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Report to Sen. John L. McClellan, Chairman, Senate Committee on Appropriations; by Elmer B. Staats, Comptroller General.

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The Navy projected a backlog of depot level aircraft maintenance for the end of fiscal years 1976 and 1977 consisting mainly of airframes and repairable components. Essentially, the airframe requirement is not urgent. With improvements in the Navy's maintenance programs, some of which are in progress, this backlog is being reduced as the equipment is needed. The Air Force did not have a depot backlog. Findings/Conclusions: Factors contributing to the difference between the Navy's and the Air Force's aircraft maintenance backlogs are: (1) the Navy schedules airframes into the depots more frequently than the Air Force; and (2) the Navy has not fully funded the depot level aircraft maintenance workload since 1970. The Navy's interval between depot visits is chosen relatively arbitrarily and has remained fairly static. The services' criteria for computing the backlog figures also differ. Recommendations: The Secretary of Defense should: require the Air Force and Navy to establish common criteria for determining when an aircraft should receive depot level maintenance; require that only aircraft actually in need of depot work be reported as an unfunded backlog requirement; require the Navy to resolve the problems contributing to the lengthy order-to-shipment times; and require the Air Force and Navy to eliminate, as much as possible, the differences in terms and acronyms used in their operational readiness reporting systems. (Author/SC)

REPORT TO THE SENATE COMMITTEE ON APPROPRIATIONS

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

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The Navy Depot Level Aircraft Maintenance Program--Is There A Serious Backlog?

Department of the Navy

The Navy projects a backlog of depot level aircraft maintenance for the end of fiscal years 1976 and 1977, consisting mainly of air frames and repairable components. Essentially, the airframe requirement is not urgent. With improvements in the Navy's maintenance programs, some of which are in progress, this backlog is being reduced as the equipment is needed.

Some additional funding could apparently be used to repair components. However, until management deficiencies are corrected, it would be difficult to determine how much funding this program should receive.

LCD-77-432

SEPTEMBER 1, 1977

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

B-133014

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

Dear Mr. Chairman:

This report presents information on the Department of the Navy's depot level aircraft repair program, in response to your August 2, 1976, request. The operations of this program affect the Navy's funding requirements and the reported end of fiscal years 1976 and 1977 backlog of maintenance.

Essentially, most of the backlog of depot level airframe maintenance is not a current priority requirement. With improvements in the Navy's programs, some of which are in progress, this backlog is being reduced as the equipment is needed. Some additional funding could apparently be used in the component repair program. However, until management deficiencies are corrected, it would be difficult to determine how much funding this program should receive and what impact it would have on readiness.

As requested, we briefed the Committee on the results of our review. We discussed this report with Department of the Navy officials, but as your office directed, we did not obtain written comments.

This report contains recommendations to the Secretary of Defense and the Secretaries of the Navy and Air Force on pages 34 and 46. As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the House Committee on Government Operations, the Senate Committee on Governmental Affairs, and the House and Senate Committees on Appropriations.

As arranged with your office, we will distribute this report to the Department of Defense and the interested committees 7 days after the date of the report. At that time we will also make copies available to other interested parties upon request.

Sincerely yours,

Comptroller General
of the United States

COMPTROLLER GENERAL'S REPORT
TO THE SENATE COMMITTEE
ON APPROPRIATIONS

THE NAVY DEPOT LEVEL AIRCRAFT MAINTENANCE PROGRAM--IS THERE A SERIOUS BACKLOG? Department of the Navy

D I G E S T

In its fiscal year 1977 appropriation requests, the Navy said that it had a $121.8 million backlog of aircraft maintenance work and that repairs would be delayed beyond fiscal year 1976 because of insufficient funds. The Air Force said it did not have a depot backlog.

The Senate Committee on Appropriations requested GAO to:

--Review differences in the Navy and Air Force maintenance criteria and utilization rates and determine what impact they have on the depot backlog of maintenance. (See ch. 2.)

--Analyze the Navy's reported backlog of aircraft depot maintenance as of June 30, 1976. (See ch. 3.)

The Committee was also concerned that the Navy's operational readiness rates were lower than the Air Force rates and the Navy's own operational readiness goals. However, despite the depot maintenance backlog and a declining operational readiness rate, the Navy indicated that its fleet aircraft were meeting their operational commitment.

The Committee asked GAO also to (1) determine what the Navy and Air Force rates have been and why there are differences and (2) assess what impact the unfunded backlog of depot level aircraft maintenance is having on the operational readiness rate. (See ch. 4.)

