate for the C-5 and C-141 strategic airlift mission, even if the additional aircrews and war reserve spares are obtained. Based on the most recent information and planning factors available to us and interviews with various officials at Air Force Headquarters and the Military Airlift Command, the following table depicts the maximum achievable surge rates after taking all factors into consideration.

Utilization Rates for C-5 and C-141 Aircraft for the First 30 Days of Mobilization

	C-5	C-141
Total number of aircraft		
Average number unavailable during first 30 days (note a)		
Average number lost due to attrition (note b)		
Total not available for support		
Total remaining for support		
Average round trip flying time (note c)		
Average unload/offload time		
Average refueling time at recovery station		
Average downtime for maintenance	DELETED	
Average total ground time per round trip		
Average total time required for one mission		
Percent of time flying for one mission		
Total hours available for mission (number of aircraft x 24 hours/day x 30 days)		
Total flying time for missions (percent x total)		
Maximum attainable daily utilization rate (note d)		

a/Based on Air Force factors for the average number of aircraft in the depot, compressed out of the depot, and unavailable due to not operationally ready supply.

b/Taken from Air Force Saber Haul Charlie study "best estimate."

c/Figures in this section are Air Force factors for average cycle times, in hours.

d/This is the average daily rate which could be expected for a total of 70 C-5 and 234 C-141 aircraft--the number the Air Force assumes would be available for wartime operations.

Based on our analysis, it appears that under optimum conditions, the C-5 will not be able to attain the 12.5-hour wartime surge rate, but the C-141 may.

If we consider the upcoming C-5 and C-141 modification programs, which will affect the C-141 between 1978 and 1982 and the C-5 between 1978 and 1987, the maximum attainable daily utilization rates are DELETED and DELETED respectively. These utilization rates are the maximum attainable under optimum conditions. Any number of unforeseen problems or delays could occur which would further impact the aircraft's ability to meet their wartime flying hour programs, such as (1) saturation of the Central European air bases, (2) a shortage of material-handling equipment, (3) a decrease in the operational ready rate, (4) an increase in the rate of attrition, and (5) inability of the depots to compress all aircraft out within 34 days.

IMPACT OF LOWER UTILIZATION RATES ON WAR RESERVE MATERIAL REQUIREMENTS

If the C-5 or C-141 aircraft are unable to attain the Air Force's planned utilization rates, the estimated number of aircrews and war reserve materials needed will be significantly decreased.

DELETED

Since funding is limited, however, it is essential that we not spend our resources on stockpiling war reserve materials or training aircrews which will never be needed. In addition, the Air Force's airlift capability could be overstated by DELETED tons in the first 30 days. This will have serious implications for those organizations planning to use airlift for deployment.

War reserve requirements, as the Air Force computes them, are a function of the total flying hours per month to be supported. Any decrease in the utilization rate--total flying hours--will also decrease the war reserve material and other requirements. The following graph demonstrates the impact of a change in utilization rates on dollars of war reserve materials.

RELATIONSHIP BETWEEN UTILIZATION RATES AND WAR RESERVE REQUIREMENTS FOR C-5 AIRCRAFT (DOLLARS IN MILLIONS)

DELETED

UTILIZATION RATE (AVERAGE HOURS PER DAY FOR 70 C-5 AIRCRAFT)

The chart shows if the utilization rate is constrained by the factors discussed in this section, and the C-5 aircraft can only attain a DELETED surge rate, the war reserve requirement could decrease from DELETED million to an estimated DELETED million. 1/ As of June 1977, the Air Force had $172.2 million in war reserves on hand for the C-5 aircraft.

WARTIME USE OF AIRCRAFT NOT ENGAGED IN THE CONFLICT

The war and mobilization plan for each fleet of aircraft, such as A-7D and F-15 aircraft, contains a number of engaged and non-engaged aircraft. The engaged aircraft are those which will be flying combat missions, and the non-engaged are those which will remain as reserve or training aircraft.

1/Estimated decrease assumes sustained rates will decrease proportionately with surge rates. Dollar decrease in war reserve requirements is based on estimates due to the complexity and cost of running actual statistics through the Air Force's computation system.

Using the war plan for our sample aircraft in the previous section, estimated flying hours for the first month of a conflict are DELETED for the non-engaged aircraft, and DELETED for the engaged aircraft. The total of these two categories is used to estimate war reserve requirements--the increase from 1,500 peacetime flying hours to DELETED wartime flying hours. The DELETED flying hours for the non-engaged aircraft, or DELETED percent of the total flying hours for the first month, affects the war reserve computation. As shown in the example on page 12, the Air Force computes war reserve requirements by the difference between the 1,500 total peacetime flying hours and the DELETED total wartime flying hours.

To illustrate the impact of supporting non-engaged aircraft during wartime, we looked at the war plans for four tactical fighter aircraft, the A-7D, F-4D, F-4E, and F-15A. The following table shows the projected number of aircraft engaged and non-engaged at the end of the first month for each of these aircraft.

War Plan for Engaged and Non-engaged Aircraft

Planned use	A-7D	F-4D	F-4E	F-15A	Total	Percent of total
Engaged						
Non-engaged						
Total						

DELETED

The above table shows about DELETED percent of these aircraft will not be flying combat missions. The Air Force assumes these aircraft will continue flying at their peacetime rates. The following graph illustrates the impact of this on total flying hours and war reserve requirements.

IMPACT OF NONENGAGED AIRCRAFT ON WAR RESERVE REQUIREMENTS FOR FOUR AIRCRAFT

DELETED

NOTE: THE AIRCRAFT USED IN THIS ANALYSIS WERE THE A-7D, F-4D, F-4E, AND F-15A.

Since the Air Force assumes there is a linear relationship between flying hours and war reserve requirements, the shaded area represents the additional increment of war reserves from including non-engaged aircraft in the total flying hour computation. Since assumptions regarding the wartime use of non-engaged aircraft affect war reserve requirements, the Air Force should take steps to ensure that specific wartime plans are made for these aircraft, rather than simply assuming they will continue to fly at peacetime rates.

DELETED

The following table shows the relationship of these training aircraft to the total remaining fleet in the first and sixth month of the war plan.

	Total remaining aircraft	Training aircraft	Percent of total
A-7D:			
First day			
Sixth month		DELETED	
F-4E:			
First day			
Sixth month			

It appears that the number of A-7D and F-4E training aircraft could be reduced to DELETED respectively, in the sixth month, and still maintain a DELETED of training aircraft. Similarly, wartime missions of other non-engaged aircraft should be analyzed in greater detail to determine if their missions are essential.

CONCLUSIONS

The Air Force plans wartime flying hour programs for its aircraft, and these are the bases for estimating war reserve requirements. Total flying hour programs are made up of aircraft flying combat missions (engaged aircraft) and other aircraft not flying combat missions (non-engaged aircraft). Missions for both engaged and non-engaged aircraft can affect war reserve requirements and, therefore, should be accurately planned.

