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The Military Services can reduce peacetime maintenance personnel costs by millions by improving its systems to determine peacetime and wartime requirements and by planning greater use of reserve personnel to meet certain wartime maintenance workloads. Findings/Conclusions: The opportunity to reduce these costs exists because the services can correct weaknesses in their systems. These weaknesses cause overstated requirements and usually attempt to staff peacetime below-depot maintenance organizations with sufficient active duty personnel to meet wartime mobilization needs. Recommendations: The Secretary of Defense should direct the Secretaries of the services to: (1) improve the manpower requirements determination process by insisting upon evaluation of the critical assumptions concerning the use of forces and their impact on below-depot aircraft maintenance manpower and modifying manpower determination systems to include current, accurate, and reliable manpower determination factors and maintenance data; and (2) develop alternatives for greater use of reserves while determining the most cost-effective and appropriate mix of forces (active and reserve) to meet the below-depot-level maintenance personnel requirements. (Author/SC)

REPORT TO THE SENATE COMMITTEE ON APPROPRIATIONS

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

Determining Requirements For Aircraft Maintenance Personnel Could Be Improved--Peacetime And Wartime

Department of Defense

The military services can reduce peacetime maintenance personnel costs by millions by improving its systems to determine peacetime and wartime requirements and by planning greater use of reserve personnel to meet certain wartime maintenance workloads. This opportunity exists because the services

--can correct weaknesses in their systems which cause overstated requirements and

--usually attempt to staff peacetime below-depot maintenance organizations with enough active duty personnel to meet wartime mobilization needs.

Defense should strengthen its manpower determination systems and should strive for greater use of reserves in meeting peacetime and wartime maintenance personnel requirements.

LCD-77-421

MAY 20, 1977

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

B-133370

The Honorable John L. McClellan
Chairman, Subcommittee on Defense,
Committee on Appropriations
United States Senate

Dear Mr. Chairman:

This report points out that the military services could save millions of dollars by (1) correcting weaknesses in their manpower requirement systems which cause overstated requirements and (2) striving for greater use of the reserve forces in meeting maintenance personnel requirements. You requested this effort as a follow-on to our previous reports on below-depot-level activities which questioned staffing requirements at below-depot-level maintenance facilities.

As you requested, we did not ask the Department of Defense to provide official written comments on this report. However, informal comments were obtained during discussions of the report material with Defense officials.

We hope our report satisfies your request and will be useful to your committee.

Sincerely yours,

Comptroller General
of the United States

Enclosure

COMPTROLLER GENERAL'S REPORT TO THE SENATE COMMITTEE ON APPROPRIATIONS

DETERMINING REQUIREMENTS FOR AIRCRAFT MAINTENANCE PERSONNEL COULD BE IMPROVED--PEACETIME AND WARTIME

D I G E S T

Defense manpower is costly (about 60 percent of the defense budget), and aircraft maintenance manpower is a sizeable portion of this cost. The military services operate approximately 25,000 aircraft. Annual costs for aircraft maintenance is over $6 billion and about two-thirds of this cost is for below-depot-level maintenance. GAO conservatively estimates the services employ over 250,000 military and civilian personnel to perform this maintenance.

The Senate Committee on Appropriations requested that GAO evaluate peacetime and wartime staffing criteria and dissimilarities among the services' systems to determine staffing requirements. The committee also asked GAO to look into the possibility of placing manpower authorizations that are in excess of peacetime requirements in the reserve components.

GAO found that military activities usually determine below-depot aircraft maintenance manpower required for wartime operations, and within the existing budget constraints most activities attempt to staff for wartime operations. The military services have done little to develop systems to determine what staffing is required for peacetime.

Each service approaches the manpower determination process using its independently developed systems and assumptions, rules, and policies. GAO found problems within this process.

--In many cases, manpower factors and data used in the individual manpower determination systems are questionable, inaccurate, or outdated. Refinement of the existing systems and information used

to determine maintenance manpower requirements is necessary if the services are to determine the most appropriate level of maintenance manpower for both wartime and peacetime.

--Assumptions concerning the use of military forces underlie each service's manpower determination system and greatly affect the manpower requirements. Reevaluating these critical assumptions could lead to reductions in manpower requirements.

For example, the services' systems generally assume all deployable aircraft units must be ready to deploy immediately, but some units will not deploy during the early stages of war. GAO believes manpower requirements could be adjusted to reduce active duty manpower levels during peacetime and use reserves to augment some of these units during wartime.

Effective use of the reserve components has become a matter of increasing concern within the Department of Defense. The reserve components face many difficult problems in the present all volunteer force environment. Meanwhile, the services have, with few exceptions, staffed their below-depot maintenance activities to support mobilizations without reliance on reserves. GAO endorses the concept of associating reserve components with active force components, possibly along lines similar to the Military Airlift Command's Associate Reserve Program, as a means of making greater use of the reserves. This, in turn, can lead to reducing active duty manpower levels by substituting reserves into units not immediately needed at the outbreak of war and, thereby, reduce the total defense manpower costs.

GAO recommends that the Secretary of Defense direct the Secretaries of the services to:

--Improve the manpower requirements determination process by (1) insisting upon

evaluation of the critical assumptions concerning the use of forces and their impact on below-depot aircraft maintenance manpower and (2) modifying manpower determination systems to include current, accurate, and reliable manpower determination factors and maintenance data.

--Develop alternatives for greater use of reserves while determining the most cost effective and appropriate mix of forces (active and reserve) to meet the below-depot-level maintenance personnel requirements. (See p. 11.)

GAO has made additional recommendations to the Secretaries of the services regarding specific improvements needed within the various systems being used to determine manpower requirements for below-depot aircraft maintenance activities. (See pp. 31, 40, and 54.)

At the instructions of the Subcommittee on Defense, Senate Committee on Appropriations, GAO did not solicit official written comments from the Department of Defense.

Tear Sheet

Contents

ABBREVIATIONS

AIMD	Aircraft Intermediate Maintenance Departments
DCM	Deputy Commander for Maintenance
DOD	Department of Defense
GAO	General Accounting Office
LCOM	Logistics Composite Model
MAC	Military Airlift Command
MACRIT	manpower authorization criteria
NAS	naval air station
SAC	Strategic Air Command
TAC	Tactical Air Command
3-M	Maintenance and Materiel Management

CHAPTER 1

INTRODUCTION

The military services operate nearly 25,000 aircraft. The annual cost to maintain these aircraft is over $6 billion. Military maintenance manpower is the largest recurring element in this cost. Large maintenance manpower costs will always be necessary, because manpower must be available in adequate numbers and quality to provide the high aircraft availability required in war. Defense manpower costs generally are great--about 60 percent of defense spending. It is important in every manpower area, including the maintenance area, to identify opportunities to improve manpower controls and to realize savings wherever possible.

Below-depot maintenance costs are about two-thirds of total aircraft maintenance costs. Below-depot maintenance generally includes two levels, organizational and intermediate. The two below-depot levels, in contrast to the depot level, are highly user or unit oriented, perform less complex tasks, and employ primarily military personnel. The Army, Navy, and Air Force employ over 250,000 military and civilian personnel to perform below-depot aircraft maintenance.

We reviewed the systems used by the Army, Navy, and Air Force to determine their below-depot aircraft maintenance personnel requirements for peacetime. Also, we examined the procedures used to project the number of such personnel required to support the increased aircraft flight activity forecasted for wartime. Finally, we evaluated the services' efforts to use reserves to limit active duty maintenance staffing in peacetime, when the use of reserves would not impair the services' ability to be potentially responsive to the increased tempo of wartime flight operations.

OUR REPORTS RELATED TO MATTERS DISCUSSED IN THIS REPORT

Some of our past reports related to these matters include (1) "Improving Productivity Through Better Management of Maintenance Operations in Europe" (LCD-75-401) March 7, 1975, (2) "Productivity of Military Below-Depot Maintenance--Repairs Less Complex Than Provided at Depots--Can Be Improved" (LCD-75-422) July 29, 1975, (3) "Navy Aircraft Overhaul Depots Could Be More Productive" (LCD-75-432) December 23, 1975, and (4) "Report to the Secretary of Defense on Aerial Port Staffing" (LCD-75-219) March 13, 1975.

GAO is reviewing the (1) productivity of the Navy's intermediate maintenance for ships, (2) Navy's management of and requirement for carrier deployed aircraft, and (3) functions, resources, and workloads at defense depot-level aircraft maintenance activities. Our reports on these areas are scheduled for issue during 1977.

SCOPE OF REVIEW

We made our review during the period August 1976 to January 1977. Detailed work was done at the following locations.

U.S. Army:
- Headquarters, Department of the Army, Washington, D.C.
- Training and Doctrine Command, Fort Monroe, Va.
- Transportations School, Fort Eustis, Va.
- Forces Command, Fort McPherson, Ga.
- 18th Airborne Corps, Fort Bragg, N.C.
- Development and Readiness Command, Alexandria, Va.

U.S. Air Force:
- Headquarters, Department of the Air Force, Washington, D.C.
- Tactical Air Command, Langley Air Force Base, Va.
- Military Airlift Command, Scott AFB, Ill.
- Strategic Air Command, Offut AFB, Neb.
- Travis Air Force Base, Calif.
- Mather Air Force Base, Calif.

U.S. Navy:
- Chief of Naval Operations, Washington, D.C.
- Bureau of Naval Personnel, Washington, D.C.
- Commander, Naval Air Force, Atlantic Fleet, Oceana, Va.
- Commander, Naval Air Force, Pacific Fleet, San Diego, Calif.
- Commander, Navy Manpower and Material Analysis Center, Atlantic, Norfolk, Va.
- Commander, Navy Manpower and Material Analysis Center, Pacific, San Diego, Calif.
- Naval Air Station, Alameda, Calif.
- Naval Air Station, Moffett Field, Mountainview, Calif.
- Naval Air Station, Lemoore, Calif.

U.S. Reserve Components:
Army National Guard Bureau, Washington, D.C.
Army National Guard, Operations Activities Center, Edgewood, Md.
Chief of Army Reserve, Washington, D.C.
Air Force National Guard Bureau, Washington, D.C.
Chief of Air Force Reserve, Washington, D.C.
Director of Naval Reserve, Washington, D.C.
Chief of Naval Reserve, New Orleans, La.

We also did limited work at other Department of Defense (DOD) locations. At the instructions of the Subcommittee on Defense, Senate Committee on Appropriations, we did not solicit written DOD comments. Throughout this review, however, we discussed our findings as they were developed with responsible DOD officials and obtained their comments. At the conclusion of our work, we held exit conferences with each of the military services in Washington, D.C.

We limited our review to staffing of below-depot aircraft maintenance activities. However, the basic issues addressed and improvements needed could well apply to other military maintenance staffing.

CHAPTER 2

MANPOWER DETERMINATION PROGRAMS FOR BELOW-DEPOT AIRCRAFT MAINTENANCE

The military manpower needs of the United States are based on the force structure deemed necessary to support our security, while accepting no more than prudent risk in the face of the perceived threat. The manpower determination process concerns the translation of the chosen force structure requirements into the manpower necessary to man and support the forces.

The military services' systems for determining below-depot maintenance personnel requirements are the basis for allocating billions of dollars for active force and reserve personnel, and these systems are a key ingredient to effective aircraft maintenance in peace and war.

Below-depot-level maintenance activities for aircraft vary widely in nature. Maintenance activities exist on ships, in squadrons, at mobile bases, and at foreign and United States Army, Navy, and Air Force bases. Each type of activity maintains aircraft that perform various kinds of missions, such as patrol, attack, support, or training. Further, because of deployments and other factors, the numbers and aircraft types an activity maintains in peace may vary greatly from that which would be maintained during war. To properly determine manpower requirements, it is necessary to identify assigned missions and the way they vary at peace and at war. To clarify missions for maintenance activities, workloads must be defined for peace and war. Further, an estimate must be made of the speed with which an activity must be able to adapt to wartime workloads. The need to define these factors must be emphasized, because good definition is necessary to properly size the forces needed and to determine the most economical mix of active, reserve, and other personnel.

Rising personnel costs are of continuing concern within DOD. Accordingly, there are basic questions which should be asked concerning the systems for determining manpower requirements and the mix of forces (active, reserve, and other personnel) to satisfy these requirements.

--Do sound systems exist to determine both (1) requirements for peacetime personnel and (2) requirements for wartime personnel?

--Has advantage been taken of opportunities to use reservists to meet personnel requirements for wartime in excess of personnel requirements for peacetime?

ARE MANPOWER DETERMINATION SYSTEMS ADEQUATE?

Determining maintenance manpower requirements is not a new process or static by any means. The military services have been developing and adjusting manpower requirements annually for many years. There is no one system which establishes requirements for all maintenance activities. In fact, each service approaches the below-depot aircraft maintenance personnel determination process using its own systems, sets of logic, decision rules, and policies. The logic of the several processes varies from precise industrial engineering work measurement to subjective judgment.