MAINTENANCE PRACTICES THAT CAUSE THE BACKLOG

Many factors contribute to the difference between the Navy's and the Air Force's aircraft maintenance backlogs. GAO did not look at all factors but limited its work to those specifically questioned by the Senate Committee on Appropriations. Important factors contributing to the Navy's airframe backlog are that

--the Navy schedules airframes into the depots more frequently than the Air Force and

--the Navy has not fully funded the depot level aircraft maintenance workload since 1970.

The Navy's interval between depot visits is chosen relatively arbitrarily and has remained fairly static. The interval is chosen soon after design, when very little reliability data is available, and it is slowly, if ever, changed. In contrast, Air Force planes are initially maintained under a program aimed at determining whether periodic depot work will be necessary and, if so, what the interval should be. (See p. 9.)

The services' criteria for computing the backlog figures also differ. Navy aircraft are considered to be in a maintenance backlog on the day the planned operating interval has passed and the plane should have been taken into the depot. The Air Force, however, does not consider its aircraft to be in a backlog until 3 months after its planned operating interval and depot induction date have passed. (See p. 12.)

The services generally believe that, as flying hours increase greatly, maintenance requirements also tend to increase and operational readiness rates will be affected. However, other variables also

enter the picture, and exactly what impact different utilization rates have on maintenance and readiness is not known. (See p. 13.)

THE NAVY BACKLOG

In the fiscal year 1977 budget presentation, the Navy reported an unfunded requirement of $121.8 million at the end of fiscal year 1976 to do depot level maintenance on an estimated 825 aircraft. GAO feels that the airframe backlog repair requirement is not urgent. Of the estimated 825 aircraft in the backlog, 540 were scheduled for storage or were unavailable for depot maintenance because of operational commitments, such as being on carriers far from the depots or being used in research and development projects.

In addition, the backlog was not all airframe repairs. A breakdown of the backlog revealed the following details. (See p. 20.)

	(millions)
Engineering support	$ 25.8
Engine repair	6.4
Airframe maintenance on 285 units	47.3
Component repair	41.3
Total	$121.8

OPERATIONAL READINESS

Both the Navy and Air Force have reporting systems to keep management informed of the operational status of their aircraft. Aircraft are classified as either operationally ready or not operationally ready. (See p. 36.)

Operational readiness rates are often thought of as indicating combat readiness, but this is not completely true. These rates indicate only equipment materiel condition, whereas combat readiness must also consider availability of personnel and other factors. Further, operational readiness rates give only an immediate picture of the aircraft

condition. They do not forecast what the condition will be tomorrow or 5 days from tomorrow. Thus, a unit can have a favorable operational readiness rate and still not be ready for combat. (See p. 38.)

During fiscal years 1972-76, the Navy operational readiness rates averaged about 60 percent and the Air Force rates averaged about 70 percent. The Navy's rate, which is below its goal, is the result of the logistics system problems the Navy is having in getting requisitions processed quickly and necessary repairs done on components before they are needed.

In June 1976 the Navy operational readiness rate was 56 percent, and the Air Force was reporting 69 percent of its aircraft in operational units as ready to perform at least one of their primary missions. (See p. 40.)

The differences between the Navy's and Air Force's aircraft reporting systems and between their equipment and missions detract from the value of comparisons of their readiness rates. (See p. 41.)

It is not possible to say how much of the differences between readiness rates is caused by differences in the reporting systems and how much indicates that one service is doing a better job in maintaining its aircraft.

In 1977 the Air Force directed a multiservice committee to identify the differences between the services' reporting systems and to recommend changes to standardize the systems. The committee concluded that the differences were not particularly great but suggested some actions to require more uniformity in operational readiness reporting. (See p. 41.)

CONCLUSIONS

There are differences in the Navy and Air Force maintenance programs which have a direct effect on the fact that the Navy has a backlog of airframe maintenance and the Air Force does not.

The Navy schedules its airframes for maintenance more frequently, has not fully funded the maintenance workload, and is very cautious in changing the frequency of maintenance. The Navy criterion for including aircraft in the backlog is rigid, whereas the Air Force allows its maintenance planners some flexibility before listing an aircraft in a maintenance backlog.

The Navy has also adopted a practice of inspecting its aircraft and extending their use beyond the depot maintenance due date when the inspections conclude the aircraft is still capable of meeting its mission requirements for another 3 months. Such aircraft, however, remain in the Navy's depot maintenance backlog.