Aircraft mission planning is an integral part of the overall wartime planning process. Like all other facets of planning, it must be as comprehensive and well coordinated as possible to assure that we are spending our limited funds where they will do the most good. We selected the strategic airlift mission to examine in detail and believe the basic planning concepts we used can be applied to other aircraft.

Several of our reports in the past have expressed concern over the planned wartime utilization rates of the C-5 and C-141 aircraft and their subsequent impact on airlift capability, maintenance requirements, and war reserve material requirements. In this review, we have not evaluated the airlift requirement. We recognize the important role of strategic airlift in a NATO conflict. We are, however, questioning the ability to achieve the strategic airlift requirement with C-5 and C-141 aircraft--the ability of the existing aircraft to meet the wartime flying hour program.

DELETED

The Air Force should know the capability of the C-5 and C-141 aircraft before spending $364.4 million for additional war reserves and $196 million to train aircrews which may not be fully needed. It is unrealistic to spend funds to support a wartime flying hour program which DELETED

The Air Force should assure that all of the other aircraft, as well as the C-5 and C-141, included in the war and mobilization plan, can attain their wartime flying hour programs. The matters discussed in this chapter for the C-5 and C-141 should be considered in these evaluations.

RECOMMENDATIONS

We recommend that the Secretary of Defense direct the Secretary of the Air Force to:

--Reevaluate planned wartime use of non-engaged aircraft in view of their impact on war reserve requirements.

--Reevaluate the capability of strategic airlift aircraft to meet its wartime flying hour requirement before committing large sums of money for war reserves and aircrews which may not be fully needed.

--Study the impact of this capability on requirements of the other services which depend on strategic airlift to move the necessary combat troops and equipment to the conflict area.

--Reevaluate the capability of all other aircraft with a planned wartime use to ensure that they can meet their wartime flying hour programs.

The Secretary of Defense should be prepared to devise plans, if necessary, which could assist military aircraft in meeting airlift requirements, or reduce the burden placed on them by considering other viable alternatives, such as increased use of sealift capability or greater prepositioning of supplies, equipment, and other material.

RECOMMENDATION TO THE CONGRESS

The Congress should require the Air Force to submit detailed plans on future war reserve requests for strategic airlift. This data should help the Congress decide which weapons systems need logistics support funding the most. If the Congress determines that the Air Force has not realistically defined the capability of strategic airlift from the data presented, it should defer further logistics support funding requests for these aircraft until the Air Force adequately does so.

CHAPTER 4

THE IMPORTANCE OF REALISTICALLY ESTIMATING AIRCRAFT ATTRITION

Attrition reduces the number of aircraft available to provide support and tends to reduce the amount of war reserve material needed. Therefore, realistic attrition estimates are important in estimating war reserve requirements. The Air Force has revised attrition estimates for selected aircraft and plans to revise attrition estimates for two strategic airlift aircraft. Air Force officials said attrition estimates for other aircraft are satisfactory.

The Air Force bases attrition estimates on the planned number of sorties to be flown. The attrition rate is multiplied by the number of sorties to estimate how many aircraft will be lost. A 1-percent attrition rate means one aircraft will be lost for each 100 sorties flown. (See table on p. 12.)

While attrition estimates are highly subjective and depend on the assumptions made, we believe a realistic assessment of attrition is important to ensure that logistics support is properly aligned for each type of aircraft. Air Force officials also stress the importance of not overestimating attrition because they feel it is better to have too many war reserves than not enough.

RELATIONSHIP BETWEEN ATTRITION AND WAR RESERVE REQUIREMENTS

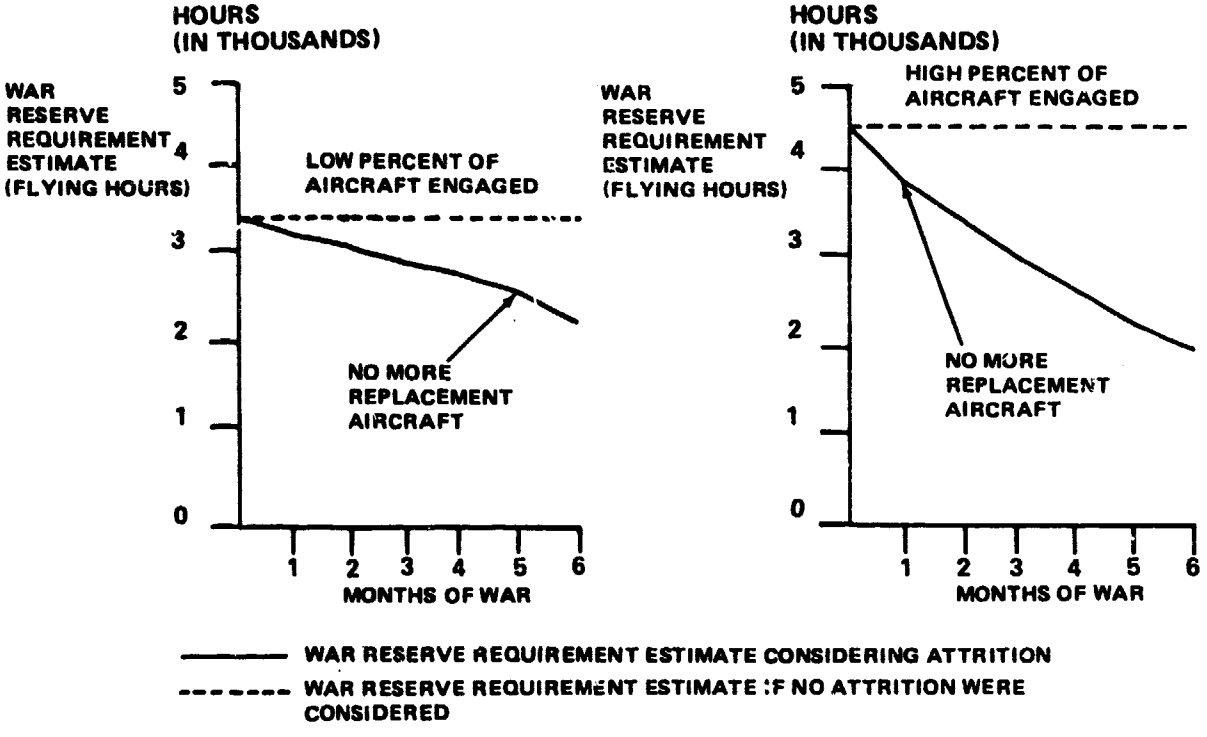
In general, attrition affects the number of aircraft remaining to provide support and, therefore, affects the amount of war reserves which will be needed. However, the impact of attrition on war reserves is more complex than this, because of two Air Force assumptions

--attrited aircraft will be immediately replaced by non-engaged aircraft and

--in some cases, if replacement aircraft are not immediately available, the remaining aircraft may be able to fly more combat sorties and still accomplish the same level of wartime activity.