The Army has basically a manual system which has been using for several years. This system relies almost exclusively on extension of a formula that considers basic quantitative factors, such as number of aircraft, maintenance man-hours per flying hour, monthly flying hours, and productive man-hours per month.

The Navy relied on a manual system for many years which also dealt with basic quantitative factors similar to those in the Army system. However, the Navy is changing to a computer-based system which contains models that can be adjusted to different conditions and employs the basic theory of regression analysis. This system is designed to compute requirements for aircraft squadrons as well as both shore-based and ship-based maintenance activities.

The Air Force does not have a single system. Each major command has its own system--ranging from a manual system using measured maintenance man-hours and related workload factors to compute peacetime staffing levels, to a rather highly sophisticated computer-based system that simulates manpower requirements based on selected input criteria for wartime situations.

Although the systems differ in structure, application, and actual results, we believe they should function for the same basic purpose--to identify the most appropriate level of personnel requirements to perform below-depot-level aircraft maintenance. Also, any system should consider a number of factors that can have an impact on personnel levels.

We found that several factors can logically have an impact on the requirements for maintenance personnel and should, therefore, be fully evaluated when establishing personnel levels. Some of these factors are:

--Aircraft attrition in wartime reduces the number of aircraft very early during any conflict, as indicated by Vietnam experience. While it is difficult to predict what aircraft attrition rates might be in the early stages of any future conflicts and, therefore, the impact on maintenance personnel requirements, this area needs to be evaluated to determine the most appropriate level of maintenance manpower during wartime. The services are not including any adjustment factors to reduce maintenance personnel requirements resulting from aircraft attrition in the early stages of war.

--During any wartime situation there are certain maintenance tasks which are not essential to fly an aircraft and could, therefore, reduce maintenance requirements. The services plan their maintenance personnel needs on the basis of performing both essential and nonessential maintenance (total maintenance currently performed at a given flying hour rate) during wartime.

--Maintenance labor hours provide a key element in determining maintenance personnel requirements. We have reported (LCD-75-422) on the systems for collecting and reporting labor hours and questioned the accuracy of reported maintenance data. With the exception of the Air Force Strategic Air Command (SAC) the services still rely heavily on this data to determine maintenance manpower requirements.

--During a wartime situation there is a surge period, normally about 30 days, wherein maintenance personnel work a longer work week. After this initial surge period the war reaches a level of sustained requirements, wherein maintenance personnel work fewer hours. In general, the services normally develop maintenance personnel requirements based on this sustained level of effort. This does not consider the extra hours available during the surge period which might reduce the personnel requirements. Considering that a lower level of personnel during the surge period may be possible and augmenting this level during the sustained wartime period with reserves might alter the theory for determining personnel requirements solely on the basis of sustained wartime levels.

There are also a number of factors that affect the individual manpower determination systems used by the services. For example:

--Logically, productivity in peacetime could vary from a wartime situation, if for no other reason but the different environments. There is no evidence showing precisely what the wartime productive available direct labor hours should be, but presumably it would be higher than the 60 percent used by the Air Force Military Airlift Command (MAC), since this is also the peacetime rate used by this command.

--Since many Navy aircraft will be deployed during wartime, the workload at intermediate level maintenance activities should change, and most likely reduce, because there are fewer aircraft at that location. The Navy assumes that staffing requirements at some shore stations will increase by as much as 75 percent during wartime but they have not studied this area to support such an increase.

--The Army has regulations to update their manpower determination system every 3 years. At the time of our review, this system had not been updated for 6 years. It was relying on maintenance man-hours per flight hour factors, derived from a combination of actual and projected data from two different time periods. The system did not allow for differences in maintenance requirements among varying models of the same type aircraft. Other questionable factors in this system are detailed in chapter 4.

Aside from the various factors used by the services that directly affect the application and results of their individual systems, there are outside influences that also have an impact on the manpower levels and the systems being used. A key area in this regard involves the planning assumptions for using military forces. While we did not initially envision questioning the assumptions about force levels, their impact became apparent as our work progressed, and we believe it essential they be considered in evaluating the manner in which maintenance personnel requirements are determined.

For example, although the services each used systems founded on assumptions concerning the number of flight hours

or sorties 1/ that would be required of each aircraft during a "worst case" wartime scenario, we noted:

--The Air Force Tactical Air Command's (TAC's) system relies on aircraft sortie rates developed in the early 1970s and there have been no significant changes to these rates in several years.

--MAC's system assumes all C-141 and C-5 aircraft must be capable of meeting a 10 hour per day sustained wartime use rate. Air Force officials have testified a number of times on the limited availability of aircraft (particularly the C-5). Logically, some aircraft would always be unavailable because of maintenance or parts. Also, at least one Air Force official has testified that it may not be possible to meet a 10 hour per day use rate even if aircraft are available.

--The Army's system assumes aircraft flight hour rates will be the same as experienced during Vietnam. It is not known precisely how aircraft might be used in a European scenario. However, the difference in terrain alone indicates that helicopters will not be used in the same manner as was the case in Vietnam. Since the Army aircraft inventory is mostly helicopters, flight hour rates could vary from the Vietnam experience.

--The Army's system assumes all deployable aircraft units must be ready for immediate deployment at the start of the conflict. As was the case in the Air Force, all aircraft may not be available at the outbreak of war. Also, in the case of the Army, some aircraft units are not scheduled to deploy during the early stages of war, which raises a question about the Army assumption.

--The Navy's system also assumes that all squadrons must immediately deploy and begin operating aircraft at wartime flight rates. This appears questionable, since there are not sufficient carriers to deploy all squadrons immediately. Also, as was the case with the other services, some aircraft will not be available at the outbreak of war for one or more reasons.

1/The flying of an airplane on a combat mission.

These matters and the systems used by the Air Force, Army, and Navy are discussed in detail in chapters 3, 4, and 5, respectively.

ARE THERE ALTERNATIVES TO FULL-TIME ACTIVE DUTY STAFFING?

Personnel available to perform maintenance missions include active duty persons, selected reservists, individual reservists, and others. These categories of personnel can be used in combination or exclusively to perform various maintenance missions. At the same time, personnel costs can vary greatly depending on what combination of personnel categories are deemed appropriate.

In recent years, with the rising costs of defense manpower, new ways are being examined to reduce such costs and continue to provide an adequate defense capability. A full-time active force is without doubt the most desirable but also the most costly. Other less costly alternatives generally include making greater use of reserve forces and reducing active forces.

Individually, the services have considered greater use of reserve forces, but, with the following exceptions, still strive to man their below-depot maintenance activities with enough people to support immediate mobilization without reliance on reserves.

The exceptions are:

--SAC staffs at the level required to meet peacetime commitments.

--MAC relies on reserves to support a portion of its increased wartime requirements, with peacetime active duty personnel making up the remainder of the difference.

--The Navy provides for reservists to augment peacetime needs to meet wartime needs at shore-based intermediate maintenance activities.

Recognition of the impact of all factors (such as attrition, deferred maintenance, and wartime surge capability), as well as reevaluation of other factors (such as probable timing for deployment of each element of the total force and actual flight activity of the deployed forces), should permit the services to reduce active duty maintenance personnel

staffing and place greater reliance on using reserves. For example:

--TAC might substitute reservists for active duty personnel in those units not included in the worst case scenario and in those units which do not have to deploy at the beginning of the worst case wartime scenario.

--MAC might reduce active duty staffing to give its existing associate reserves a more realistic share of the achievable wartime flying program.

--The Army might substitute reserves for active personnel in those units which will not deploy immediately at the beginning of war.

--The Navy might substitute reserves to augment those squadrons which will not be committed to battle during the early stages of war.

CONCLUSIONS

DOD has not provided the services with strong central guidance on how they should determine below-depot-level aircraft maintenance personnel requirements. Each of the services has, as a result, independently developed one or more systems to determine such staffing requirements. The systems vary widely in degree of sophistication, but with the possible exception of the Air Force's SAC, each had major procedural or data accuracy weaknesses.

The procedural weaknesses noted can have a large impact on the reasonableness of the services' calculations of personnel requirements. The actual impact, however, cannot be accurately measured until the weaknesses are corrected.

The various manpower determination systems relied heavily and without question on service input data concerning the probable timing, deployment, and rate of use of forces at the outset of war. The reasonableness of these assumed factors can have a potentially larger impact on the computed number of required personnel than individual procedural weakness in the systems themselves. The various assumptions can also have a large bearing on the number of cost-effective alternatives which can be considered for reducing peacetime active duty staffing. We have questioned the reasonableness of some of these operational assumptions and believe that

considerable cost savings for personnel can be realized if the assumptions are reevaluated.

RECOMMENDATIONS

We recommend that the Secretary of Defense direct the Secretaries of the services to:

--Improve the personnel requirements determination process by (1) insisting upon evaluation of the assumptions concerning the use or forces and their impact on below-depot aircraft maintenance personnel and (2) modifying personnel determination systems to include current, accurate, and reliable personnel determination factors and maintenance data.

--Develop alternatives for greater use of reserves while determining the most cost effective and appropriate mix of forces (active and reserves) to meet the below-depot-level maintenance personnel requirements.

CHAPTER 3

AIR FORCE MAINTENANCE MANPOWER DETERMINATION SYSTEMS

The Air Force's Tactical Air Command, Military Airlift Command, and Strategic Air Command have the vast majority of the approximately 9,000 aircraft in the Air Force. As of June 1976, these commands had over 75,000 military and civilian personnel authorized to perform below-depot-level maintenance for these aircraft. This number includes indirect maintenance support personnel.

These Air Force commands have similar aircraft maintenance responsibilities, and their basic organizational structure is the same. However, each command has developed its own method to determine aircraft maintenance manpower requirements, and these methods are considerably dissimilar. For example: TAC's manpower requirements for major weapons systems are determined by a computer simulation model, MAC's requirements are based on man-hour per flight hour factors, and SAC uses statistical standards to determine manpower requirements. The methods differ because each one is related to the commands' mission, deployment requirements, and types of aircraft. Furthermore, TAC and MAC base their requirements on wartime needs, while SAC's are based on peacetime.

Some of the basic assumptions used in the MAC and TAC manpower determination methods appear questionable, and computed manpower authorizations may be considerably overstated. In contrast, SAC's manpower determination method appears adequate because it is based on valid assumptions.

AIRCRAFT MAINTENANCE STRUCTURE

Aircraft squadrons are the basic units in the Air Force's aviation program. Squadrons consist of a specific number and model of aircraft, such as C-141s, B-52s, or F-15s. The squadrons are administratively combined to form wings which generally consist of a number of squadrons of a particular type of aircraft, such as bombers, fighters, and cargo carriers.

Air Force Manual 66-1 generally requires that each major command satisfy the organizational and intermediate aircraft maintenance needs of its separate activities. This is accomplished using a standardized organization which generally provides the following for each command at each base:

--A Deputy Commander for Maintenance (DCM) group is responsible for overall management of the command's maintenance complex. Basic management responsibilities include planning, scheduling, controlling, and directing the use of all maintenance resources to meet mission requirements.

--An organizational maintenance squadron is responsible for aircraft inspections, preventive maintenance, and other minor tasks, such as aircraft refueling and lubrication. Most of this work is done while aircraft are on the flight line, and is considered the least complex level of maintenance.

--A field maintenance squadron repairs aircraft engines, related components, and equipment. It also inspects and maintains aerospace ground equipment and, if necessary, provides for local manufacture of some parts for aircraft and support equipment. The squadron has both flight line and in-shop personnel.

--An avionics maintenance squadron maintains various electronic systems, such as communications and navigation equipment and related testing and measuring equipment. Maintenance work may be done on the flight line or in base shops.

--A munitions maintenance squadron maintains and repairs munitions and associated handling equipment. This squadron is also responsible for loading and unloading munitions.

TAC

TAC's basic missions are to prevent enemy aircraft from interfering with friendly forces, attack enemy facilities and aircraft on the ground, provide direct air-to-ground firepower to support ground forces, and provide air reconnaissance. TAC is assigned various attack, fighter, and reconnaissance aircraft, and is generally considered to be the Air Force's quick reaction and deployment force.

Maintenance manpower determination process

Before 1974, TAC used a man-hour per flight hour basis to determine below-depot maintenance manpower requirements. One reason this manpower determination process was later judged to be unreliable was because it was based on self-reported information, and used past workload data to project

future manpower requirements. Furthermore, the Secretary of the Air Force directed that engineered manpower standards be developed for all primary aircraft. As a result, TAC adopted a computer simulation technique to determine manpower requirements.

This simulation technique is called the Logistics Composite Model (LCOM) and was jointly developed by the Air Force Logistics Command and the Rand Corporation. As of September 1976, TAC had completed LCOM studies for six types of aircraft.