Through management actions to implement the new reliability-centered maintenance concept and to lengthen the interval between performance of depot level maintenance, the maintenance backlog should be reduced.

Concerning the component backlog, additional funds have been programed into this area by the Navy in fiscal years 1975 and 1977. However, the Navy is still not able to repair all its components until they are needed.

The Navy believes additional funds are necessary to reduce the component maintenance backlog and improve the shelf-stock position of these components.

However, GAO found no evidence that increased funding would improve the Navy's

not operational because of supply [illegible]. (See p. 33.)

GAO questions whether additional funds should be put into the component repair program until all reasonable efforts have been made to correct management deficiencies, which delay ordering and shipping materials, and a better assessment can be made as to how much funding this program should receive.

Concerning the engines and engineering support backlogs, the Navy has acted to eliminate these requirements because they are not high-priority items.

GAO believes that the differences in the materiel readiness reporting systems of the Navy and Air Force must be eliminated. If this were done, comparisons of the services' operational readiness rates would be more useful indicators of which service is better supporting its aircraft.

RECOMMENDATIONS

The Secretary of Defense should:

--Require the Air Force and Navy to establish common criteria for determining when an aircraft should receive depot level maintenance and require that only aircraft actually in need of depot work be reported as an unfunded backlog requirement. (See p. 34.)

--Require the Navy to resolve the problems contributing to the lengthy order-to-shipment times. (See p. 34.)

--Require the Air Force and Navy to eliminate, as much as possible, the differences in terms and acronyms used in their operational readiness reporting systems. (See p. 46.)

As directed by the Committee, GAO discussed this report with Department of the Navy officials but did not obtain written comments.

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ABBREVIATIONS

ASO	Aviation Supply Office
CLAMP	closed loop aeronautical management program
DOD	Department of Defense
GAO	General Accounting Office
MESL	mission essential subsystem listing
NAVAIR	Naval Air Systems Command
NORM	not operationally ready due to maintenance
NORS	not operationally ready due to supply
OR	operational readiness

CHAPTER 1

INTRODUCTION

The objective of the Department of Defense's (DOD's) annual $6 billion aircraft maintenance program is to sustain enough aircraft in good operating condition to meet current requirements.

The Department of the Navy has an inventory of about 7,000 aircraft in the Regular Navy, the Marine Corps, and the Reserves. This inventory includes fighter, attack, anti-submarine, patrol, warning, transport, refueler, observation, training, and rotary wing aircraft. Generally about 5,000 aircraft are in operational units, 800 are in various stages of depot repair, and 1,200 are in storage or on loan to other activities. The Department of the Navy spends about $1.3 billion annually at the organizational, intermediate, and depot level maintenance facilities to maintain its aircraft.

About half of the aircraft maintenance expenditures are for standard depot level maintenance. In fiscal year 1976 and 1977, the Navy depot program was budgeted at $637.5 and $722.3 million, respectively. The $84.8 million increase in fiscal year 1977 is for pay raises and repair of a greater number of engines and components. About 80 percent of this budget is used in the naval aircraft rework facilities, and 20 percent is to pay for contracting with private industry for depot level aircraft maintenance.

In March 1976 the Navy reported that at the end of fiscal year 1976 it would need an additional $121.8 million to do depot level maintenance on 825 aircraft. The Navy claimed it has delayed doing this unfunded work because its budgets since fiscal year 1970 did not provide sufficient funds.

Whereas the Navy reported a backlog of aircraft depot maintenance, the Air Force said it did not have a backlog in its inventory of 9,000 aircraft. Its depot program is funded at about $1.2 billion per year.

Further, the Air Force was reported to have a higher operational readiness (OR) rate for its aircraft. For fiscal years 1972-76 the Air Force averaged 70 percent and the Navy 60 percent. The OR rate indicates the percentage of the aircraft in operational units that are ready to perform at least one of their primary missions.

Despite the apparent need for aircraft repairs and a declining OR rate, the Navy has said that its fleet aircraft have met their operational commitments with a sortie completion rate of about 90 percent.

The Senate Committee on Appropriations was concerned about the adequacy of the funding for the Navy's aircraft depot maintenance program. The specific questions the Committee requested us to answer were:

--Are there any differences in maintenance criteria between similar aircraft (such as the F-4 and A-7) in the Air Force and the Navy? Why are the criteria different? Is DOD planning to standardize the criteria? If not, why not?