A change in attrition rates would not affect war reserve requirements unless (1) the Air Force runs out of replacement aircraft or (2) the remaining aircraft are unable to increase their rates to compensate for attrited aircraft. The accuracy of attrition rates, therefore, becomes more critical for a large percentage of aircraft engaged early in the conflict, because this leaves fewer aircraft available for replacement. In addition, attrition rates become most critical when the entire fleet is engaged at maximum utilization. The effect on war reserve requirements for fleets having a low and high percent of aircraft engaged but having the same attrition rates is illustrated below:

IMPACT OF ATTRITION ON WAR RESERVE REQUIREMENT ESTIMATES



For example, aircraft with a high percent engaged may run out of replacements in the first month of war, while aircraft with a low percent engaged may not run out of replacements until the fifth month. The WRSK/BLSS portion of the estimated war reserve requirement will not be affected by attrition until there are no more replacement aircraft, since kits are stocked for engaged aircraft only. The sustaining portion of the war reserve requirement is, however, affected by any fluctuation in attrition rates, because it is based on total flying hours which includes engaged and replacement aircraft.

Estimated war reserves for aircraft with a high percent engaged will, therefore, be more severely affected by any change in the attrition rate because there are fewer replacement aircraft. DELETED

BASIS FOR ATTRITION RATES

Because it is important to accurately estimate attrition, we wanted to determine the basis for the attrition rates and demonstrate their impact on war reserve requirements. In addition, we researched attrition in past wars, reviewed attrition studies, and spoke with military attrition experts to determine the reasonableness of the rates used.

Attrition rates are established for each aircraft based on past experience, special studies, and computer modeling techniques. Estimates of attrition are affected by assumptions regarding

--war scenario,

--capability of enemy forces,

--combat tactics,

--frequency of operations (number of sorties flown), and

--weather conditions.

Attrition rates for each aircraft are listed in the Air Force's War and Mobilization Plan, and average from DELETED percent for the B-52 bomber and other strategic aircraft, to DELETED percent for most tactical fighter aircraft such as the A-7D and F-15, to DELETED percent for support aircraft such as the C-5, C-141, and KC-135 tanker. Since these rates have remained relatively unchanged for the past several years despite changes to the above assumptions, we wanted to determine if they should be refined. We examined in detail the basis for and the reasonableness of attrition rates for tactical fighter and airlift aircraft, because of their critical missions in the surge portion of the conflict.

Tactical fighter aircraft

We reviewed aircraft attrition statistics from past wars, including the Yom Kippur, Vietnam, and Korean Wars, and World War II. We also reviewed aircraft attrition studies by the Rand Corporation and the Air Force Studies and Analysis Group.

The Air Force had traditionally used a DELETED percent attrition rate for all combat sorties flown for most aircraft. Past experience seems to indicate that the DELETED percent rate is a reasonable average. However, it may vary substantially depending on the intensity of the conflict at various stages of the war. Based on experience gained in the Yom Kippur War--thought to be the experience most applicable to an intense war such as the "NATO" scenario--it appeared that higher attrition rates may be experienced early in a conflict. Israeli aircraft attrition fluctuated between DELETED percent and DELETED percent during the first 7 days of the Yom Kippur War. An independent study done for the Air Force indicates that attrition for ground attack aircraft--A-7, A-10, F-4, and F-111--may average DELETED percent during the first 20 days of a NATO conflict.

Based on these studies and interviews with officials of the Tactical Air Command, we felt that while a DELETED percent attrition rate is probably reasonable, stratified attrition rates--higher for the first part and lower for the later stages of a conflict--may be more realistic. This would also help the Air Force better align logistics support for these aircraft.

During our review the Air Force refined attrition rates for six aircraft--the A-7, A-10, F-4, F-15, F-16, and F-111--to reflect the intense air war expected in the first few critical days of a conflict. These new attrition rates range from DELETED percent for the first 7 days, DELETED percent for the next 23 days, and remain at about DELETED percent for the last 5 months.

Although the revised attrition rates are substantially higher early in the conflict, the average attrition rate over the 6-month scenario will actually fall below DELETED percent--the old rate. For example, the average 6-month attrition rate for the A-7D, F-15A, and F-4E aircraft are DELETED percent, respectively, down from DELETED percent. The overall rate may be too low according to experience gained in past wars. World War II and Israeli War statistics 1/ showed an overall attrition rate of DELETED and DELETED percent, respectively. It is not clear what impact the new rates will have on war reserve requirements. The Air Force is currently realigning WRSK/BLSS and sustaining war reserve requirements to reflect these new attrition rates.

The Air Force has made significant progress developing more realistic attrition rates for tactical aircraft for the early part of a NATO conflict. The new rates were based on input from various attrition studies and expert panels organized to evaluate each aircraft. They should, however, assure themselves that they have not underestimated attrition for the latter part of the conflict.

Attrition rates should be adjusted for all the other aircraft with a planned wartime mission, because attrition affects total wartime flying hour activity which is the basis for estimating war reserve requirements.

In addition to refining attrition rates for aircraft engaged in combat, another important aspect which should be considered is the extent of losses which could occur on the ground from sabotage activity. Providing security

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1/While this experience data may present the best historical data, it should be recognized that the Warsaw Pact has "state of technology" weapon systems and numerical superiority. Therefore, loss rates would undoubtedly be much higher than any historical data base now used.

for air bases involves host nation support agreements for U.S. military activities in Europe. However, the U.S. Air Force, Europe (USAFE), had been considering requesting additional U.S. Air Force security forces for rear area protection.

USAFE recently concluded that local ground defense of its air bases DELETED

With these critical shortfalls, the chances for losses of tactical and strategic airlift aircraft increase.

Airlift aircraft

In past and present planning cycles, the Air Force assumed that support aircraft, such as the C-5, C-141, and KC-135, DELETED In previous GAO reports, based on the Joint Chiefs of Staff strategic mobility study and the Air Force's Saber Haul attrition studies, we recommended that attrition be incorporated as a planning factor in computing logistics support requirements.

The Air Force is now reexamining attrition factors for the C-5 and C-141 aircraft and plans to incorporate an attrition rate in the next war planning cycle. The Air Force is, however, undecided over what rate to use. The rate will be based on the Saber Haul studies.

The original Saber Haul study on airlift attrition was completed in September 1972. The study was updated in November 1976 and again in December 1977. As previously mentioned, the Air Force denied us access to either of the updated studies so we were forced to use the 1972 rates.

The attrition rates in the 1972 Saber Haul study reflect only airlift aircraft destroyed on the ground while loading or unloading. The following table is based on the 1972 Saber Haul study and shows the expected number of aircraft lost by attrition for the first 90 days of conflict. The study

includes a low rate based on favorable conditions, a best estimate based on the most probable conditions, and a high estimate based on unfavorable conditions.