LCOM simulates the interaction of the expected maintenance environment and required aircraft operations to determine the manpower needed to support sustained wartime requirements. (See figure 1.) Factors used in the simulation are based on historical experience and forecasted requirements and 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 primary factor is the aircraft sortie rate 1/ needed to sustain a 30 to 90 day war under the worst expected scenario. If the first simulation shows that the desired sortie rate cannot be achieved, the number of maintenance personnel is adjusted and the simulation is repeated. This process is continued until the desired rate is achieved. The number of personnel identified at this point becomes the manpower requirement.

LCOM is used to determine productive direct manpower requirements. Additional requirements, such as unit administration and aerospace ground equipment authorizations, are determined by other methods. LCOM is not used for these work centers because their workload is not generated by sortie rates.

1/The average daily combat missions required per aircraft.

LOGISTICS COMPOSITE MODEL (LCOM)

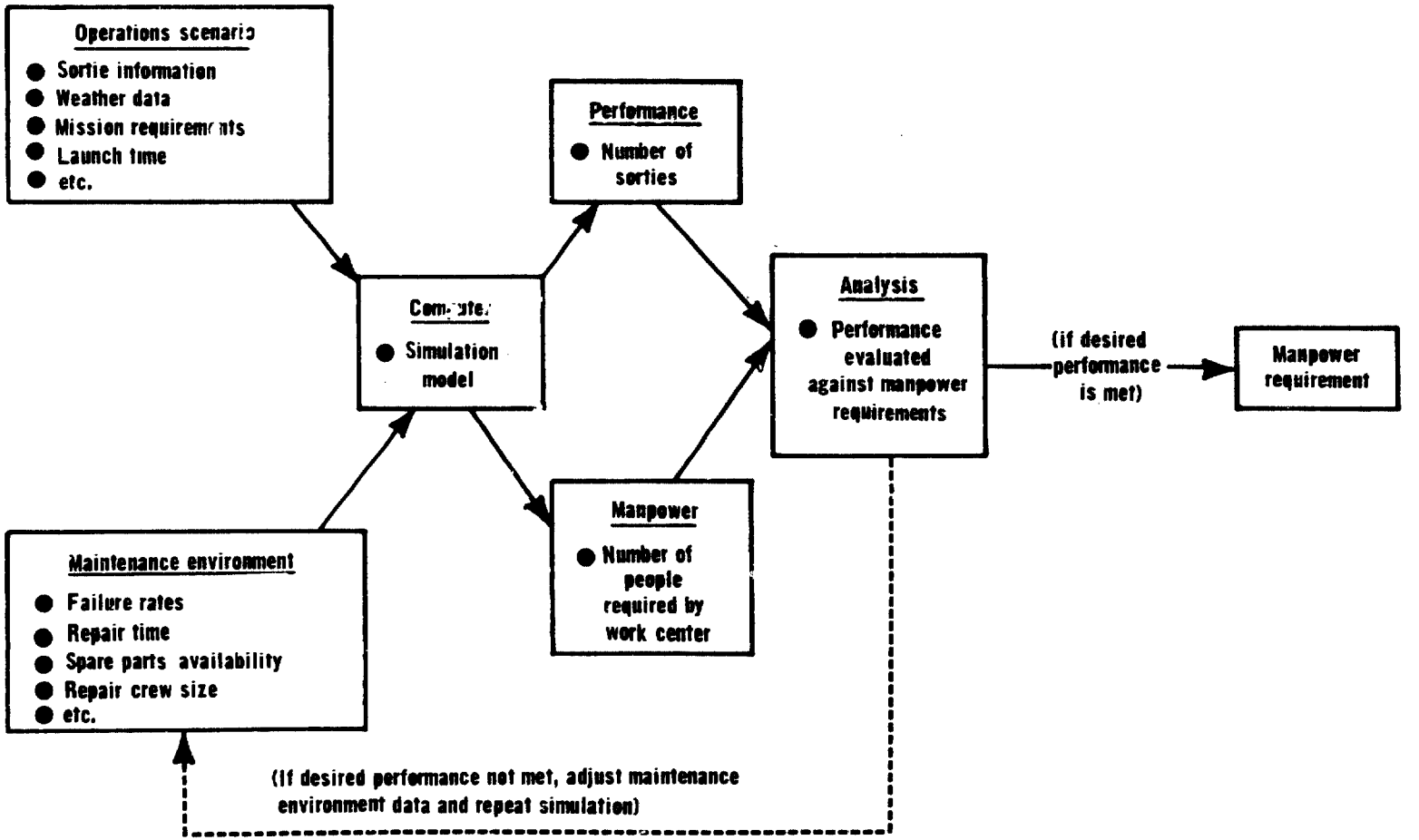

FIGURE 1.

LCOM's ability to predict maintenance performance and manpower requirements was field tested at Seymour-Johnson Air Force Base in 1973, and TAC began using LCOM to compute manpower requirements in 1974. The model is used for all maintenance squadrons except munitions.

The LCOM studies completed so far have shown an increase in manpower requirements. Actual staffing of LCOM requirements began in July 1976, but was not expected to be completed until March 1977. TAC officials believe the increased requirements are attributed solely to the more accurate determination of wartime needs.

LCOM assumptions

Generally, LCOM is based on TAC's deployment concept. This concept requires that TAC's tactical fighter forces maintain a flexible capability to rapidly deploy anywhere in the world and operate either independently or as part of a joint force. TAC can deploy an entire aircraft wing from a single location, or deploy separate squadrons and/or elements of the wing, and simultaneously conduct air operations from more than one location. Consequently, LCOM was designed to compute deployed wartime manpower requirements for all maintenance squadrons.

Other basic assumptions used in the LCOM are:

--Computer simulation is the best method for evaluating the interaction of support resources and to determine the optimal mix of resources needed to support a specific flying program.

--The required wartime flying schedule should be used to determine manpower requirements. If it is held constant, the supportive resource requirements can be altered by simulation until the desired sortie rate can be achieved.

--Deferred maintenance, combat attrition, and wartime surge factors do not have to be considered when computing manpower requirements for sustained wartime operations.

Questionable factors used in the LCOM

We believe TAC's manpower requirements may be inaccurate because the sortie rate may not reflect the most current

requirement, and the LCOM has not been tested by sensitivity analysis. In addition, manpower requirements may be overstated because:

--All maintenance squadrons were staffed for deployed wartime operations, but the war scenario did not require all unit elements to deploy during the first 30 days of war.

--The effect of deferred maintenance, the wartime surge period, and combat attrition were not adequately considered.

Sortie rate

The aircraft sortie rate is the primary factor used in the LCOM and it should reflect the best estimate of current wartime requirements. We were told the sortie rates were developed in the early 1970s. However, during our exit conference, Air Staff officials said the rates were reviewed, evaluated, and approved each year, but no significant changes have been made in several years.

Sensitivity analysis

LCOM is a very sophisticated simulation model. It evaluates the interaction of many factors to determine the best mix of resources needed to support a specific flying program. Sensitivity analysis is a method of determining the influence and interrelationship of these factors, but it has not been used extensively with LCOM. For example, the Air Force has not determined the extent to which the factors noted on page 14 have an impact on each other during the simulation process.

Deferred maintenance, combat attrition, and wartime surge factors

Some maintenance tasks do not have a critical impact on aircraft safety and mission capability and are often deferred during wartime. For example, some scheduled inspections may not be performed, and some specific maintenance tasks may be deferred if they do not reduce operational capabilities. This practice temporarily reduces maintenance man-hour requirements, but LCOM does not consider deferred maintenance when computing manpower requirements.

We did not attempt to determine how much deferred maintenance occurs during wartime and/or how much it would reduce manpower requirements. However, if deferred maintenance is considered, we believe manpower requirements would be reduced.

When using LCOM to compute maintenance manpower requirements, TAC assumes that flying units will have a full complement of aircraft for sustained war operations and that combat losses will be replaced immediately. This assumption does not consider the probability of high aircraft attrition during the initial combat period or recognize that immediate replacement of such losses, and additional losses incurred after the first 30 days of combat, is highly unlikely.

As a result of this questionable assumption, LCOM appears to be computing maintenance requirements for aircraft which may not be available for operations and is, in turn, overstating manpower requirements.

Two other factors also reduce TAC's manpower requirements for the wartime surge period.

--The availability of maintenance repair parts is largely limited--until supply routes are established and operational--to what the squadrons can carry with them when they deploy.

--Maintenance people are expected to work longer hours during the surge period (up to 72 hours per week, as opposed to 60 hours per week during sustained wartime).

TAC's LCOM does not consider these factors since it computes personnel requirements based solely on the sustained wartime environment--when repair parts are available and maintenance people can no longer be expected to work productively at a surged or expanded workhour rate.

TAC's worst expected war scenario doesn't require all units to deploy

LCOM is based on TAC's deployment concept; consequently, maintenance manpower should be related to each squadron's deployment requirements. We found the worst expected war scenario did not require all maintenance squadrons to deploy, but manpower requirements were computed on the assumption that in wartime all squadrons would deploy.

TAC's September 1976 contingency plans showed that a certain percentage of maintenance squadrons elements were not expected to deploy to Europe under the worst case scenario. However, LCOM does not consider the deployment requirements for individual squadron elements, but rather computes all manning for wartime deployment needs. Since no distinction was made between deployable and nondeployable

squadron elements, we estimated annual maintenance manpower requirements were overstated at least $21 million for those units not deploying to Europe.

This computation is based on the estimated costs (pay and allowances excluding any fringe benefits) of maintenance personnel in units that were not scheduled to deploy to Europe and not necessary to meet peacetime workloads. 1/

Alternatives for reducing manpower requirements

TAC has not considered using individual reservists to fill maintenance manpower requirements for sustained wartime, and, thus, may be incurring unnecessary manpower costs. We believe greater reliance on the reserves can reduce peacetime manpower requirements without degrading TAC's ability to meet its wartime requirements. Two possible alternatives for using reservists are discussed below.

Active TAC squadrons, by relying on work hour surge capability, could be staffed to meet initial 30-day wartime requirements, and reservists could be used to fill the additional manpower requirements for sustained wartime operations. The reservists could be integrated with active units under a concept similar to MAC's Reserve Associate program.

We estimate that such a program of reduced current staffing and planned reserve augmentation can reduce TAC's annual maintenance personnel costs by over $50 million. This computation is based on the estimated difference in pay and allowances (excluding fringe benefits) between active duty personnel and reservists for the number of reservists that would replace active duty personnel to meet the sustained wartime requirement.

This alternative would also coordinate staffing with each squadron's deployment requirements. For example:

--Squadrons not needed during the first 30 days could be staffed with enough active duty personnel to meet peacetime needs and reservists could be used to fill additional positions needed for sustained wartime.

--Deployable squadrons could be staffed to meet the wartime surge requirements and reservists could be used during sustained wartime to meet additional manpower requirements.

1/All savings computations are based on classified data and, therefore, are not included in this report.

--Squadrons required to deploy during the surge period could be staffed for a 30-day war and personnel from nondeployable squadrons could be used to provide the additional manpower for sustained wartime. Reservists could then be used to supplement the nondeployable squadrons.

Another possible alternative would be to establish reserve manpower pools. These reservists could be used to fill the additional manpower requirements needed for sustained wartime, and the active squadrons could be staffed primarily for the first 30 days of war. Under this concept, the reservists would not be preassigned to specific squadrons. Instead, they would be available for assignment to those squadrons requiring wartime augmentation.

MILITARY AIRLIFT COMMAND

MAC's primary mission is to provide strategic and tactical airlift for the Armed Forces. The C-130, C-141, C-5A, and Civil Reserve Air Fleet aircraft constitute MAC's essential resource for this mission.

Maintenance manpower determination process

MAC, in contrast to TAC (see p. 13) and SAC (see p. 28), is not using engineered standards to determine its maintenance manpower requirements. Instead, it uses comparatively simple equations to predict sustained wartime requirements based on the relationship of historical labor hour charges to various workload factors. We reviewed only the equations used for the C-141 and C-5A aircraft, but the same basic process is used for all MAC aircraft.

The primary factors used in the manpower equations are: (1) a man-hour per flight hour factor, (2) number of aircraft, (3) aircraft use rate, and (4) productive direct man-hour availability.

These and similar factors are used in various mathematical equations to determine productive direct manpower requirements needed for sustained wartime. The C-141 manpower authorizations, for example, are determined using an equation which does nothing more than make a linear projection--based on a worldwide historical man-hour per flight hour factor--of the maintenance hours estimated to be required during wartime. In contrast, the C-5A home station requirements are determined using a program estimating equation which provides constant authorizations for required maintenance inspection tasks,

supplemented by a variable manpower factor based on programed flying hours.

We also found that MAC's manpower determination process for the C-141 and C-5A is based on several key assumptions, including the following:

--The Maintenance Data Collection system data used to develop some factors in the manpower equations is accurate, and properly reflects maintenance man-hour requirements.

--During peacetime and wartime 60 percent of available man-hours is productive direct time.

--234 C-141s and 70 C-5As will be available for operations during sustained wartime.

--The C-141 and C-5A aircraft will be able to achieve a 10-hour use rate 1/ during sustained wartime. It is further assumed that active forces will be assigned 60 percent of the sustained flight program, and the reserves and auxillary forces will be assigned the balance.