--How do utilization rates of similar Air Force and Navy aircraft (for example, F-4, A-7, etc.) compare? These comparisons should consider at least the following measures of utilization rates:

  --Hours per month per unit equipment aircraft.

  --Hours per month per total number of aircraft of that type in the inventory.

  --Hours per month per crew.

--What are the implications of different utilization rates and different aircraft status reporting criteria?

--What is the Navy's support for the 621 aircraft on maintenance extension at the end of fiscal year 1976?

--What is the Navy's projection of aircraft on maintenance extension for the end of fiscal year 1977, and how is this supported?

--What are the current not operationally ready due to supply (NORS) and not operationally ready due to maintenance (NORM) rates being experienced by the Navy?

--How do these rates compare with those of the Air Force, and to what extent are any differences attributable to reporting criteria? Why are the criteria different? Is DOD planning to standardize the criteria? If not, why not?

--In connection with DOD's OR criteria, how and why do the Air Force and Navy criteria for aircraft in "reportable" and "nonreportable" status differ? Please provide comparisons for all Air Force/Navy similar aircraft (for example, F-4, A-7, and helicopters).

SCOPE OF REVIEW

We made our review at the DOD offices responsible for aircraft maintenance and readiness reporting policy and at various Departments of the Navy and the Air Force headquarters and field activities involved in the aircraft budget, operations, and maintenance. The specific activities are:

--Office of the Assistant Secretary of Defense for Installations and Logistics, Washington, D.C.

--Office of the Chief of Naval Operations, Washington, D.C.

--Deputy Chief of Naval Operations (Air Warfare), Washington, D.C.

--Naval Material Command, Headquarters, Washington, D.C.

--Naval Air Systems Command, Headquarters, Washington, D.C.

--Naval Air Systems Command Representative, Atlantic, Norfolk, Va.

--Air Force Deputy Chief of Staff for Systems and Logistics, Washington, D.C.

--Headquarters, Tactical Air Command, Hampton, Va.

--Navy Aviation Supply Office (ASO), Philadelphia, Pa.

--Oceana Naval Air Station, Virginia Beach, Va.

Our report contains figures obtained from various Navy and Air Force automated data processing reporting systems. These systems are a large, complex, integral part of the services' operations and we did not evaluate the reliability of the data coming from them.

CHAPTER 2

DIFFERENCES BETWEEN AIRCRAFT MAINTENANCE PRACTICES AND UTILIZATION RATES AND THE EFFECT ON THE DEPOT BACKLOG

There are differences between the Navy's and Air Force's scheduled maintenance programs and utilization rates for comparable aircraft. Differences in maintenance program factors, such as the frequency at which depot maintenance is desired, greatly affect the maintenance backlog. Also, utilization can affect both maintenance workload and operational readiness rates; however, the direct relationship is not clear.

The Senate Appropriations Committee's questions about the services' maintenance programs and utilization of aircraft were:

--Are there any differences in maintenance criteria between similar aircraft (such as the F-4 and A-7) in the Air Force and the Navy? Why are the criteria different? Is DOD planning to standardize the criteria? If not, why not?

--How do utilization rates of similar Air Force and Navy aircraft (for example, F-4, A-7, etc.) compare? These comparisons should consider at least the following measures of utilization rates:

  --Hours per month per unit equipment aircraft.

  --Hours per month per total number of aircraft of that type in the inventory.

  --Hours per month per crew.

--What are the implications of different utilization rates and different aircraft status reporting criteria?

We observed differences between the Navy and Air Force maintenance programs that account for the fact that the Navy has a backlog of depot level maintenance and the Air Force does not. For example, the Navy schedules its aircraft for depot level maintenance more frequently than does the Air Force. The Navy schedules its F-4s for depot maintenance every 36 months, compared to the Air Force's interval of 48 months. Further, since 1970 the Navy has not fully funded the depot

level maintenance workload. As a result, there is a backlog of depot work. (See p. 10.)

The Office of the Secretary of Defense is not directly involved in establishing the frequency of depot maintenance. This function is delegated to the services as part of their program of developing and maintaining the equipment they find necessary to fulfill their assigned missions. For example, DOD has recently directed the services to adopt a reliability-centered system 1/ of aircraft maintenance. However, implementation has been left up to the individual services. The DOD aircraft maintenance policy office prefers that the services gain some experience under the new concept before the development of a DOD directive which would be more definitive about what the reliability-centered maintenance programs, goals, and expectations are to be.