Estimated Attrition Losses
For Airlift Aircraft

Days of war	Favorable conditions C-5	Favorable conditions C-141	Probable conditions C-5	Probable conditions C-141	Unfavorable conditions C-5	Unfavorable conditions C-141
0						
5						
10						
20			DELETED			
30						
90						
Total						

The lowest estimate is based on all cargo deliveries

DELETED

The study tried to determine potential combat attrition levels for strategic airlift aircraft in a 1978 Central European conventional war. Study results were used for a portion of the Air Force's input to the Joint Strategic Objectives Plan for fiscal years 1975 and 1982. The study shows that the C-5 and the C-141 will be subjected

DELETED

IMPACT OF ATTRITION ON WAR RESERVE REQUIREMENTS

During our review, the Air Force revised attrition rates for tactical fighter aircraft. It is now using higher rates for the first 7 days of a conflict, and lower rates for the remainder of the war. For example, before the revision the Air Force projected a DELETED percent attrition rate for the F-15A and A-7D aircraft. The revised rates are DELETED and DELETED percent, respectively,

for the first 7 days; DELETED percent for the next 23 days; and DELETED percent for the remaining 150 days. Overall, these rates fall below DELETED percent for a 6-month period.

The following table shows the change in estimated war reserves for the F-15A and A-7D aircraft caused by varying attrition rates, assuming each aircraft tries to achieve the same level of activity. The three attrition rates used are (1) the revised rate--less than DELETED percent over 6 months--currently being used for planning, (2) the old rate DELETED used in previous planning cycles, and (3) DELETED selected arbitrarily for comparative purposes:

Impact of Attrition on War Reserve Requirements for Two Tactical Combat Aircraft

	War reserve requirement at various attrition rates (note a)		
Aircraft	Revised rate	Old rate	DELETED percent rate
F-15A			
A-7D		DELETED	
Total			

a/Estimates are based on fiscal year 1978 war reserve requirements and assume a proportionate relationship between flying hours and war reserve dollars.

As attrition rates increase, fewer aircraft are available to be supported (assuming none are replaced) and, therefore, aircraft would fly fewer hours. The above table shows that the war reserve requirement for these two aircraft would be reduced by about $117,394,000 if the old rate DELETED were used rather than the revised rate.

War reserve requirements for the C-5 and C-141 aircraft are currently based on DELETED attrition rate. The Air Force plans to incorporate DELETED rate in future planning cycles but is undecided about what rate to use. Incorporating DELETED rates

for these aircraft will substantially reduce war reserve requirements, particularly for the C-5, because (1)
DELETED

The following table shows the estimated reduction in war reserve material requirements which would result when incorporating the estimated low, best, or high attrition rates from the 1972 Saber Haul study.

Impact of Attrition on Airlift Aircraft War Reserve Requirements

Aircraft	Reduction in war reserve requirement at various attrition rates (note a)		
	Low estimate	Best estimate	High estimate
C-5			
C-141		DELETED	
Total reduction			

a/Due to the complexity and cost of running actual calculations through the Air Force's war reserve computation system, these reductions are estimated.

Although more C-141 aircraft will be lost than C-5s, the dollar impact is much less for the C-141s, because its computed requirement, based on flying hours, is almost DELETED times less (see p. 48). Also, a much higher proportion of C-141s are available for replacement. Therefore, the C-141's inventory would not become as severely depleted as that of the C-5, and its war reserve requirements would be less affected.

CONCLUSIONS

Attrition rates affect the number of aircraft remaining to provide support and consequently affect war reserve requirements estimates. The Air Force has made significant progress in refining attrition rates for six tactical fighter aircraft. However, past wars indicate that the overall rate may be too low. Air Force officials said they plan to

incorporate DELETED rates for the C-5 and C-141 airlift aircraft once they decide on DELETED We believe this will result in better attrition estimates and will help the Air Force determine war reserve requirements more accurately.

Air Force officials indicate they have no immediate plans to revise attrition rates for any other aircraft. We believe attrition rates should be studied for each aircraft with a planned wartime use. War reserve requirements should be based on these revised attrition rates.

RECOMMENDATIONS

Because attrition rates are important factors in accurately determining war reserve requirements for each aircraft, the Secretary of Defense should direct the Secretary of the Air Force to:

--Determine whether immediate replacement of attrited aircraft is a feasible concept. If not, there should be an offsetting factor for attrition in computing war reserve requirements.

--Ensure that, in revising attrition estimates for the six tactical fighter aircraft, attrition for the latter months of conflict are not underestimated.

--Reassess attrition rates for all aircraft with a planned wartime use.

--Reassess the impact that strategic airlift attrition could have on the C-5 and C-141 wartime flying hour program, on the capability to lift the necessary troops and equipment with reduced numbers of aircraft, and on reduced requirements for war reserve materiel.

CHAPTER 5

MORE REALISTIC APPROACHES

FOR COMPUTING WAR RESERVE REQUIREMENTS

The total Air Force estimated war reserve requirement for fiscal year 1979 is over $2.8 billion. Of this amount, they estimate that about $1.1 billion, or 40 percent, will be unfunded. The Air Force bases this estimate on he increased flying hours during wartime, by assuming a direct relationship between parts requirements and flying hours. In this chapter we examine the reliability of using sorties 1/ instead of flying hours to estimate war reserve requirements.

Using the number of sorties and mission types instead of simply flying hours may improve the accuracy of these requirements estimates. If the Air Force assumes correctly that requirements are directly proportional to hours flown, then for a given part, the failure rate per flying hour for a given aircraft (for example the F-15) would be the same regardless of sortie duration. However, studies indicate that parts failure rates tend to decrease as sortie duration increases for comparable missions. Since Air Force statistics indicate that nearly all aircraft are to fly sorties of greater duration in wartime, war reserve requirements estimates may be overstated. This analysis must be tempered, however, by the difference in wartime missions, the effects of increasing sortie rates, and the potential destruction of war reserves in the combat area.

Using the sortie method for computing war reserve requirements could reduce the Air Force's investment in these types of spares and repair parts considerably, without degrading wartime readiness.

IMPORTANT FACTORS AFFECTING THE COMPUTATIONS

Many complex factors and assumptions affect the amount of war reserves to be stocked as determined by the requirements computations. Some of these include

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1/While there are varying definitions of a sortie, in this report a sortie is generally considered to be one takeoff and landing.

--the rate at which parts fail in peacetime,

--the wartime flying hour program,

--the essentiality of the item to mission accomplishment,

--the length of time to repair an item during war,

--the time it takes to resupply a base,

--the various safety levels of stock,

--the logistics requirements relationship to flying hours, and

--the time needed for a manufacturer to supply items in war.

Further, the actual computation process is an involved, detailed computer program, which integrates all of these and other factors and assumptions to develop a war requirement. We recognize the extreme importance of this calculation because it impacts on the Air Force's $2.8 billion war reserve requirement. We are currently reviewing the computation process and related factors and assumptions as part of a separate audit.

This report focuses on the use of flying hours to determine logistics requirements. We investigated the alternative of using sorties of the aircraft as an indicator of requirements.

STUDIES ON THE RELATIONSHIP BETWEEN SORTIES AND MAINTENANCE REQUIREMENTS

The Air Force, as well as independent agencies such as the Rand Corporation and the Boeing Aircraft Corporation, have extensively examined the relationships of sorties and flying hours to maintenance requirements. Generally these studies indicate that the number of sorties are more reliable than flying hours in predicting maintenance requirements. The following is an examination of findings and conclusions from some of these reports and includes our opinions.