--The DCM organization requires manpower authorizations equal to 10 percent of the total positions authorized for direct labor, aerospace ground equipment, supply support, and survival equipment.

--Deferred maintenance and combat attrition do not have to be considered when computing manpower requirements.

--Peacetime and sustained wartime manning levels for active duty personnel should be the same.

As discussed in more detail below, we believe each of these assumptions is questionable, and may be causing an overstatement of requirements.

Manpower equations are based on inaccurate data

Several of the factors used in MAC's manpower equations are based on labor hour charges recorded in the Air Force's

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1/The average daily flight hours required per aircraft for a specific war scenario.

Maintenance Data Collection system. We have previously reported that such data is inaccurate and overstated because its reporting is not adequately controlled. 1/ Several MAC officials agreed the data is unreliable and is generally inflated. Some SAC officials said the data does not provide an accurate assessment of the man-hours used to support actual flight hours.

The man-hour per flight hour factor 2/ used in the C-141 manpower equation was derived from the reported man-hour data. After consolidating the reported labor hour data, Air Force officials review and evaluate it. They make adjustments to eliminate obvious errors, but agree that all errors could not be eliminated. Within the scope of this review, we did not determine the extent of overstatement in either the adjusted or raw man-hour data. However, the effect of any overstatement can be easily shown. For example:

--If the C-141 man-hour per flight hour factor is overstated 5 percent, manpower would be overstated by 348 authorizations which cost about $3 million annually.

--If the factor is overstated 20 percent, 1,393 authorizations costing about $13 million annually would not be needed.

Some factors used in the C-5A equations were also derived from questionable man-hour data. As a result, the C-5A manpower requirements may also be overstated.

Productive direct man-hour availability

MAC assumes direct productivity is 60 percent during both peacetime and wartime. However, Air Force Manual 26-3 states that productivity may be expected to increase during wartime.

MAC officials agreed productivity is generally greater during wartime because some administrative functions normally done during peacetime are not performed during wartime. SAC

1/"Productivity of Military Below-Depot Maintenance--Repairs Less Complex Than Provided at Depots--Can Be Improved" (LCD-75-422), July 29, 1975.

2/The ratio of maintenance hours used to support actual flight hours.

officials said productivity is higher during wartime, and even peacetime productivity is often greater than 60 percent.

MAC uses the 60 percent productivity factor when computing manpower requirements. However, as explained above, the productivity rate may be higher during both peacetime and wartime. To illustrate the effect increased productivity has on manpower needs, we assumed some maintenance personnel were 75-percent productive and the remainder of the workforce was 60-percent productive. As shown below, increased productivity would create considerable manpower reductions.

Manpower Reductions

Assumption	C-141 (note a)	C-5A (note a)	Total reductions	Annual cost savings (note b)
1. 10 percent of workforce is 75-percent productive	177	108	285	$ 2.7 million
2. 20 percent of workforce is 75-percent productive	341	215	556	5.2 million
3. 30 percent of workforce is 75-percent productive	577	309	886	8.2 million
4. 40 percent of workforce is 75-percent productive	650	403	1,053	9.8 million
5. 50 percent of workforce is 75-percent productive	792	494	1,286	12.0 million
6. Entire workforce is 75-percent productive	1,394	886	2,280	21.2 million

a/Calculations based on sustained wartime requirements.

b/Based on an average annual cost of $9,304 per enlisted man.

Number of aircraft

Manpower requirements are computed on the basis that 234 C-141s and 70 C-5As will be available for operations during sustained wartime. Although additional aircraft, such as training and nonoperational active aircraft, can be used during wartime, many aircraft may not be available. Considering the available aircraft, for example:

--On an average day during 1975, only 43 C-5As and 178 C-141s were flyable.

--During December 1975 and January 1976, an average of 33 C-5As were in flyable status and only 8 more (a total of 41) could have been made available within 48 hours. MAC officials said it would have taken 60 days to make as many as 52 C-5As available for operations.

Planned aircraft modifications and depot maintenance requirements also reduce aircraft availability. The Air Force plans to stretch the C-141 fuselage by 23 feet and add an air refueling capability. Based on the estimated work schedule, 34 C-141s will be undergoing stretch modification at any one time during fiscal years 1980 through 1982. Futhermore, another 11 C-141s are programed to be out of service for routine depot maintenance.

The Air Force is also planning to modify the C-5A wing structure, and an average of about 10 C-5As will be out of service each month until the project is completed. In addition, some other C-5As, probably six or more, would be undergoing routine depot maintenance at any one time during the same period.

While these are examples of current modifications, similar modifications could be in process at the start of a conflict.

Aircraft use rate

MAC plans to achieve a 12.5-hour use rate during the wartime surge period, and a 10-hour rate during sustained wartime. The actual fiscal year 1976 use rate for C-141s and C-5As was 3.40 and 1.57 respectively. The fiscal year 1977 programed rate for the C-141 is 3.24 and the programed rate for the C-5A is 1.80. These peacetime use rates are about three to six times less than the 10-hour rate planned for sustained wartime.

In June 1976 we reported 1/ that the Air Force may never be able to achieve a 12.5 use rate for all C-5A and C-141 aircraft. At that time, Air Force officials indicated that the maximum use rates achievable may be only 5 hours for the C-5A and 7 hours for the C-141. Consequently, the likelihood of achieving even a 10-hour use rate appears questionable.

The use rate has a significant impact on manpower requirements. For example, MAC's fiscal year 1977 direct labor authorizations for C-141 and C-5A active duty squadrons was based on a 6-hour rate. 2/ Annual manpower costs could have been reduced about $16 million if a 5-hour rate had been used.

Deputy Commander for Maintenance authorizations

Authorizations for the Deputy Commander for Maintenance organization are not based on standards or reported maintenance hours. The organization is simply authorized 10 percent of the total authorizations otherwise computed for direct labor, aerospace ground equipment, supply support, and survival equipment. We were told the 10-percent allowance was customary and based on a past judgment formed from experience.

No additional documentation nor more detailed explanation was provided to support the 10-percent figure.

Deferred maintenance and combat attrition

Deferred maintenance temporarily reduces manpower requirements. A MAC official said maintenance is often deferred during wartime, but we could not find any indication that MAC's manpower determination process considered this factor.

We recognize that maintenance during wartime could increase because of battle damage and possibly offset the deferral of some maintenance. There also was no indication that MAC provided for increased maintenance due to battle damage when determining maintenance manpower requirements.

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

2/The remaining 4 hours (10 minus 6) of the planned daily use rate are assigned to the reserves and auxiliary forces.

Likewise, MAC does not consider combat attrition when computing manpower requirements. Some aircraft may be lost and/or destroyed during wartime and, since aircraft availability affects manpower requirements, this factor should be considered. For example, a 10-percent loss of C-141 and C-5A aircraft during combat, equates to 1,127 personnel authorizations which would not be needed to support the remaining number of aircraft. The annual cost for these authorizations is about $10.5 million.

Wartime manpower requirements exceed peacetime workloads

MAC's manpower requirements are based on estimated workloads for sustained wartime and the assumption that a wartime capability must be maintained during peacetime. This assumption may create excess manpower requirements for peacetime operations. For example:

--A MAC official said the C-5A is authorized more manpower for wartime than can be used during peacetime. Comparing the wartime and peacetime man-hour availability shows that the same number of C-5A active duty personnel intended to support a 6-hour wartime use rate could support a 3.57 hour peacetime daily use rate. However, the fiscal year 1977 programed C-5A peacetime use rate is only 1.80 hours daily. Since maintenance personnel could support a use rate as high as 3.57, we estimate that 1,995 authorizations are not needed to support the peacetime flying program. The annual cost of these authorizations is about $19 million.

--The C-141 workforce could support a 3.65 aircraft use rate daily during peacetime, versus the fiscal year 1977 programed aircraft use rate of 3.24. As a result, 710 authorizations costing about $7 million annually are not needed for the planned peacetime workload.

We used peacetime man-hour availability and the fiscal year 1977 programed aircraft use rate to compute manpower requirements, and compared them with MAC's fiscal year 1977 authorizations. This comparison shows that the computed wartime authorizations exceed planned peacetime needs by 2,988 positions. These authorizations cost about $28 million annually.

Alternatives for reducing manpower requirements

As previously explained, some of the basic factors used in the manpower determination process appear questionable and manpower costs may be overstated. These factors should be reviewed and updated to accurately reflect manpower needs. Furthermore, other factors not currently considered should be included in the manpower equations.

The aircraft use rate should be reviewed to determine whether it can be achieved and maintained during a sustained wartime environment. As explained on page 25, a 10-hour use rate may not be possible; consequently, manpower requirements should be based on reasonable use rates.

The number of aircraft available for operations may be less than what is planned. Is it reasonable to assume 234 C-141s and 70 C-5As will be available for operations at the beginning of and throughout a prolonged wartime period? We realize MAC has additional aircraft that can be used during wartime, but it is totally unrealistic to believe that all 304 aircraft will always be flyable during wartime operations.

Productivity factors influence manpower requirements, and they should be based on current data and adequately documented. MAC's 60-percent productivity factor should be reviewed, and the differences in wartime and peacetime productivity should be recognized.

Many officials believe reported maintenance man-hour data is overstated. It could also be understated. The accuracy of the reported data should be thoroughly reviewed and appropriate controls established so that man-hour expenditures are properly reported.

Deferred maintenance, wartime surge capabilities, and combat attrition tend to reduce manpower needs during wartime, but the equations do not include these factors. MAC should determine reasonable weights to assign these factors and the equations should be adjusted accordingly.

Increased use of reservists could reduce peacetime manning requirements

MAC has an Associate Reserve program under which reserve maintenance units are co-located with active duty squadrons. The reserves use equipment and facilities assigned to active duty units and fly and maintain active-force aircraft. The

program has been successful and it has inherent economical and operational advantages.

MAC plans to use Associate Reserves to augment active forces during wartime, and they are expected to support a considerable part of the wartime flying program. However, we believe the role of the Associate Reserve program could be expanded and peacetime manning requirements reduced without degrading wartime capabilities.

As previously explained, some manpower authorizations were not needed to support the programed peacetime flying program. Consequently, it may be possible to assign the excess manpower to the Associate Reserves and staff active duty squadrons only for peacetime operations. This approach would significantly reduce manpower costs and, at the same time, allow MAC to maintain the needed wartime capability.

SAC

SAC's basic missions are to develop and maintain the operational capability needed to conduct strategic warfare according to emergency war orders, perform peacetime training missions in support of alert commitments, and conduct combat missions as required during conventional warfare.

SAC operates and maintains B-52 bombers, intercontinental ballistic missiles, and reconnaissance aircraft. SAC is also the Air Force's single manager for air refueling operations, and, therefore, operates and maintains a fleet of KC-135 tankers.

Maintenance manpower determination process

SAC determines maintenance manpower requirements by developing statistical standards for each job center within the maintenance complex. The standards are used to compute manpower requirements for peacetime operations and are derived from measured maintenance man-hours and related workload factors.

SAC's manpower standards development process includes three phases: (1) preliminary--planning the study, (2) measurement--conducting the study, and (3) computation--computing the standard.

Preliminary phase

The preliminary phase consists of learning the job center functions, formulating a measurement plan, and preparing for the measurement phase. A management engineering team is designated as the lead team to conduct and coordinate the review. The lead team reviews the job center's functions, documents the job categories and tasks performed, and develops a detailed work center description. Specific installations are then selected for review, and input teams are tasked to perform the review at these locations. We were told seven or eight installations are usually reviewed, but detailed questionnaires are sent to all SAC units.

Measurement phase

The measurement phase includes measuring the time workers use to do required tasks and relating this data to variable workloads. Generally, man-hours are measured by operational audit, which consists of interviewing supervisors and workers and analyzing workload data. Various measurement techniques are used to determine the frequency of specific job tasks and the time required to accomplish each task. The frequency and accomplishment time for each task identified in the work center description is measured and converted to monthly man-hours.

Computation phase

The computation phase includes analyzing and reviewing the data gathered during the measurement phase and performing various tests with different workload factors and statistical models.

The man-hour data is reviewed and job categories and tasks are analyzed. The accomplishment times and frequencies for each job category and task are compared to determine the degree of variance. If a significant variance is identified, the appropriate input team remeasures the data and explains why the variance occurred.

Rank correlation is then used to test the statistical relationship between measured man-hours and potential workload factors. Also, the potential workload factors are subjected to various statistical tests, such as standard error estimate, coefficient of determination, and correlation coefficient to determine which factor has the highest degree of relatability. In many cases, aircraft sorties and/or flight hours are selected as the appropriate workload factor.

The optimal statistical relationship between measured man-hours and workloads is determined by correlation and regression analysis. Regression analysis is used to determine the relationship between workload factors and man-hours, and correlation analysis tests the validity of this relationship. Consequently, the resulting equation relates manpower requirements to programable workload factors, such as base population, sorties, or flying hours.