There was little difference between the Navy and Air Force hours flown per month on the F-4 aircraft when we considered the entire inventory of aircraft. However, the Navy's A-7Es were flown more than the Air Force's A-7Ds. Moreover, when we considered only aircraft assigned to combat units, both models of Navy aircraft were flown considerably more than the comparable Air Force models. (See p. 14.)

Other variables relating to flying also affect readiness ratings and maintenance:

--Sortie length changes the average number of takeoffs and landings per hour, which affects maintenance.

--Level flying does not use as much of the onboard equipment as complex maneuvers do.

--Pilot experience can cause differences in maintenance needs.

Exactly what effect the different utilization rates have on maintenance and readiness is not completely understood. The

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1/The reliability-centered maintenance concept limits maintenance to that which is meaningful to safety, reliability, and economics. By analysis and data surveillance, unnecessary organizational and depot maintenance tasks are eliminated, thus reducing costs and improving safety by minimizing human error or part failure. It is believed this concept will increase the interval between aircraft depot visits and decrease the time aircraft are in the depot.

Navy is making a study to determine the cause and effect relationships so it can better manage its aircraft inventory.

MAINTENANCE PRACTICES

The objective of DOD's aircraft maintenance programs is to sustain enough operating aircraft to meet mission requirements. Both the Navy and Air Force inspect, service, repair, and, when necessary, modify aircraft at predetermined intervals. Such maintenance is termed "scheduled" and contrasts with the unscheduled maintenance done on an as-needed basis, as in the case of crash damage repairs.

Maintenance is also categorized as organizational, intermediate, or depot, depending upon the level at which it is done.

--Organizational maintenance is done by the operating squadron on a day-to-day basis to support its own operations. This includes servicing, preflight and postflight inspections, periodic inspections, and repairs or adjustments not requiring shop facilities.

--Intermediate maintenance is generally not scheduled on a periodic basis and is done only when repair is beyond the capability or capacity of the local or squadron level commands. The air stations or ships (in the Navy) will generally supply the necessary shop facilities.

--Depot maintenance involves major rework and supports lower level activities by providing technical assistance and doing maintenance beyond their capability. It is done mainly at industrial-type facilities and sometimes by depot field teams.

Differences in maintenance criteria must be considered in terms of the level at which the maintenance is done and the impact on the backlog and OR rates. We observed that organizational and intermediate maintenance practices affect day-to-day availability of aircraft, thereby affecting OR rates. (See p. 7.) Depot level maintenance practices (see p. 8) directly relate to the size of the backlog. Key issues include

--length of the intervals between overhauls (see p. 9),

--practices relating to extending aircraft beyond intervals (see p. 11), and

--time required to do depot work (see p. 12).

We realize that many other factors could contribute to the backlog, but our work concentrated on areas of specific interest to the Senate Committee on Appropriations.

Organizational maintenance

In addition to normal servicing and flight checks, scheduled maintenance below the depot level involves periodic inspections. These inspections result in many tasks that can be done either all at one time or in segments. The intervals between inspections can be based on either calendar time or flight time.

The aircraft assigned to the operating squadrons are counted in the OR reporting systems, and for each hour they are undergoing maintenance at the organizational level, they are categorized as not operationally ready due to maintenance. Maintenance practices at this level can therefore affect the OR/NORM rates but have a less direct effect on the depot level backlog.

In a 1970 report, 1/ we observed that the Navy scheduled below-depot maintenance on the basis of calendar time and had a policy of doing all the maintenance at one time. We concluded that these practices were causing Navy aircraft to remain out of commission longer than necessary and, as a result, were reducing the number of available aircraft.

Since that report, the Navy has followed our recommendation by adopting the Air Force practices of scheduling below-depot maintenance on the basis of flight hours and using the phased concept. The phased concept involves dividing periodic inspections into segments that can be done during periods when the aircraft are not scheduled to fly, thereby reducing the time they are unavailable for day-to-day operations.

The Navy's A-7E and the Air Force's A-7D are similar aircraft and both are maintained under the phased concept. The Navy schedules inspections every 75 flying hours, and

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1/"Potential For Savings in Aircraft Maintenance" (B-152600, May 7, 1970).

six inspections constitute a complete 450-hour cycle. The Air Force makes its A7-D inspections every 100 hours, and three inspections constitute a complete 300-hour cycle. At the end of a cycle, the periodic inspections are repeated.