--Rand Corporation Memorandum RM-4049-PR, Trends in Aircraft Maintenance Requirements, June 1964. This study covers 8 months (Jan.-Aug. 1962) of data for 16 B-52G aircraft with a flying hour sample of 7,300 hours. There were two types of sorties flown; 326 training mission sorties for approximately 2,700 flying hours, and 194 considerably longer airborne alert missions for approximately 4,600 hours. Traditional method dictates that the 4,600 flying hours should produce 70 percent more maintenance problems than 2,700 hours, but in reality 39 percent fewer occurred. This is partly because certain parts are not scheduled for use on airborne alert missions and there were fewer sorties. But for other parts, the number of malfunctions reported were the same for both types of missions, in spite of the much longer duration alert mission. Therefore, the length of the sortie (flying time) was not closely related to workload requirements.

--Rand Corporation Memorandum RM-5701-PR, The Relationship of Flight Line Maintenance Manhours to Aircraft Flying Hours, August 1968. This study looks at the relationship between unscheduled flight line maintenance hours (which is predominant in wartime) and aircraft flying hours. The results indicate that unscheduled flight line hours are at best only slightly related to flying hours, while sortie length appears to exert a definite influence on hour production. For some aircraft (F-4C, F-5A, F-102) a negative correlation between flying hours and various maintenance factors is identified. This indicates a relationship of decreasing maintenance requirements per flying hour for longer sorties.

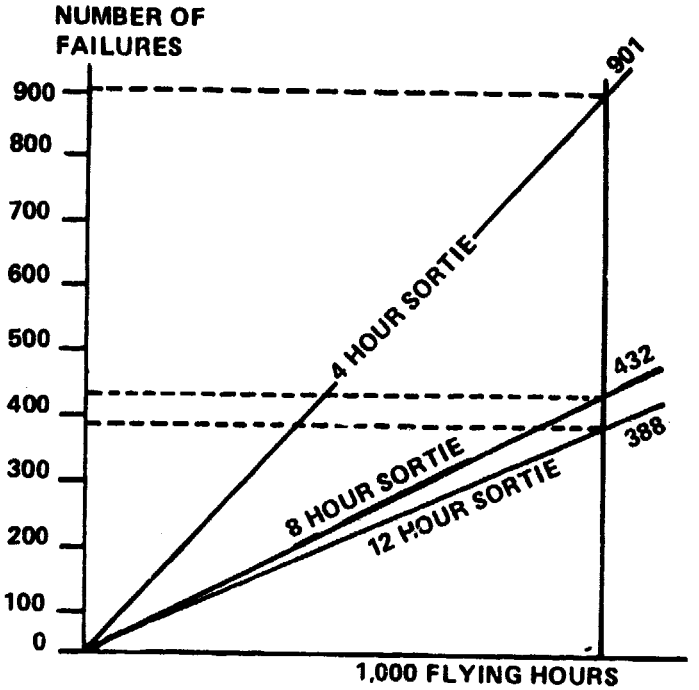
--Air Force Logistics Command Pamphlet, AFLCP 800-3, Logistics Performance Factors in Integrated Logistics Support, April 1973. Results in this study indicated that in some instances, sorties are a more definitive performance measurement than flying hours for selected hardware. It also showed that logistics requirements (manhours, spares, etc.) do not increase proportionally with increases in flying hours, and a specific factor such as maintenance hours per flying hours used as a constant and directly applied to increased flying hours will tend to overpredict requirements. In a comparison of C-130E aircraft flown by MAC and TAC, MAC flew

three times as many hours as TAC, but experienced only about 58 percent as many failures per 1,000 flying hours. The primary consideration here was that MAC flew about half as many sorties as TAC. This clearly illustrates the effect of sortie length and frequency upon maintenance requirements. In Southeast Asia, B-52D aircraft flying 4-hour sorties experienced 43 percent more maintenance failures per 1,000 flying hours than those flying 12-hour sorties. The following chart reveals the number of failures for three different systems on the B-52D aircraft. These figures indicate that failure rates per 1,000 flying hours decrease steadily as sortie length increases.

Number of Failures Per 1,000 Flying Hours

System	4-hour sortie	8-hour sortie	12-hour sortie
Instruments	288	146	133
Auto pilot	93	40	29
Bomb navigation	520	246	226
Total	901	432	388

If the requirements computation currently used by the Air Force is correct, and maintenance requirements are directly proportional to flying hours, the number of failures for any one system would be the same regardless of sortie length. This traditional computation, when graphically displayed as number of failures per flying hour, should display a single line. Yet plotting the total actual failures per flying hour reveals three distinct rates, depending on sortie length.



NOTE: FAILURE RATES ARE SHOWN AS STRAIGHT LINES FOR ILLUSTRATIVE PURPOSES. WHILE ACTUAL FAILURES WOULD PROBABLY NOT OCCUR LINEARLY, THE GRAPHIC RELATIONSHIPS ARE VALID.

--AFLC Technical Report No. 76-7, Logistics Impact of Sortie Oriented Air Crew Training, April 1977. This study looks at F-4 aircraft operational and maintenance data, which reveals that the length of a sortie has little effect on the number of maintenance actions following that sortie. Therefore, an increase in the number of sorties with no change in total flying hours would generate additional maintenance actions. The study also concludes that the aircraft's mission is one of the factors for determining maintenance requirements.

--AFLC Technical Report No. 76-16, Logistics Impact of Longer C-5 Missions, May 1977. This study shows C-5 aircraft flying 230 sorties with an average sortie length of 1.2 hours required about four times the number of maintenance actions per flying hour as those flying 370 sorties with about a 2.9 hour average. This is contrary to the results expected using the Air Force computation process, for which the C-5s with longer sorties flying 3.8 times as many hours (1,059 versus 276 hours) should have experienced a greater maintenance workload. The following conclusions are made in the report:

(a) The number of maintenance actions per flying hour generally decreases as flight length increases.

(b) The number of sorties results in a given number of maintenance actions regardless of the length of the sorties.

The summary of the C-5A study commented that:

> "Most, if not all of the referenced reports infer that the traditional approach of forecasting logistics support based on flying hours is subject to considerable error. While unanimous agreement as to the 'ideal' forecasting model does not exist, most knowledgeable authors conclude that the number of sorties and the type of sorties flown has an impact on logistics support."

COMPARISON USING SORTIES TO ESTIMATE WARTIME LOGISTICS REQUIREMENTS

Traditionally, peacetime aircraft maintenance data has been kept on a flying hour basis and used to forecast wartime logistics requirements. Typically, the ratio of peacetime flying hours to wartime flying hours for each type of aircraft is the primary factor used in calculating wartime materiel requirements. Peacetime use rates for individual parts are multiplied by this flying hour ratio to determine wartime needs. For example, if an aircraft flew 100 hours per month and required five radios to support the peacetime program, it would need ten radios to support 200 flying hours each month during war.

Under this philosophy, the Air Force spends many millions of dollars annually to stock parts for projected wartime use. This tradition persists, despite the fact that several detailed studies (including those previously mentioned) indicate that other factors are more reliable than flying hours in determining wartime logistics requirements. We believe that aircraft with wartime missions, differing substantially from peacetime missions, could require different levels of support than that predicted by the flying hour computation.