The following basic assumptions are used in SAC's manpower determination process:

--Systematically developed statistical standards should be used for determining manpower requirements.

--Manpower standards should be based on measured man-hours and related workload factors.

--Increased man-hour availability can be relied upon to support increased maintenance requirements during wartime.

--Man-hour data from the Air Force's Maintenance Data Collection system is inaccurate and should not be used to compute manpower requirements.

--Productive direct man-hour availability should be measured, as opposed to using a standard productivity factor for all work centers.

Assessment of SAC's manpower determination process

We reviewed SAC's standards development process and evaluated the assumptions, statistical tests, and models used to develop the standards. We concluded that SAC's manpower determination process is based upon accepted measurement techniques and analyses, is statistically valid, and produces generally reasonable estimates of the minimum maintenance staffing levels required to meet stated requirements.

CONCLUSIONS

Each Air Force command has developed its own process for determining aircraft maintenance manpower requirements, and these methods are considerably dissimilar. TAC and MAC base their manpower requirements on sustained wartime operations, while SAC computes manpower based on peacetime needs.

Some of the basic assumptions used in the TAC and MAC manpower systems appear questionable, and their manpower requirements may be considerably overstated. In contrast, the basic assumptions used in SAC's manpower determination method appear reasonable.

We believe TAC and MAC should review their manpower determination methods and use accurate and reasonable factors to arrive at their manpower needs. Furthermore, each of these commands should consider placing greater reliance upon reservists as a means for reducing peacetime manpower requirements without degrading wartime capabilities.

RECOMMENDATIONS

We recommend that the Secretary of the Air Force require TAC and MAC to:

- --Review and evaluate the assumptions used in the manpower determination process.
- --Use accurate, reasonable, and supportable factors in all manpower computations.
- --Use all pertinent factors when computing manpower requirements.
- --Evaluate the feasibility of relying upon reservists for the additional manpower needed during wartime and reduce peacetime manning requirements accordingly.

CHAPTER 4

ARMY AIRCRAFT MAINTENANCE MANPOWER: POTENTIAL FOR REDUCING REQUIREMENTS

In July 1976 the active Army had over 9,000 aircraft and 22,000 personnel directly performing aircraft maintenance below the depot level, plus an undetermined number of indirect maintenance support personnel. The system to determine manpower requirements was basically a manual system using manpower formulas. Some factors used in these formulas were outdated or inaccurate, raising a serious question about the aviation maintenance manpower required in the Army. Furthermore, the Army could possibly reduce maintenance manpower requirements almost $20 million by using individual reservists to fill certain positions beyond peacetime requirements without degrading a unit's ability to respond to wartime needs.

MAINTENANCE STRUCTURE

The Army has traditionally used three levels of aircraft maintenance below the depot. Organizational maintenance is the lowest, least complex form of maintenance, and is generally performed on the flight line. It includes work such as pre- and postflight inspection, changing tires, and cleaning the aircraft. Direct support is an intermediate maintenance level and includes repairing, removing, and replacing aircraft components and subsystems. The repair work is done in shops and on the aircraft by deployable units attached to Army divisions or Corps. The highest maintenance level below the depot is general support. General support maintenance is done in shops and includes maintenance such as major airframe structural repair, which is beyond the direct support capability. General support maintenance may be done by both deployable and nondeployable units.

The application of the various levels of maintenance depends on the number of aircraft assigned to a unit. (See fig. 2.) Maintenance for units with less than 10 aircraft is traditionally structured in three below-depot levels. For units with 10 or more aircraft, however, the traditional structure is modified by combining organizational maintenance and part of direct support maintenance. This level is called integrated direct support maintenance and is performed by the aircraft using unit.

In 1975 the Army restructured its below-depot maintenance from three to two levels (see fig. 2) to enhance availability

STRUCTURE OF MAINTENANCE BELOW THE DEPOT LEVEL UNDER DIFFERENT CONCEPTS

Total amount of maintenance performed below depot

TRADITIONAL CATEGORIES

organizational maintenance	direct support maintenance	general support maintenance

INDIVIDUAL DIRECT SUPPORT MAINTENANCE CONCEPT

10 or more aircraft	individual direct support maintenance (formerly organizational and part of direct support)	direct support maintenance	general support maintenance
Less than 10 aircraft	organizational maintenance	direct support maintenance	general support maintenance

TWO LEVELS BELOW DEPOT CONCEPT

10 or more aircraft	aviation unit maintenance (formerly individual direct support maintenance)	aviation intermediate maintenance (formerly part of direct and general support)	▨	← Part of former general support maintenance transferred to the depot level
Less than 10 aircraft	aviation unit maintenance (formerly organizational maintenance)	aviation intermediate maintenance (formerly direct & part of general support maintenance)	▨	←

FIGURE 2.

and operational readiness of Army aircraft by accomplishing maintenance at the level where it can be most effectively and economically performed. Army officials believed the two level structure--aviation unit maintenance and aviation intermediate maintenance--would enhance component repair capability at lower levels, decrease maintenance downtime, and result in more efficient use of personnel. However, the structure which will be implemented worldwide on a phased basis has been adopted only for certain units in overseas commands and has caused an increase in manpower requirements. Also, worldwide implementation will eliminate certain units.

MAINTENANCE MANPOWER DETERMINATION PROCESS

Army manpower requirements are reflected in tables of distribution and allowances for garrison-type units and tables of organization and equipment for deployable combat and combat support units. The garrison-type units are staffed at current productivity levels as determined by manpower surveys conducted by major commands at approximately 3-year intervals. Therefore, we did not include them in our review.

A table of organization and equipment describes the unit's mission and establishes a standard organization including personnel and equipment requirements. However, major commands may modify it to meet specific and/or unique needs of individual units. For example, a unit may have unique equipment for a specific mission or it may be required to operate in a distinctly different climate or environment.

The number of aircraft mechanics and technicians in a unit is determined by using formulas shown in manpower authorization criteria (MACRIT) published in Army regulations. MACRIT also includes most of the quantitative factors needed for the formulas. The formulas used for organizational, direct support, and general support maintenance requirements are:

$$\text{Organizational maintenance manpower requirements} = \text{Density of aircraft} \times \text{Number of people required for each aircraft}$$

$$\text{Direct support (general support) maintenance manpower requirements} = \frac{\text{Density of aircraft} \times \text{Maintenance man-hours per flying hour} \times \text{Monthly flying hours} \times \text{Percent of military occupational specialty} \times \text{Distribution of military occupational specialty}}{\text{Productive manhours per month}}$$

Aircraft density	Actual number of aircraft supported.
Number of people required per aircraft	The standard number of maintenance people required for each type aircraft as defined in MACRIT.
Maintenance man-hours per flying hour	The standard number of maintenance man-hours spent for each hour flown by aircraft type as defined in MACRIT.
Monthly flying hours	Planned number of wartime flying hours each month for each type of aircraft as defined in MACRIT.
Percent of military occupational specialty	A standard percentage used to distribute manpower requirements between general mechanics and component repair specialists for a particular aircraft type as defined in MACRIT.
Distribution of military occupational speciality	A standard percentage used to distribute component repair specialist requirements to various shops as defined in MACRIT.
Productive man-hours per month	Standard number of wartime hours available from one man for productive maintenance work as defined in MACRIT.

QUESTIONABLE FACTORS USED IN THE MANPOWER DETERMINATION PROCESS

The MACRIT used as the basis for determining manpower requirements was outdated. The flying hour factor was higher than that specified in the current worst expected wartime scenario. Although we did not fully evaluate all other MACRIT factors, we obtained evidence showing that the validity of some of these other factors was highly questionable. We believe potential exists for more accurately determining aircraft maintenance personnel requirements by updating the factors used in MACRIT to reflect current experience and wartime planning.

MACRIT factors are outdated

The MACRIT used to develop manpower requirements should contain factors reflecting recent experience and current expectations for wartime to provide equitable and economical allocation of maintenance personnel. Consequently, the Army requires MACRIT to be updated at least every 3 years. At the time of our review, the MACRIT was over 6 years old.

Flying hour factor

The monthly flying hour factor in MACRIT greatly influences manpower requirements. If excessive flying hours are used in the manpower formula, requirements will be overstated. The monthly flying hours were derived from a 1967 Army study based on Vietnam experience. However, the current worst wartime scenario requires less flying hours than those reflected in the 1967 study and used to compute manpower requirements.

A 1976 study to determine current flying hour requirements was being evaluated by the Army. Since the evaluation was still in process at the time of our review, officials could not specify when or if the revised flying hours would be incorporated into MACRIT.

Maintenance man-hours per flying hour

We believe the maintenance man-hours per flying hour factor should be computed using actual maintenance man-hours and flying hours experienced in the same time period. However, when computing the maintenance man-hour per flying hour factor used in MACRIT, actual maintenance man-hours for 1970 and proposed time flying hours for 1967 were used. We did not evaluate the impact of using such dissimilar data,

but we believe the use of 1970 flying hours would provide a more accurate and realistic factor.

In addition, the 1970 maintenance man-hours used in the maintenance man-hour per flying hour computation were distorted because maintenance man-hours experienced for a specific aircraft model were used as the standard for all models despite differences in requirements for each model. For example, maintenance man-hours for the CH47A helicopter were used as the standard for the CH47B and CH47C. As illustrated in the following table, there were distinct differences in maintenance man-hour requirements for each model presented in the 1970 MACRIT.

Annual Maintenance Man-hour Requirements Per Aircraft Based on Reported Maintenance Hours

Model	Organizational maintenance	Direct support maintenance	General support maintenance
CH47A	8,946	7,548	5,523
CH47B	8,661	5,876	4,518
CH47C	7,942	8,652	6,220

Further, actual maintenance man-hours used in the formula appear unreliable because of inconsistencies in the data being recorded and reported by maintenance activities. For example, some aircraft maintenance units may not report maintenance man-hour data at all, while others may report their total available maintenance time rather than the time actually worked. This may result in both overstated and understated direct maintenance man-hours.

Also, indirect productive time (which consists of that part of the maintenance man-hours used for such things as awaiting parts, setting up test equipment, and going to and from the work area) was arbitrarily established as 40 percent of the direct productive time rather than being based on actual needs for individual aircraft maintenance units. A 1975 Army study concluded that indirect productive time was more closely related to unit type, location, environment, organization, and administrative procedures, than to the direct productive time used to perform specific tasks.

Density of aircraft

To determine the staffing needed for a direct or general support maintenance unit, it is necessary to know how many aircraft the unit is designed to support. However,

the number of aircraft was unknown and/or unidentified for some Army units. In these instances, an estimate is used in MACRIT.

Generally, the Army does not know whether the combined capability of nondivisional direct and general support maintenance units meets the capacity required to support the total number of nondivisional aircraft. Army officials stated that a study was in process to determine if the direct and general support maintenance capacity is excessive.

Productive man-hours per month

The productive man-hours per month factor as set forth in MACRIT and used in the manpower requirements formula should represent an aircraft maintenance unit's total direct maintenance time available. The lower this factor the higher the maintenance manpower requirement.

When determining the productive man-hours per month factor, a unit movement percentage was used to adjust the total man-hours available for nonproductive time expected to be spent while a unit is deploying. Unit movement percentages used to determine the productive man-hours per month factor were developed in the early 1960s, before Army aviation assumed its current combat role. The factors vary between 7 and 25 percent of a unit's total available man-hours, depending on how the unit will be used in combat.

Army officials did not know whether the present unit movement percentages accurately reflected current needs. They believed, however, that the ability to move units is greater today because helicopters are used extensively. Also, they said a study of unit movement percentages was in process and the results were expected sometime in fiscal year 1977.

POTENTIAL FOR REDUCING MANPOWER REQUIREMENTS

Army regulations stipulate that aircraft maintenance manpower requirements for all deployable units should be computed and staffed based on the maximum planned maintenance needs during sustained wartime, regardless of the units' expected use during the early stages of war. The Army, however, does not expect to deploy all aircraft maintenance units during the first 30 days of war. We believe using individual reservists to fill positions beyond current

peacetime requirements offers potential for reducing the number of active personnel.

Use of individual reservists

Considering mission and readiness requirements, the Army established deployment times for individual aircraft maintenance support units and using units with 10 or more aircraft. Based on this information, some maintenance manpower was not required to deploy during the first 30 days of war. Therefore, individual reservists could be used to fill these later deploying positions and the cost for active duty personnel could be reduced about $20 million. This reduction is the estimated difference in pay and allowances for active duty personnel filling the later deploying spaces on a full-time basis and reserve personnel filling them on a "when actually training" basis. It does not consider differences in fringe benefits.

Conceptually, individual reservists may be used to fill positions not required during the first 30 days of war by integrating them directly into active Army units. The reservist could do his monthly and annual training in his assigned active unit, working side-by-side with active Army personnel. The reservist could fill an authorized position in the active unit on a part-time basis during peacetime but, if the unit should deploy during wartime, the reservist could fill the position full time. The reservist may be assigned to a reserve element for administrative control or be placed under the direct administrative control of the active command or unit.