The Navy also uses the phased concept for its F-4J. This includes inspections every 60 flying hours, with six inspections constituting a complete 360-hour cycle. The Navy is considering changing to a six-inspection, 480-hour cycle, with inspections every 80 hours.

Most Air Force aircraft are maintained under the phased concept, but the F-4E, which is similar to the Navy F-4J, is an exception. At the time of our review, the Air Force F-4E was being converted from the phased concept to periodic inspections. Under the phased concept, the Air Force inspected the F-4Es after 100 flying hours, with six such inspections constituting a 600-hour cycle. Under the periodic inspection concept, the F-4E will be given an extensive inspection of the entire aircraft after 600 flying hours.

The effectiveness of maintenance practices at the organizational level affect the services' NORM rates. The two services' NORM rates for fiscal years 1972-76 were about equal at 20 to 25 percent. (See p. 40.) The implications of this data are that the services' organizational and intermediate maintenance practices are having about the same impact on the materiel readiness rates.

Depot maintenance

Both the Navy and the Air Force have scheduled maintenance programs that require aircraft to undergo depot rework at certain intervals throughout their operating lives. When aircraft are not brought into a depot at the end of an operating interval, they are said to be on extension and become part of the maintenance backlog. Almost all Navy aircraft are subject to this requirement. However, more than half of the Air Force inventory does not have set intervals for depot level maintenance. Moreover, Air Force intervals between depot visits have generally been longer than those for comparable Navy aircraft.

The term "depot maintenance backlog" applies to (1) aircraft that need depot maintenance regardless of time interval and (2) those that exceed the time interval. The latter are aircraft that have been extended in service beyond the end of their normal depot maintenance interval because an inspection revealed that they do not require depot level work

to continue operating safely and reliably. The Navy's end of fiscal year 1976 backlog includes aircraft in both categories. (See ch. 3.)

In contrast to aircraft undergoing organizational maintenance, those on depot maintenance have a less direct effect on operational readiness because they are extra aircraft purchased to fill the maintenance pipeline while most of the aircraft inventory is assigned to operating units. The condition of only the latter aircraft is judged and reported in the OR reporting system. The differences in the number of aircraft the services report in their depot maintenance backlogs are influenced by such factors as

--the established time interval between depot maintenance,

--the services' policies for deferring scheduled depot maintenance, and

--the time required for depot rework.

Establishing the interval between depot level maintenance visits

Before a new model of aircraft enters the Navy's inventory, it is assigned an interval based on the manufacturer's recommendation that slowly, if ever, changes. A 1974 report 1/ by the Center for Naval Analyses pointed out that the manufacturers' recommendations are usually based on the intervals assigned to similar models, not on sound engineering data related to the new aircraft. After the new aircraft is accepted from the manufacturer, the Navy's Analytical Rework Program is supposed to recommend changes in the intervals. However, until 1974 few changes occurred as a result of the program. The Center's report concluded:

> "The interval policy chosen by the Navy has been relatively arbitrary and rather static; that is, (depot) interval has been chosen soon after aircraft design with very little data base and then slowly, if ever, changed."

The chronology of events pertaining to revision of the F-4 maintenance interval shown in appendix III demonstrates how

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1/"Aircraft Periodic Depot Level Maintenance Study" (November 1974).

long the Navy takes to decide whether to extend the interval of an aircraft.

In contrast, Air Force planes are not assigned a depot interval when they first enter the inventory. Instead, they are initially maintained under the Analytical Condition Inspection program to determine whether periodic rework will be required and, if so, how often. If an interval is assigned, the Air Force monitors its appropriateness through its Controlled Interval Extension program. Under this program, a selected sample of aircraft are extended in service beyond their normal interval to determine whether their depot intervals can be changed.

It should be pointed out that depot intervals are usually based on months in service, not on flight-hours or any other indicator of use. Consequently, aircraft become part of the backlog when they have been in service for a given number of months, even though their condition is judged satisfactory to continue operating. Various studies have indicated that maintenance requirements based on calendar time are somewhat arbitrary and, therefore, do not accurately reflect true requirements. For example, a Navy depot recently reported that A-6 aircraft it had reworked

> "* * * ranged from aircraft with less time than two years service since last depot rework which are very badly degraded, to aircraft with over five years of service which had no major or critical defects requiring depot attention."

This example demonstrates that months in service is not by itself a valid basis for determining when aircraft need depot maintenance. In 1976 the Navy increased from 17 to 33 the number of aircraft models that have a depot interval stated in terms of both months in service and flying hours.