To test this theory, we obtained the Air Force's projections of wartime flying hours and the number of sorties for

several aircraft. Using this information, we wanted to show the impact that changing from a flying hour base to a sortie base could have on war reserve requirements. We compared wartime surge rates based on flying hours with wartime surge rates based on the number of sorties for six key aircraft. This involved determining the average monthly peacetime flying hours and sorties flown, and comparing them to the average monthly wartime flying hours and sorties flown, to obtain the wartime surge rates. The graph on page 47 depicts the difference in surge rates between flying hours and the number of sorties for the same six aircraft.

The graph shows that surge rates based on the number of sorties are generally less than surge rates based on flying hours. This is because the length of wartime sorties (flying hours) for most aircraft are expected to be longer than peacetime sorties.

Since most aircraft will surge at a higher level of activity and fly a longer sortie than they did in peacetime, they will not require as many parts per flying hour for wartime use, thereby reducing war reserve requirements based on flying hours. Simply put, an aircraft needing five radios in peacetime to support 100 sorties lasting an hour each (100 flying hours) would only require ten radios to support 200 sorties lasting 2 hours each (400 flying hours). Under the Air Force's current requirements methods, the same aircraft would require 20 radios to support the fourfold increase in flying hours. However, as explained on page 40, differences in wartime missions, increasing sortie rates, and other factors such as increased flying hours could cause somewhat of a variance in the requirements.

Using sorties for computing wartime requirements, we estimated the reduced savings available from using this method instead of the total flying hours method. The savings were computed using the following formula:

$$\frac{\text{Surge rate based on flying hours}}{\text{Surge rate based on sorties}} = \frac{\text{Current \$ war reserve requirement}}{X}$$

The graph on page 48 shows a $594.8 million potential savings due to this change. It depicts current war reserve material requirements for the C-5, C-141, F-15, B-52, A-7, and KC-135 aircraft, and what these figures might be if

PERCENT OF SURGE OVER PEACETIME RATES

C-5A
FLYING HOURS
NUMBER OF SORTIES

C-141A
FLYING HOURS
NUMBER OF SORTIES

F15A
FLYING HOURS
NUMBER OF SORTIES

B-52D
FLYING HOURS
NUMBER OF SORTIES

A-7D
FLYING HOURS
NUMBER OF SORTIES

KC-135A
FLYING HOURS
NUMBER OF SORTIES

DELETED

NOTE: WAR RATES USED WERE AN AVERAGE OF THE AIR FORCE'S PROJECTED SIX MONTH FLYING-HOUR PROGRAMS AND NUMBER OF SORTIES FLOWN.

IMPACT OF SORTIE-BASED WAR RESERVE REQUIREMENTS FOR SIX AIRCRAFT (MILLIONS OF DOLLARS)

CURRENT REQUIREMENT C-5	
SORTIE-BASED	
CURRENT REQUIREMENT C-141A	
SORTIE-BASED	
CURRENT REQUIREMENT F-15A	
SORTIE-BASED	
CURRENT REQUIREMENT B-52D	DELETED
SORTIE-BASED	
CURRENT REQUIREMENT A-7D	
SORTIE-BASED	
CURRENT REQUIREMENT KC-135A	
SORTIE-BASED	
CURRENT REQUIREMENT TOTAL OF SIX AIRCRAFT	
SORTIE-BASED	

NOTE: CURRENT REQUIREMENT IS TAKEN FROM THE AIR FORCE'S FISCAL YEAR 1979 ESTIMATE FOR AIRCRAFT WAR RESERVE SPARES AND REPAIR PARTS. SORTIE-BASED WAR RESERVE REQUIREMENT ESTIMATES REFLECT CHANGES IN SORTIE DURATION FROM PEACETIME TO WARTIME ONLY AND DO NOT CONSIDER CHANGES IN PEACETIME AND WARTIME MISSIONS.

requirement calculations were based on sorties. These six aircraft account for over 42 percent of the total $2.8 billion Air Force war reserve requirements.

Studies show that the relationship between the numbers of peacetime sorties and wartime sorties is a more accurate indicator of war reserve requirements. Although using sorties may not be the only answer to improving the war reserve requirements computation, the Air Force cannot afford to overlook this method in view of the potential savings--$594.8 million for the six aircraft we examined.

If we apply this concept to the C-5, C-141, and B-52 aircraft--three of the six aircraft we examined--in addition to the flying hour constraints and attrition factors discussed in chapters 3 and 4, the resulting war reserve requirements for these aircraft would be less than the amount already on hand. The deficit for these three aircraft would therefore be eliminated. The Air Force should consider these and other approaches when it estimates wartime support.

CONCLUSIONS

Although the Air Force has responded to the Office of the Secretary of Defense's requests for streamlining their war reserve requirements, they could do more. We reviewed a variety of studies which indicate that the current method of computing wartime maintenance requirements could be improved. The studies and our own work confirm that more realistic approaches should be given high consideration, because they could substantially reduce war reserve requirements and still have no adverse effect on the total number of hours and sorties which need to be flown. Thus, wartime readiness would not be degraded at all.

RECOMMENDATION

We recommend that the Secretary of Defense direct the Secretary of the Air Force to determine the feasibility of modifying wartime requirements computation procedures to recognize more realistic approaches for computing war reserves. Using sorties rather than total hours flown, for example, could substantially reduce and in some cases eliminate the deficit for war materiel requirements without affecting or degrading wartime readiness.

THE WARTIME PLANNING PROCESS: WHAT IS INVOLVED?

The objective of logistics support planning is to meet specific operational support goals at minimal total cost. Support planning should emphasize operational readiness, responsiveness to potential wartime requirements, and peacetime efficiency, in that order; but continual effort must be made to provide logistics support more efficiently.

To support and maintain their military equipment and weapons systems during wartime, the military services need a proper mix of people, facilities, equipment, and spare parts. If a war actually occurred between NATO and the Warsaw Pact, the overall military power of the United State's tactical and strategic air forces would be substantially capable of helping ground forces deter enemy attacks.

Translating overall war planning concepts into logistics plans and programs is an extremely complex task. The assumptions and related factors affecting war reserve requirements, which enter into this process, are varied and complicated too. In essence, these factors involve many subjective judgments of what might occur should a war break out.

For example, someone must first determine which war scenario is most likely to occur. Second, someone must estimate the size and type of threat that will be encountered, the enemy's resources, and the combat tactics the enemy will use. Third, someone must determine our resources and how they can be effectively deployed to counter the threat. Finally someone must estimate the logistics support to meet that level of activity.

Following is an explanation of how materiel defense policies are translated into programs and budgets, and a discussion of some of the complexities involved. It suggests that all facets of wartime plans and programs should tie together with logistics plans and operations, and that the assumptions should be realistic in view of the most current data available.

DOD'S PLANNING, PROGRAMMING, AND BUDGETING SYSTEM

The Secretary of Defense is responsible for developing all requirements for military items and support materiel

needed during a contingency, including requirements for war reserves. The Secretary, however, delegated this responsibility to the military services which, in turn, individually develop their own needs for these items.