The Army is already applying this concept with full reserve units. One objective of the Army's Affiliation Program is to improve response and deployment capability of selected reserve units so that the Army can meet mobilization contingency requirements. This program uses smaller reserve units to fill out larger active units. For example, a normal Army infantry division consists of three brigades made up of active personnel, but, under the Affiliation Program, one brigade may consist totally of reserve units.

This staffing concept is being tested in a military intelligence unit at Fort Bragg, North Carolina. The test studied the feasibility of using reservists to fill critically needed skills in the active unit. One-half of the reservists are located in the Fort Bragg area and do their monthly reserve and annual active duty training by working

directly with their active duty counterparts at Fort Bragg. The other half, located in small groups in the Eastern United States, do their monthly training at local reserve centers and their annual training working directly with their active duty counterparts at Fort Bragg. The reservists are included in evaluations of the active units' proficiency and readiness. Test results had not been compiled at the time of our review, but Army officials involved in the test believe the concept is viable, although recruiting, funding, and command and control problems surfaced during the test.

CONCLUSIONS

The quantitative factors in the MACRIT which were used to determine manpower requirements were outdated. The flying hours factor was higher than that currently expected in the worst wartime scenario. Also, other factors were based on experience in 1970 or before and may not reflect current needs. The accuracy of the maintenance man-hours per flying hour factor was questionable, the aircraft density factor for certain units was unknown, and the unit movement percentage appeared unrealistic.

The Army's present practice is to staff deployable aircraft maintenance units for wartime operations. As an alternative, it may be practicable to use reservists to fill out those units not immediately required for deployment. This could result in a reduction in manpower requirements of almost $20 million without degrading the active unit's ability to respond to wartime needs. (See ch. 6 for information on reserves.)

RECOMMENDATIONS

We recommend the Secretary of the Army require the appropriate Army commands to:

--Use accurate and timely data to develop the quantitative factors used in aircraft maintenance manpower requirements computations.

--Explore opportunities for incorporating individual reservists into active units to fill manpower positions beyond those needed for immediate deployment and provide for their use for periods beyond the initial 30 days of war.

CHAPTER 5

NAVY MAINTENANCE PERSONNEL REQUIREMENTS DETERMINATION SYSTEMS

Two approaches can be used in reviewing the Navy's aircraft maintenance manpower requirements. One is to accept the current organizational structure and determine whether manpower levels are adequately determined for that organizational scheme. The other is to focus on the structure itself and determine whether any organizational changes could be made to reduce manpower without sacrificing defense readiness.

The following discussion pertains to the Navy's systems for determining aircraft maintenance personnel requirements under their current structure. Later in the chapter (see p. 51) we discuss alternative organizational structures which could reduce maintenance manpower requirements.

AIRCRAFT BELOW-DEPOT MAINTENANCE STRUCTURE

As of August 1976 the Navy had an authorized strength of over 60,000 military personnel to perform below-depot-level maintenance and indirect maintenance support on the more than 6,000 aircraft in the Navy.

The Navy has 13 active aircraft carriers, each of which has a specific air wing assigned to it. An air wing consists of a specified mix of aircraft types. The mix varies slightly among wings to suit the support capability of their assigned carriers. The aircraft mix includes several squadrons of fighter, attack, electronic warfare, reconnaissance, and helicopter aircraft.

The Navy also has numerous land-based naval air stations (NAS). These air stations support nondeployed carrier aircraft, land based aircraft, and transient aircraft.

Navy below-depot aircraft maintenance is done on two levels--organizational and intermediate level.

Organizational level maintenance is done by personnel assigned to the individual operating aircraft. For example, an attack squadron of 12 A7E aircraft has 158 enlisted personnel assigned to do organizational level maintenance. These people work only on that squadron's aircraft and travel with the squadron when it deploys.

Organizational maintenance personnel may also be assigned to support nonoperational groups such as NAS organizational maintenance departments, refresher training squadrons, training commands, and various special purpose squadrons--all possessing their own aircraft or support transient aircraft belonging to others.

Tasks assigned to these units include inspecting; servicing and lubricating equipment; and adjusting, removing, and replacing parts, minor assemblies, and subassemblies. More complex work is usually forwarded to intermediate level activities.

Intermediate level maintenance is done at consolidated Aircraft Intermediate Maintenance Departments (AIMD). There is normally only one AIMD at each air station and aboard each aircraft carrier. They typically support a number of aircraft squadrons or other organizational activities and a variety of aircraft types and models. Assigned work includes calibrating, repairing, or replacing damaged or unserviceable parts, components, or assemblies; modifying material; and providing technical assistance to user organizations.

Both shore-based and carrier-based intermediate maintenance departments have an assigned nucleus maintenance crew. The nucleus crews are augmented by intermediate level maintenance personnel which are temporarily assigned from each squadron or other organizational activity that is being supported by AIMD.

In other words, organizational activities have both organizational level and intermediate level maintenance personnel. The organizational level personnel physically stay with their activity, while the intermediate level personnel are detached to work with the nucleus crew at whatever AIMD is providing support. Athough the intermediate level people are identified with their organizational activity and deploy when it deploys, they are always in temporary assignment to an AIMD.

MAINTENANCE MANPOWER DETERMINATION SYSTEMS

Manpower requirements for organizational and intermediate aircraft maintenance have historically been evaluated by manpower survey teams. These teams periodically visited each maintenance activity, or a representative squadron for an aircraft type, and made detailed workload measurements. Techniques used included interviews, work sampling measurements, and audits of records.

The Navy recognized that manpower requirements could not be determined consistently using manpower surveys because they involved differing human judgments. Further, considerable manpower was needed to staff survey teams, and mission or organizational changes required time-consuming and expensive new surveys. Finally, the survey method could not predict workloads under varying projected operating conditions, and was, therefore, only applicable to the current situation.

Due to these problems the Navy developed a new, systematic approach for determining manpower requirements.

The new approach uses regression analysis to determine the relationship between workload and various workload factors based on statistics of past performance. For example, maintenance man-hours required for a given aircraft can be related in an algebraic formula (or equation) to flying hours. Once this relationship is determined, workloads for a number of projected operating conditions can be reasonably predicted.

The Navy has completed development of the regression method for organizational level activities, and plans by October 1, 1977, to have applied the method to determine wartime manpower requirements to all aircraft squadrons. A similar approach has been developed for intermediate level activities, but as of January 1, 1977, the approach had not yet been approved for use.

Organizational level activities

Wartime requirements

The organizational (or squadron) level methodology keys on three basic types of information; Maintenance and Materiel Management (3-M) system data, 1/ given wartime operating factors, and detailed manpower survey measurements known as operational audits.

The 3-M system data includes preventive and corrective maintenance man-hours. Prevention (or scheduled) maintenance is directly related to operating factors such as flight hours,

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1/Refers to the Navy Maintenance and Materiel Management System. This system includes a procedure for collecting data on all maintenance work performed (Maintenance Data Collection System) and a procedure for specifying preventive maintenance to be performed (Preventive Maintenance System).

sorties, and calendar time. Preventive maintenance can, therefore, be predicted for any given set of wartime or peacetime operating factors. Corrective (or unscheduled) maintenance is precipitated by aircraft or support equipment malfunctions, so the amount that will be needed is not as easily predicted. However, by using corrective maintenance hours recorded in the 3-M system as input to statistical regression analysis, the Navy has been able to develop predictive equations--by aircraft type--to relate Navy-wide reported maintenance hours directly to historical peacetime flight hours. Hence, total maintenance hours required for a particular projected flight hour program can be calculated. The total hours can then be prorated to each work center according to the historical workload ratio derived from the 3-M data.

Anticipated wartime operating factors are published for each squadron type based on "at sea, at war" requirements. These published factors for monthly flight hours, sortie lengths, operational days per week, readiness, and number of aircraft per squadron are used in the manpower calculations.

Detailed operational audits are used to establish those regression analysis data bases which cannot be extracted from the 3-M system. Examples include the data bases needed to compute allowance factors for indirect productive time (such as supervision, administrative work, cleanup, and putaway time), nonproductive time (such as awaiting parts and work stoppages due to sea conditions), and nonavailable time (such as leave, sick call, and training).

After the squadron manpower documents are computed, a survey team visits the squadron to (1) verify the various workload factors and computed manpower needs with squadron personnel and (2) identify any variations required by special circumstances. Following this visit, appropriate changes are made and the document is submitted to the squadron's type and fleet commanders 1/ for review and comment. Unresolved differences between these commands and the survey teams are resolved by the Deputy Chief of Naval Operations for Manpower.

1/Commanders, Naval Air Forces, Atlantic and Pacific, and Commanders in Chief, Atlantic and Pacific Fleets.

Peacetime requirements

Although it could do so by substituting peacetime factors for wartime factors, the Navy has not used its new system to compute maintenance personnel needed to meet its peacetime workload requirements. Since peacetime deployed aircraft squadrons are assigned a forward strike force mission, the Navy believes the wartime manpower requirements outlined in the squadron manpower documents are appropriate for both peace and war.

Nevertheless, the authorized manpower level for squadrons is generally less than the wartime level computed for the squadron manpower documents. This difference in levels is due to congressional funding restrictions. Some differences are large and others small. A P-3C squadron, for example, is authorized only 286 of the 365 positions required for wartime staffing, while an A-7E squadron is authorized 229 of the 241 positions required for full wartime staffing.

The differences between total wartime requirements and congressional funding levels are distributed by the Navy among squadrons during an annual "respread conference." The conference is attended by representatives from the type and fleet commanders and various representatives from appropriate Chief of Naval Operations offices. These officials use a combination of judgment and negotiation to decide how the personnel shortages will be allocated among the various activities.

Navy officials said they recognize that the respread conference has shortcomings and, that in the near future, they intend to use their manpower determination methods, with peacetime factors, as an adjunct or replacement for the respread conference.

Assessment of the Navy's manpower determination system--organizational level

The Navy's new regression analysis procedure for determining organization level manpower needs appears to be a major improvement over prior methods. Overall reliability of the procedure, however, may be somewhat limited because it

--depends on historical direct labor hour data of questionable accuracy and

--does not recognize and allow for aircraft combat attrition, deferred maintenance, and other maintenance limiting factors.

Data accuracy is questionable

The new regression analysis procedure depends heavily on historical data accumulated through the Navy's 3-M data collection system. As pointed out in our earlier report on productivity of below-depot maintenance activities, the accuracy of labor hour charges reported in the 3-M system was not adequately controlled, labor hour charges were not compared to engineered labor standards to test their reasonableness, and it was questionable whether managers had a reasonable basis for determining how many personnel were needed to satisfy maintenance requirements.

Navy officials said during the current review that the 3-M data collection system errors tend to be offsetting and, since the new manpower determination procedure uses Navy-wide summary data for each aircraft type, overall data accuracy is reasonably assured. They also said that their manpower teams attempt to validate 3-M data during their onsite visits and added that other efforts are continuously underway to attempt to improve the quality of 3-M system reporting. While Navy officials concede there are still problems with 3-M data, they believe their adjustments and validations do improve data quality. They also believe that an automated, online data collection system, which is being developed for implementation in 1979, will further improve the accuracy of 3-M data.

Aircraft attrition, deferred maintenance, and other maintenance limiting factors are not considered

The Navy's maintenance manpower determination system assumes that enough organization level maintenance people must be available on the first day of war to support each and every active aircraft operating at its forecasted wartime flying rate.

It appears that some aircraft may not be available to operate at the forecasted wartime rate on the first day of war and for some time thereafter. For example:

--An average of two or more aircraft carriers are always in a state of limited availability because they are undergoing repairs or major overhauls.

--One or more aircraft carriers, along with their assigned aircraft and crews, are always stationed at their home ports, far from a probable theatre of operations.

Also, during a war some aircraft will be lost or damaged and some routine maintenance tasks will be deferred.

However, the above factors are not considered in defining wartime operating factors for input to the manpower determination system, although they should have an impact on total organizational maintenance requirements.

Intermediate level activities

Wartime requirements

Navy staffing documents specify both peacetime and wartime requirements for intermediate level maintenance activities. For example, the manpower authorization document for NAS Moffett Field shows a 75-percent increase (from 153 to 267) in AIMD nucleus personnel for mobilization. NAS Lemoore's document also shows a 75-percent increase. Navy officials, however, were unable to explain how the mobilization increases were derived or what assumptions they might include.

Apparently, these mobilization requirements were calculated several years ago based on certain war and mobilization assumptions. From that time on the numbers were apparently "passed down the line" to succeeding responsible officers and the rationale behind the calculations was lost.

Several Navy officials speculated that the wartime levels were calculated by simply extending peacetime operations from a two to a three shift operation. Neither headquarters nor subordinate command officials could satisfactorily explain why the workload at shore-based intermediate activities would expand 75 percent in wartime, when presumably many squadrons would be deployed, leaving fewer aircraft to support. Some said that flying rates of remaining aircraft would increase and that reserve aircraft would replace some deployed aircraft, but could offer no specific information about these changing workloads.