We reviewed the services' depot intervals for two comparable models, the Navy's F-4J and A-7E and the Air Force's F-4E and A-7D. In the case of the F-4s, the Navy had a scheduled depot interval of 36 months or 960 flight hours, compared to the Air Force's interval of 48 months. At the time of the November 1974 Center for Naval Analyses report, the difference between the services' intervals had been even greater: 30 months for the Navy versus 48 months for the Air Force.

In the case of the A-7s, the Navy was scheduling depot maintenance every 30 months in 1974 and later increased the interval to 36 months at the time of our review. The Air Force did not have a set interval for periodic depot visits for its A-7s.

The Navy contends that the effects of operating off aircraft carriers--more structural stress and saltwater corrosion--require that its planes receive more maintenance than comparable Air Force planes. The scope of this review did not permit us to assess the effects of the Navy and Air Force operating environments, but the Center's report casts doubt on the validity of the Navy's position. The report noted that the stresses of carrier landings and takeoffs and the corrosive effect of saltwater are quantifiable from an engineering standpoint and that Navy aircraft are therefore built stronger and more corrosion resistant than comparable Air Force models. Moreover, the Navy has many non-carrier-based aircraft for which this argument is not valid.

Extension of aircraft beyond depot intervals

Air Force officials have testified before the Senate Committee on Appropriations that the Air Force has actively pursued a policy of (1) lengthening or eliminating scheduled depot intervals and (2) insuring that aircraft are sent to a depot when intervals have elapsed. In contrast, the Navy has tended to extend aircraft beyond their scheduled maintenance times instead of lengthening their intervals. At any given time, as many as 10 percent of the Navy's active operating aircraft may be on a planned extension of their rework interval for various reasons, including unavailability because of deployment aboard a carrier.

The Center for Naval Analyses report concluded that budgetary considerations can influence the Navy to grant extensions instead of officially lengthening its depot intervals. In the first place, the number of aircraft the Navy is authorized to buy depends partially on anticipated depot maintenance requirements which, in turn, are partially based on scheduled rework intervals. Thus, the shorter the intervals, the greater the maintenance requirements and the more aircraft the Navy will be required to maintain in its inventory. Secondly, there is the issue of "hard" versus "soft" budget items. Or, as the Center's report stated:

> "'Hard' items are the ones which get approved and funded. They usually are those which can

be defended by simple arithmetic and are keyed to authorized levels of either personnel or equipment. For example, if one is authorized 1,000 aircraft and is authorized to rework them every two years, and each rework is standardized to a norm of 10,000 man-hours, then the need for funding 500 aircraft reworks per year for 5 million rework man-hours is rather straightforward and 'hard.' If, on the other hand, the Navy budget submission indicates that only some aircraft will require rework and this rework will be over a range of about 3,000 to 8,000 man-hours, this is a 'soft' item that is not easily defended."

Another way that extension policies affect the depot backlog involves exactly when a plane is classified "on extension." The Air Force, for instance, allows its maintenance planners to program aircraft into a depot within 3 months of their scheduled induction date. With this scheduling flexibility, aircraft are not considered to be on extension until they are more than 3 months beyond the end of their normal operating interval. Navy planes, on the other hand, are considered to be on extension the day after their operating interval has ended. Of the more than 800 Navy aircraft on maintenance extension at the end of fiscal year 1976, 339 (about 40 percent) would not have been so classified had the Navy followed the Air Force criteria.

Time required for depot rework

Much of the work to be done during a depot visit is determined through numerous inspections after the aircraft enters the depot and by standard depot work packages the Navy has developed for each model. As a result, the amount of work required varies widely, even among aircraft of the same type, model, and series.

During fiscal years 1975 and 1976, the Navy did scheduled depot maintenance on 107 of its 335 A-7Es. Each rework required an average of about 50 calendar days. During the same period, scheduled depot maintenance was not required for the Air Force's 355 A-7Ds.

Of the Navy's 347 F-4Js, 63 required an average of about 114 calendar days each for scheduled rework in 1975-76. In the same period, 262 of the Air Force's 615 F-4Es were reworked at an average time of 109 calendar days.

The Navy's backlog of aircraft included both F-4 and A-7 aircraft. From the above data, depot turnaround times in the Navy and Air Force maintenance facilities do not appear to be very different.

The services realize that their depot requirements, and thus their backlogs, are affected by these factors. They are adopting maintenance criteria based on reliability analysis, which is expected to reduce the amount of depot level maintenance required.