The Secretary's annual Policy and Programming Guidance Memorandum is the basic policy and guidance document which the military services use to determine their overall logistics requirements. DOD's Planning, Programming, and Budgeting System translates national policy objectives into specific defense programs, including programs for funding war reserve materiel requirements.

The planning cycle begins with the Joint Chiefs of Staff's views on military strategy and the forces necessary to accomplish this strategy. Their views, however, are developed without overt consideration of fiscal constraints; therefore, their plan may be too expensive because it is not constrained by fiscal levels.

Based on the Joint Chief's views, the Office of the Secretary of Defense prepares the defense policy and planning guidance. Specific scenarios, for which U.S. forces must be available, and broad fiscal guidance are defined in this document. Thus, a document is developed which spells out the DOD strategies as well as the dollars available to support them.

From this guidance, the services are required to develop their programs for the next year. They can introduce new programs, but must tailor the mix of new and already approved programs to stay within the specified fiscal levels. Subsequently, the Secretary of Defense decides on program adoption and informs the services. From here the system moves into the budgeting cycle with the objective of getting all program decisions consolidated into one approved program, known as the Five Year Defense Plan.

The budgeting cycle is rather standard in that it emphasizes incorporating programs into the correct budgeting format, making normal budget cuts, and keeping the total size of the budget within prescribed preliminary budget levels. However, many decisions in the planning and programming cycle are changed when the budgeting phase is finally reached. This can be caused by changes in dollar ceilings, in congressional attitudes toward specific programs,

and in the direction of many programs established early in the process.

As mentioned before, the relationship of strategic wartime planning with logistics support and operations is a critical factor in this overall process. All important aspects of planning or programming must be adequately and completely analyzed, or defense budgets provided to the Congress might not show the optimum picture of what is needed to sustain military operations.

AIR FORCE'S PLANNING PROCESS

The key ingredient for successfully transporting the necessary supplies and equipment, maintaining air superiority, and attacking strategic and tactical targets during war is the number of hours each engaged aircraft expects to fly for the planned duration. Supply support and maintenance experience data are expressed in terms of quantities of material and maintenance manhours for each flying hour.

The Air Force's war and mobilization plan contains wartime flying hour programs for each aircraft. The accuracy of flying hour programs is important for good estimates of facilities, people, equipment, and spare parts. During the war mobilization planning process, other factors can logically impact on flying hour requirements, and therefore should be fully evaluated when support for wartime objectives is being determined. Such factors include aircraft combat attrition; downtime for repair; frequency of repair; time to load and offload material; refueling capability; and availability of aircraft, flight crews, and maintenance crews.

The methods, processes, and data used by war planners to determine logistics requirements for supporting operational scenarios are shown in figure 1 on the following page. The elements depicted are, naturally, interdependent and mutually constraining on each other, and require accurate data so that planning throughout this process is effective.

The Air Force's Planning, Programming, and Budgeting System allows for all the various logistics elements described above and must accommodate them within the fiscal constraints imposed by DOD, the Office of Management and Budget, and the Congress. Since the Air Force translates DOD's guidance (described on page 51) into policies and programs which ultimately

APPENDIX I

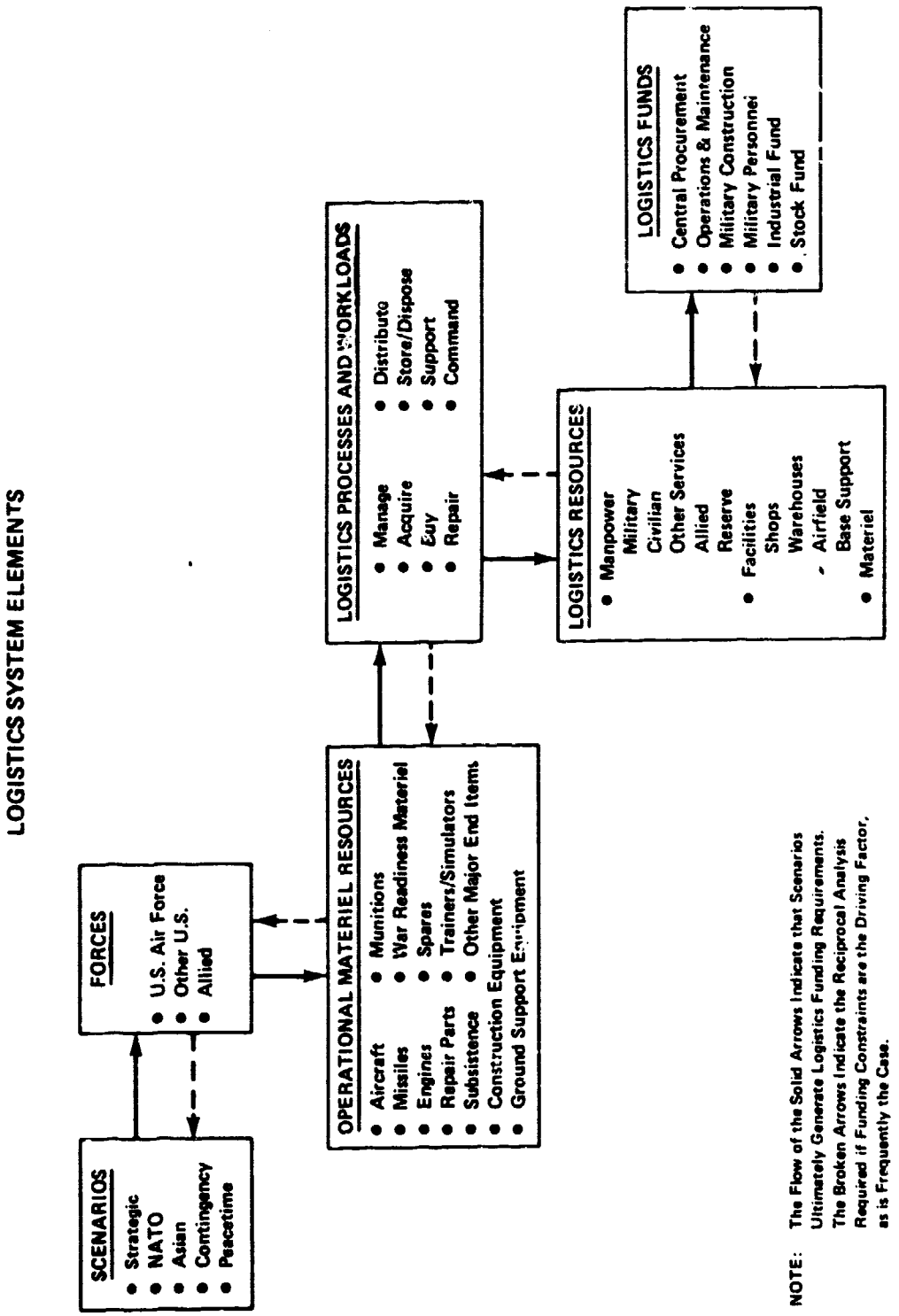
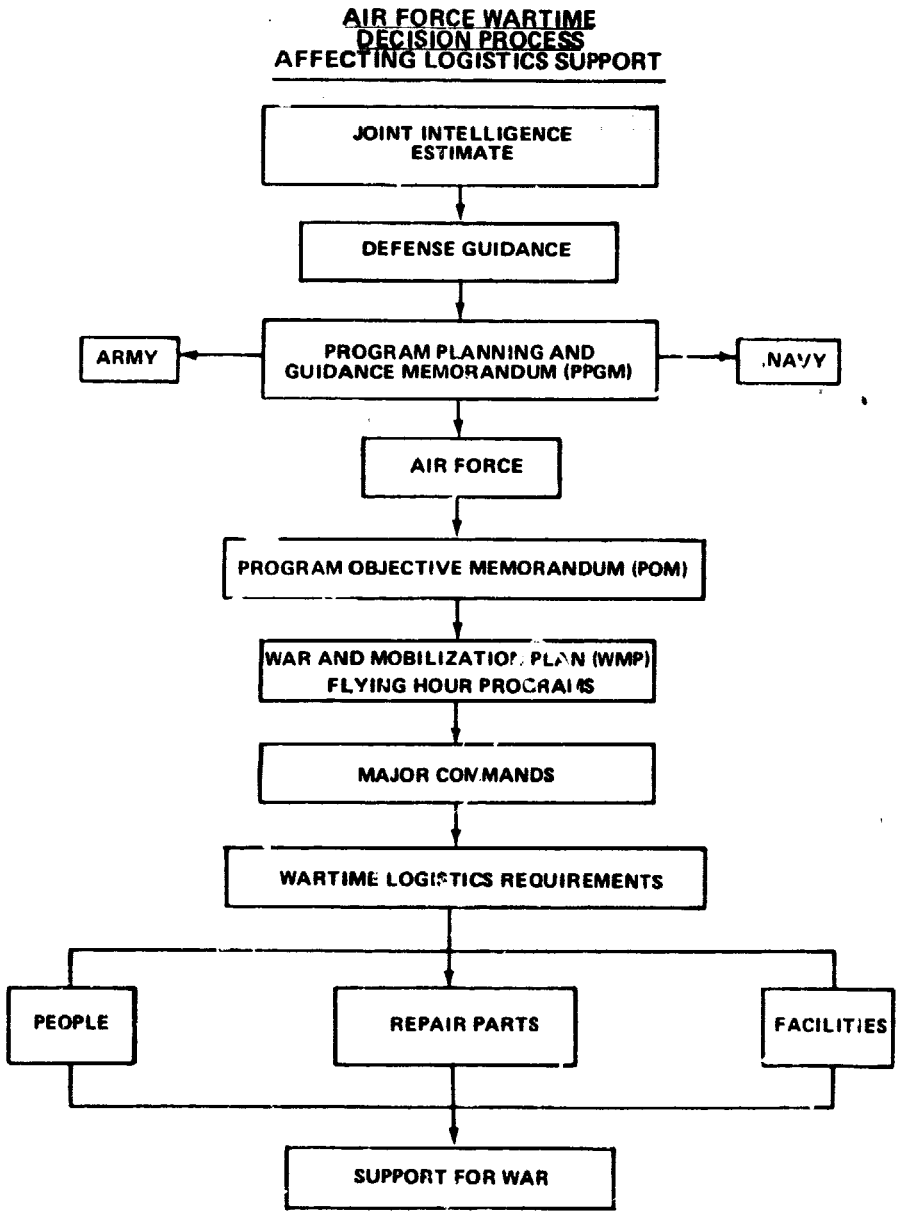