The Navy believes that implementing the new intermediate level manpower determination system which includes specific definitions of activities' peacetime and wartime missions and operating factors, should resolve uncertainties about mobilization requirements. This new system is discussed in the following section.

Peacetime requirements

Currently stated peacetime requirements for intermediate aircraft maintenance were originally determined by the old manpower survey method. The last of these surveys was done about 1971, when the Navy abandoned them to concentrate efforts on developing new methods. Manpower requirements have since been updated as necessary through a process of discussions and negotiation among naval station commanding officers and their superiors up to the Chief of Naval Operations level.

The Navy has developed a new method for computing peacetime intermediate level requirements, but it has not yet been approved for implementation. For now, the method uses regression analysis to relate recent historical workload data (from the 3-M system) to the number of aircraft supported by type and model for shore-based AIMD's and to the number of aircraft supported and flyi hours for ship-based AIMDs. For shore-based AIMDs, the proposed method correlates workload with numbers of aircraft rather than flying hours, because a reliable correlation between workload and flying hours could not be established. This approach is acceptable in the Navy's view because changes to work week length could be used to offset any disparities between workload and manpower caused by lack of precision in estimating manpower requirements.

Assessment of the Navy's manpower determination system--intermediate level

The manpower survey method, on which current manpower levels are based, has certain shortcomings which the Navy has recognized. The proposed new method has not yet been officially approved or implemented and, although it appears to promise some improvement, it also has some potential shortcomings.

The survey method cannot predict wartime needs

Intermediate level manpower requirement calculations are based on manpower surveys. When made, these surveys measured only the workload and manpower requirements at the time of the survey. Consequently, this method could not predict wartime needs.

Current requirements may be overstated

In one of our previous reports (see footnote on p. 22), we concluded that productivity at intermediate level facilities was low, indicating that intermediate level facilities may be overstaffed.

Officials at the Navy Manpower and Material Analysis Center, Atlantic, who were responsible for developing the new manpower determination methods, said that based on their observations they also believed that intermediate activities are overstaffed. They believed that the new methods, once implemented, would show a need for fewer personnel.

Since current peacetime manpower requirements were essentially determined by manpower surveys, these observations indicate the old system was inadequate to determine manpower requirements.

Although we could not determine how currently stated wartime requirements (mobilization manpower spaces) were predicted they also appear to be questionable.

The stated wartime requirements have not been updated recently and appear to be based on judgmental factors. Since there is no obvious reason to believe workloads at stateside intermediate maintenance departments would increase, especially as much as 75 percent (see p. 47), and no justification for mobilization requirements can be given, we believe these requirements are overstated.

Data accuracy in the proposed method is questionable

The proposed method relies heavily on 3-M system data. Therefore, it should have the same data accuracy problem as discussed in the analysis of the organizational level methods.

The proposed method may not be able to predict wartime needs at shore-based AIMDs

The proposed method does not relate workload to flying hours for shore-based AIMDs. Instead, it relates workload to numbers of aircraft supported. The workload equations are based on peacetime data which is related to peacetime flying activity. Thus, any major changes in flying activity at the

onset of a war may invalidate the workload equations if workload is sensitive to flying activity. The organizational manpower determination method supports the likelihood that the workload is sensitive to flying hours at intermediate activities. If this is true, the Navy may not be able to accurately predict wartime needs for shore-based AIMDs.

This is not a significant problem if workloads at shore-based activities do not rise considerably in wartime. However, it is a problem if they do. Since we could not determine how workloads are affected in wartime, we do not know if this is a major problem.

ALTERNATIVES FOR REDUCING MANPOWER REQUIREMENTS

Designing a reasonable system for determining maintenance manpower requirements does not, in itself, guarantee optimal staffing. This is because the various assumptions taken as "givens" in design of the system may influence the computed staffing numbers to a greater extent than individual weaknesses in the actual system methodology.

In this review we intended to include only an evaluation of the staffing determination methodology used and alternatives available for greater use of the reserves to meet the computed staffing objectives. As a by-product, however, we could not avoid gaining an increased awareness of the "givens" and an appreciation of their restrictive impact on the development of alternatives. Two of these givens--peacetime programed/wartime forecasted aircraft flight activity and maintenance organizational structure--are particularly important.

Programed and forecasted aircraft flight activity

The Navy at our request used their computerized staffing program to compute how many organization level maintenance people would be required to support the peacetime deployed and nondeployed aircraft flight hour rates programed for typical A-7E and P-3C squadrons. This exercise showed fewer maintenance people are required to support a peacetime deployment situation than are required for full wartime deployment. This can be explained because a peacetime deployed squadron operates at a lower flight rate than it would in wartime (resulting in fewer required maintenance hours), but the maintenance people work the longer work shifts called for in wartime (resulting in more hours available to do the required maintenance work).

At the same time, this exercise also showed as many (or more) people are required to support nondeployed squadrons in peacetime as are required in a full wartime deployment.

This second result may seem surprising, but can be explained by the relationship between flight hours and available work hours. A peacetime nondeployed squadron operates at a much lower flight rate than in wartime (resulting in much less required maintenance), but the maintenance people in nondeployed squadrons only work a normal peacetime workweek rather than at a wartime workweek rate (considerably reducing the number of labor hours available to satisfy requirements).

The net result of the above--that peacetime and wartime organization level maintenance staffing needs are about equal--severely limits the possibilities for reducing peacetime active duty staffing through greater reliance on reserves. But opportunities for greater reliance on reserve maintenance personnel would be greatly enhanced if

--there is a reduction in the squadron's programed peacetime flight activity and/or

--there is a change in the basic assumption that all squadrons must be able at all times to support their forecasted wartime flight rate.

We are not advocating that these changes be made, but we do want to emphasize that there are alternatives available to the Navy through such changes. Although the system now indicates peacetime and wartime squadron staffing requirements are about the same, a greatly different picture is possible if the assumptions underlying the system are altered. We are not satisfied that the risks of changing the system's underlying assumptions are being adequately assessed and routinely reviewed from both a strategic and budgetary view.

Maintenance organization structure

The number of people required to do a job can be directly influenced by how they are organized. Although the Navy has consolidated intermediate level aircraft maintenance (there is only one AIMD at each ship and shore station) each Navy squadron continues to be responsible for doing organizational maintenance on only its assigned aircraft.

We reported earlier (LCD-75-422, July 29, 1975) that this structure (1) results in underuse of maintenance equipment

and duplication of administrative and other indirect maintenance personnel, (2) is inconsistent with the treatment of intermediate maintenance and Air Force's consolidated treatment of all below-depot maintenance, and (3) was found to be the inferior approach in a Navy study of the potential for organizing all below-depot maintenance under a consolidated wing approach similar to the Air Force's.

The Navy has not adopted a consolidated wing approach, but we believe there is considerable merit for adopting this approach. We also believe its adoption could greatly improve Navy's opportunities to reduce peacetime staffing and place greater reliance on the reserves.

For example, all the aircraft, maintenance personnel, equipment, and aircraft at each air station could be consolidated (pooled) and centrally controlled.

Not only would this arrangement take advantage of economies of scale, but it could make available the best personnel, equipment, and aircraft for each deployment and, if combined with a reduction in peacetime nondeployed flight hours, it could reduce the total size of the maintenance personnel pool needed. The reduction in active duty personnel could then be offset by greater reliance on reserve personnel to round out the total complement within a reasonable time after commencement of hostilities.

Certainly, there are many variables that would have to be considered. However, the benefits are potentially large, so for this reason each of the variables should be adequately assessed and the concept given a fair test.

Another organizational structure change that can be explored is the practice of having a specific air wing attached to each aircraft carrier. Since at least two carriers are normally in shipyard overhaul (and hence unavailable for combat for at least 30 days), it may be possible to place one or more wings in reserve status. The remaining wings would rotate among the operational carriers.

Navy officials said they have considered this alternative and concluded it is not viable because (1) wings use ship overhaul time for training and for transition to new aircraft, (2) not all carriers have the same aircraft support capabilities, and (3) time in deployed status for remaining wings would increase beyond reasonable levels.

While these arguments may be valid, the Navy could not provide us any specific studies of the matter. In terms of deployed status, we compared the availability of 10 pairs of A-7E squadrons with the 5-year deployment schedules of the Navy's 12 1/ aircraft carriers and found that the 20 squadrons could be rotated to meet all deployment schedules and still have a reasonable amount of time between deployments.

CONCLUSIONS

We perceive weaknesses in the Navy's system for determining organization level maintenance staffing because of:

--The Navy's existing maintenance structure.

--The Navy premise that it must be prepared at all times to support immediate use of all aircraft at full wartime rates.

--3-M data accuracy problems noted.

The potential inaccuracies in the 3-M data cannot be ignored. Unless the Navy further verifies the data accuracy it is questionable if the system reasonably predicts manpower needs. The same conclusion about data accuracy can be made for intermediate level maintenance staffing requirements.

The Navy has not adequately identified AIMD wartime workload factors. Without this information about AIMD wartime support requirements, it is not possible to assess whether the proposed intermediate manpower determination methods will work, whether AIMD wartime requirements are more or less than peacetime, and whether the reserves can play a role in augmenting the AIMD wartime needs.

The currently stated AIMD mobilization requirements appear to have no solid justification and, therefore, are extremely questionable.

If it is desired to reduce numbers of active personnel and increase the role of individual reservists in augmenting the remaining active organizations, then some parameters

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1/The Navy will have only 12 aircraft carriers in the near future.

(such as flying rates) or the maintenance structure will have to change. For example, it appears that only by reducing peacetime flying rates can the peacetime manpower requirements be reduced below wartime requirements under the current structure and, thus, open a role for reservists.

Other reductions in active personnel might occur with a restructuring of the maintenance organization. For example, changing to a maintenance wing concept may make more efficient use of maintenance personnel.

If the maintenance structure is changed, both the organizational and intermediate level manpower requirements determination methods will have to be revised to accommodate the new structures.

RECOMMENDATIONS

We recommend that the Secretary of the Navy:

--Assess the accuracy of the 3-M system data and make appropriate adjustments to manpower requirements if a significant error exists.

--Evaluate AIMD wartime aircraft support missions and accordingly reevaluate AIMD mobilization requirements and their impact on the need for reserve forces to augment AIMDs.

--Evaluate alternative maintenance structures.

--Evaluate the potential of transfering some active squadrons, with aircraft common to all wings, to the reserve, and rotating the remaining active squadrons among the wings to meet deployment commitments.

--Evaluate the effect of aircraft attrition, deferred maintenance, and the fact that not all aircraft will be deployed immediately in a war on the total wartime maintenance force required and on mobilization planning.

CHAPTER 6

HOW CAN RESERVE FORCES BE USED?

Greater use of the reserve forces has been a subject of increasing concern in recent years. The growing size of defense manpower costs was instrumental in the evolvement of a total force concept to provide greater use of reserve components in the event of mobilization. Better use of reserve components could presumably reduce the requirement for full time active military forces and, thus, hold down manpower costs in peacetime since reserve forces cost considerably less than active forces.

The services have taken action to implement the total force concept and effect greater use of the reserve forces. The reserves have been assigned and have assumed greater responsibilities in the event of full mobilization. This has undoubtedly relieved the active forces of certain requirements and helped to hold the line on increasing defense manpower costs. At the same time, most of the services' efforts have been designed to merely use the reserve forces to supplement existing active forces during mobilization, thereby providing a greater defense capability earlier in the mobilization of forces.

Little, if any, of their efforts have resulted in sizeable reductions in the size of active forces in peacetime and particularly in the area of aviation maintenance. While we believe there is considerable potential for further effecting reductions in active force peacetime levels through greater use of reserve forces, we recognize there are a number of problems which must be addressed before such a move could be successful.

EMPHASIS TO INCREASE USE OF RESERVE FORCES

There have been a number of studies recently completed concerning the use and effectiveness of reserves as part of the total force.

--The Department of Defense study, "The Guard and Reserve in the Total Force," published in 1975, dealt with such key issues as (1) identifying essential missions within the capabilities of the reserves, (2) improving readiness and training of reserve forces, (3) integrating reserve units into war plans, (4) manning reserve units, which are scheduled to

deploy early, at a higher level than other reserve units, and (5) integrating the planning and management of active and reserve component forces into a coherent whole, thus simplying the transition from normal peacetime operations to operation of a single force after mobilization.

--The Defense Manpower Commission's report to the President and the Congress, published in 1976, highlighted many of the problems facing the reserve forces, such as (1) sizing the reserve components to meet mobilization requirements for augmenting active forces, (2) assuring the readiness of reserve units scheduled to be deployed in the event of mobilization, (3) providing adequate active forces to upgrade training of reserve components, (4) providing recruiting incentives to improve potential prospects for meeting recruiting requirements, and (5) developing comprehensive plans that will serve to avert a major shortfall in reserve accessions induced by unfavorable conditions of supply or demand.