FIGURE 1

drive requirements for support of war, it determines requirements for war materiel based on a series of subjective estimates and assumptions. Therefore, decisions made during the initial stages of the planning cycle, if based on inaccurate assumptions, could have a tremendous dollar impact on total logistics requirements for war, including requirements for personnel, repair parts, and facilities. The following chart illustrates how the defense guidance translates into war logistics requirements.



PRIOR GAO REPORTS CONCERNING AIR FORCE REQUIREMENTS FOR SPARES, REPAIR PARTS, AND RELATED MATTERS

1. System for Buying Spare Parts for Initial Support of New Military Aircraft Needs Substantial Improvements (B-133396, Jan. 31, 1972).

2. Need To Improve Accuracy of Air Force Requirements System for Reparable Parts (B-146874, Sept. 13, 1972).

3. Reduced Requirements for Modular Electronic Equipment for Aircraft (B-133396, July 3, 1973).

4. Information on the Requirement for Strategic Airlift (PSAD-76-148, June 8, 1976).

5. Air Force Could Reduce War Reserve Requirements of Combat-Ready Units For Spares and Repair Parts (LCD-75-444, Aug. 27, 1976).

6. Determining Requirements for Aircraft Maintenance Personnel Could be Improved--Peacetime and Wartime (LCD-77-421, May 20, 1977).

7. The Air Force Can Reduce Inventories by Eliminating Unneeded Stock Levels (LCD-76-425, June 17, 1977).

8. Alternatives Available for Reducing Requirements for Spare Aircraft Engines (LCD-77-418, Oct. 12, 1977).

9. Need to Strengthen Justification and Approval Process for Military Aircraft Used for Training, Replacement, and Overhaul (LCD-77-423, Oct. 28, 1977).

10. Air Force Maintenance Depots--The Need for More Responsiveness to Mobilization as well as Peacetime Efficiency (LCD-78-403, Nov. 23, 1977).

PRINCIPAL OFFICIALS RESPONSIBLE FOR ADMINISTERING ACTIVITIES DISCUSSED IN THIS REPORT

	Tenure of office	
	From	To
DEPARTMENT OF DEFENSE		
SECRETARY OF DEFENSE:		
Dr. Harold Brown	Jan. 1977	Present
Donald H. Rumsfeld	Nov. 1975	Jan. 1977
James R. Schlesinger	July 1973	Nov. 1975
ASSISTANT SECRETARY OF DEFENSE (MANPOWER, RESERVE AFFAIRS, AND LOGISTICS):		
Dr. John P. White	May 1977	Present
Dale R. Babione (acting)	Jan. 1977	Apr. 1977
Frank A. Shrontz	Feb. 1976	Jan. 1977
John J. Bennett (acting)	Mar. 1975	Feb. 1976
Arthur I. Mendolia	June 1973	Mar. 1975
SECRETARY OF THE AIR FORCE:		
John C. Stetson	Apr. 1977	Present
John C. Stetson (acting)	Jan. 1977	Apr. 1977
Thomas C. Reed	Jan. 1976	Jan. 1977
James W. Plummer (acting)	Nov. 1975	Jan. 1976
ASSISTANT SECRETARY OF THE AIR FORCE (MANPOWER, RESERVE AFFAIRS, AND INSTALLATIONS):		
Antonio H. Chayes	July 1977	Present
Richard J. Keegan (acting)	Feb. 1977	July 1977
J. Gordon Kapp	Mar. 1976	Jan. 1977
Frank A. Shrontz	Oct. 1973	Feb. 1976

(947308)