--We reported in January 1970 (B-148167) and again in October 1975 (LCD-75-402) on problems causing a low readiness posture in the reserve forces. Major problem areas in the reserve forces involved equipment shortages and inadequacies, personnel and skill imbalances, and training deficiencies. Another of our reports (FPCD-75-169), dated March 5, 1976, dealt with improving the effectiveness and efficiency of recruiting.

These studies and the resulting initiatives are indications of the concern expressed for and attention directed to many of the problems connected with reserves.

There seems little doubt that problems still exist, particularly recruiting and maintaining reserves with the skills necessary to assure an adequate defense capability. Therefore, we do not have much assurance that the reserves offer the immediate answer to reducing active force maintenance manpower levels. However, these problems are being addressed and we believe can be solved or alleviated with appropriate attention. For example, the Office of the Deputy Assistant Secretary of Defense (Reserve Affairs) is performing a study of the Reserve Compensation System. The major objective is to select and recommend the compensation system that will best enable the country to develop and maintain the reserve force structure for effective future mission performance.

We also believe the programs discussed in the following section provide an indication of how reserves might be used more effectively.

PROGRAMS MAKING GREATER USE OF RESERVE FORCES

While much has been written about greater use of reserve forces, actual programs for this matter and, more specifically, the maintenance area have been rather limited.

One program which has been in operation within the Military Airlift Command specifically addresses greater use of reserves in the maintenance function. This program--Associate Reserve Program--shares some of the problems that have been addressed earlier in this chapter. At the same time, it offers the potential for greater use of the reserves and further demonstrates that many of the problems can be overcome once management is dedicated to the concept.

Reserve personnel in this program train with and use the operational equipment of an associated active unit. This provides personnel cost savings because the reserve unit has a smaller management structure. Further, no costs are incurred to provide or maintain additional reserve equipment. The Associate Program provides the required manpower capability which the active force lacks. The need to fill this shortfall has encouraged active force support for the program. No active force reductions have resulted from the program. However, we believe some excess peacetime maintenance manpower is present. The program's success indicates that a shift of excess peacetime manpower to the reserve forces could reduce total costs without sacrificing combat capability.

The Associate Program accomplishes many desirable objectives for augmenting aircraft maintenance capability.

- --It provides people who are familiar with the specific aircraft to be maintained.
- --Reservists have an existing personal relationship with the active personnel with whom they would mobilize.
- --Reservists know the specific procedures used by the unit to which they are assigned.
- --Reservists are productive both in peacetime and upon mobilization.

We do not mean to imply that the Associate Program is the only way to obtain these objectives, but all programs should strive for similar objectives.

The Air Force is also testing a program within the Tactical Air Command which augments the active force with individual reservists. Augmentation with individual reservists is a different approach than that of the Associate Program, which uses whole reserve units, complete with their own support personnel, to augment active units. This program promises, if successful, even more cost savings than the Military Airlift Command Associate Program because individuals are responsible to and receive support from the active command rather than the reserve command. This arrangement reduces personnel required in the reserves.

CONCLUSIONS

DOD, through more effective use of reserves, has an opportunity to reduce peacetime maintenance personnel costs. The Air Force Associate Program highlights this potential. However, serious problems with the effectiveness and availability of reserve personnel deter managers from completely taking advantage of this potential.

APPENDIX I

United States Senate

COMMITTEE ON APPROPRIATIONS
WASHINGTON, D.C. 20510

June 2, 1976

B-133370

The Honorable Elmer Staats
Comptroller General of the United States
Washington, D. C.

Dear Mr. Staats:

Two recent reports by the General Accounting Office on Aerial Port staffing (LCD-75-219, LCD-76-217) have been quite helpful to the Committee in analyzing personnel requirements at certain Air Force installations. They have also raised a question concerning the peacetime staffing requirements of other Department of Defense support activities, in particular, the staffing at below-depot-level maintenance facilities.

Your reports on below-depot-level activities (LCD-75-422, LCD-75-401) have identified problem areas, including lack of productivity and potential overstaffing. It would be very helpful to the Committee if the GAO could perform a follow-on review of below-depot-level maintenance facilities staffing to ascertain the following:

1. For the activities selected, ascertain whether peacetime manning standards or other systematic ways of computing peacetime manning requirements exist. If so, are they relatively uniform service-to-service?

2. Utilizing the peacetime manning standards (or other criteria) ascertain how many personnel are required to meet peacetime workloads.

3. Ascertain current manpower authorizations at these activities.

4. Compare current manpower authorizations with the peacetime manning criteria and standards.

5. Explain any significant variances.

6. Ascertain how the Services develop the manpower needs for these same activities for a wartime mission.

7. Has the Department of Defense (or the Military Services) ever examined the possibility of placing the manpower authorizations that are in excess of peacetime requirements in the Reserve components?

A. If so, what were the results and conclusions.

B. If not, what would be the feasibility of placing the manpower authorizations in excess of peacetime requirements in the Reserve components? Would it be practical to create "associate" maintenance units that could, like existing associate flying units, train on the actual equipment they would be maintaining in wartime?

8. If the personnel authorizations in excess of peacetime requirements were placed in the Reserves, would there be a direct one-for-one reduction in active forces and increase in reserve forces strength? If not, what would be a recommended approach to this matter?

9. If the above suggestion is considered to be feasible, what would be the estimated annual cost saving from shifting the personnel to the Reserves?

10. Would it be feasible to obtain the necessary personnel in a reserve status (i.e., would there be recruiting and retention problems)?

11. Would the reserve units thereby created be able to respond rapidly to DoD's requirements in the event of mobilization or utilization without mobilization (e.g.,under the authority of PL 94-286, an Act which permits the President to call up to 50,000 reservists involuntarily without declaring a national emergency)?

12. What would be a feasible time period from activation of these maintenance units until they could be available? (Aerial Port squadrons, the Committee was advised, have consistently met a 72-hour activation criteria in their readiness inspections.)

13. Would it be feasible and advisable to consider differential readiness criteria; that is, having certain critical early-required units meet more rapid activation standards than units that are less critical, and for the latter, wouldn't the reserve concept be particularly suited?

If the GAO could examine the above questions in connection with aircraft maintenance activities in all of the Services, it would

be most helpful to the Committee. If the results indicate that the proposal outlined above would be cost effective, the Committee may consider requesting examination of other types of maintenance activities.

A study of this type obviously will require some time to accomplish. It would be most helpful if the Committee could obtain a final report not later than June 1977. It would also be appreciated if GAO would provide the Committee staff with a progress report in November 1976 and early February 1977.

The Committee staff has discussed this request with Mr. Grosshans of the Logistics and Communications Division.

With kind regards, I am

Sincerely,

John L. McClellan
Chairman

JLM:ljm

APPENDIX II

PRINCIPAL OFFICIALS

RESPONSIBLE FOR THE ADMINISTRATION OF

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
William P. Clements, Jr. (acting)	Apr. 1973	July 1973
DEPUTY SECRETARY OF DEFENSE:		
Charles W. Duncan, Jr.	Jan. 1977	Present
William P. Clements, Jr.	Jan. 1973	Jan. 1977
ASSISTANT SECRETARY OF DEFENSE (INSTALLATIONS AND LOGISTICS):		
Dale R. Babione (acting)	Jan. 1977	Present
Frank A. Shrontz	Feb. 1976	Jan. 1977
John J. Bennett (acting)	Mar. 1975	Feb. 1976
Arthur I. Mendolia	June 1973	Mar. 1975
ASSISTANT SECRETARY OF DEFENSE (MANPOWER AND RESERVE AFFAIRS):		
Carl W. Clewlow	Jan. 1977	Present
William K. Brehm	Sept. 1973	Jan. 1977
Carl W. Clewlow (acting)	June 1973	Aug. 1973
ASSISTANT SECRETARY OF DEFENSE (COMPTROLLER):		
Fred P. Wacker	Sept. 1976	Present
Terence E. McClary	June 1973	Aug. 1976
DEPARTMENT OF THE ARMY		
SECRETARY OF THE ARMY:		
Clifford Alexander	Feb. 1977	Present
Martin R. Hoffman	Aug. 1975	Jan. 1977
Howard H. Callaway	July 1973	Aug 1975

APPENDIX II

	Tenure of office	
	From	To
DEPARTMENT OF THE ARMY (cont.)		
UNDER SECRETARY OF THE ARMY:		
Vacant	Jan. 1977	Present
Norman R. Augustine	May 1975	Jan. 1977
Vacant	Apr. 1975	May 1975
Herman R. Staudt	Oct. 1973	Apr. 1975
ASSISTANT SECRETARY OF THE ARMY (INSTALLATIONS AND LOGISTICS):		
Edwin Greiner (acting)	Jan. 1977	Present
Harold L. Brownman	Oct. 1974	Dec. 1976
Edwin Greiner	Aug. 1974	Oct. 1974
Edwin Greiner (acting)	May 1974	Aug. 1974
Vincent P. Huggard (acting)	Apr. 1973	May 1974
ASSISTANT SECRETARY OF THE ARMY (MANPOWER AND RESERVE AFFAIRS):		
Paul Phillips (acting)	Jan. 1977	Present
Donald G. Brotzman	Mar. 1975	Jan. 1977
M. David Lowe	Feb. 1974	Jan. 1975
Carl S. Wallace	Mar. 1973	Jan. 1974
ASSISTANT SECRETARY OF THE ARMY (FINANCIAL MANAGEMENT):		
Hadlai A Hull	Mar. 1973	Present
COMPTROLLER OF THE ARMY:		
Lt. Gen. John A. Kjellstrom	July 1974	Present
Lt. Gen. E.M. Flanagan, Jr.	Jan. 1973	July 1974
DEPARTMENT OF THE NAVY		
SECRETARY OF THE NAVY:		
W. Graham Claytor, Jr.	Feb. 1977	Present
Gary D. Penisten (acting)	Feb. 1977	Feb. 1977
Joseph T. McCullum	Feb. 1977	Feb. 1977
David R. MacDonald	Jan. 1977	Feb. 1977
J. William Middendorf	June 1974	Jan. 1977
J. William Middendorf (acting)	Apr. 1974	June 1974
John W. Warner (acting)	May 1972	Apr. 1974

APPENDIX II

	Tenure of office	
	From	To
DEPARTMENT OF THE NAVY (cont.)		
UNDER SECRETARY OF THE NAVY:		
R. James Woolsey	Mar. 1977	Present
Vacant	Feb. 1977	Mar. 1977
David R. MacDonald	Sept. 1976	Feb. 1977
John Bowers (acting)	July 1976	Aug. 1976
Vacant	Mar. 1976	June 1976
David S. Potter	Aug. 1974	Mar. 1976
Vacant	June 1974	Aug. 1974
J. William Middendorf	June 1973	June 1974
ASSISTANT SECRETARY OF THE NAVY (MANPOWER AND RESERVE AFFAIRS):		
Joseph T. McCullen, Jr.	Sept. 1973	Present
James E. Johnson	June 1971	Sept. 1973
ASSISTANT SECRETARY OF THE NAVY (FINANCIAL MANAGEMENT):		
Gary D. Penisten	Oct. 1974	Present
Vacant	May 1974	Oct. 1974
Robert D. Nesen	May 1972	May 1974
DEPARTMENT OF THE AIR FORCE		
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
Dr. John L. McLucas	July 1973	Nov. 1975
ASSISTANT SECRETARY OF THE AIR FORCE (INSTALLATIONS AND LOGISTICS):		
Richard J. Keegan (acting)	Feb. 1977	Present
Hon. J. Gordon Kapp	Mar. 1976	Jan. 1977
Frank A. Shrontz	Oct. 1973	Feb. 1976
Richard J. Keegan (acting)	Aug. 1973	Oct. 1973
Lewis E. Turner	Jan. 1973	Aug. 1973

APPENDIX II

	Tenure of office	
	From	To
DEPARTMENT OF THE AIR FORCE (cont.)		
ASSISTANT SECRETARY OF THE AIR FORCE (MANPOWER AND RESERVE AFFAIRS):		
James P. Goode (acting)	Jan. 1977	Present
Nita Ashcraft	Aug. 1976	Jan. 1977
James P. Goode (acting)	July 1976	Aug. 1976
David P. Taylor	June 1974	July 1976
James P. Goode (acting)	June 1973	June 1974
ASSISTANT SECRETARY OF THE AIR FORCE (FINANCIAL MANAGEMENT):		
Everett T. Keech	Sept. 1976	Present
Francis Hughes	Mar. 1976	Sept. 1976
Arnold G. Bueter (acting)	Aug. 1975	Mar. 1976
William W. Woodruff	Apr. 1973	July 1975
COMPTROLLER OF THE AIR FORCE:		
Lt. Gen. Charles G. Buckingham	Sept. 1975	Present
Lt. Gen. J. R. DeLuca	Oct. 1973	Sept. 1975
Lt. Gen. D. L. Crow	Apr. 1969	Oct. 1973