Under the reliability-centered maintenance concept, only meaningful maintenance tasks are done. By analysis and data surveillance of items in the standard depot work packages, new decisions are being made as to what maintenance work is important for safety and reliability and what past tasks are unnecessary. For example, for the Navy P-3 aircraft, the first model to undergo this analysis, depot tasks are expected to be reduced from 900 to 464. The result would be a reduction of 2,000 labor-hours for each aircraft processed and a reduction of 15 days (from 51 to 36) for the depot work.

COMPARISON OF NAVY AND AIR FORCE UTILIZATION OF F-4 AND A-7 AIRCRAFT

We looked at the number of hours flown per month by the Navy and Air Force F-4 and A-7 aircraft to determine if utilization was affecting the Navy depot level maintenance backlog.

When we considered their entire inventories, we found little difference in the services' utilization of comparable F-4 models. However, the Navy's A-7Es were flown much more than the Air Force's A-7Ds. Moreover, considering only aircraft assigned to combat units, we found that both models of Navy aircraft were flown much more than the comparable Air Force models. This data is summarized in the following table.

Comparison of Navy and Air Force Flying Hours, Fiscal Year 1976

Type of aircraft	Total aircraft	Total flying hours	Flying hours per month per aircraft
Total inventory:			
F-4E (Air Force)	615	148,815	20.2
F-4J (Navy)	347	81,035	19.5
A-7D (Air Force)	355	86,757	20.4
A-7E (Navy)	335	107,693	26.8
Combat units (note a):			
F-4E (Air Force)	390	97,345	20.8
F-4J (Navy)	249	79,822	26.7
A-7D (Air Force)	168	43,393	21.5
A-7E (Navy)	251	106,943	35.5

a/The Air Force has F-4Es and A-7Ds assigned to training squadrons and A-7Ds assigned to Air National Guard units, resulting in a smaller percentage of the total inventory being available to regular combat squadrons. The Navy has no F-4s or A-7s assigned to training units.

It is interesting to note that the Navy F-4J has a 36-month/960-hour depot maintenance interval, which is consistent with the average monthly use of about 26.7 hours. At June 30, 1976, 37 of the 42 F-4Js on extension because the 36-month interval had expired had also exceeded the 960-hour criterion by from 134 to 1,392 hours. As previously discussed, the materiel condition of the aircraft was judged satisfactory to continue operating. This suggests that the current utilization rate supports an interval between depot level maintenance that would be longer than 36 months or 960 hours.

In addition, Navy F-4 and A-7 pilots flew more than their Air Force counterparts during the year. We obtained statistics for the Navy's Atlantic and Pacific commands, which included most of its operating inventory. Navy F-4J pilots in the Atlantic and Pacific commands flew an average of 19.0 and 19.9 hours a month, respectively, during the year. In contrast, Air Force F-4E pilots flew an average of 15.2 hours a month during the year. Navy A-7E pilots assigned to the Atlantic

and Pacific commands flew an average of 24.2 hours and 19.2 hours, respectively, during the year. In the same period, Air Force A-7D pilots were averaging 21.4 flying hours a month.

The number of hours flown per month by both services' F-4 and A-7 pilots are a function of the hours allocated through the flying hours program. As discussed in our recent report, 1/ the services predetermine flying-hour standards or levels of flying for specific types of aircraft. Expressed in numbers of hours or sorties (a single flight that may vary in length), the standards reflect what is deemed necessary to keep aircrews combat ready. Standards are used as a control on the amount of flying done to maintain individual and unit military preparedness. Further, the standards are used to develop the overall flying-hour requirements and related budget request for the services.

In the Navy, the fleet commanders, the primary Navy aircraft users, have determined, through experience, the hour standards for each type of operational aircraft to maintain certain levels of military preparedness. The criterion is primary mission readiness or

> "* * * those hours required to maintain the average flight crew qualified and current to perform the primary mission of the assigned aircraft; to include all-weather/day/night/ carrier operations as appropriate."

The Air Force standards are stated in terms of number of sorties and are therefore event oriented rather than oriented toward a specific number of hours. They are based on the number and the type of events historically necessary to reach a desired capability.

The standards for similar aircraft used by the various services are not readily comparable because of different mission requirements. Also, the Air Force uses sorties as a basis for establishing requirements, while the Navy and Marines use hours. Even using average length for a sortie does not produce directly comparable statistics.

1/"Analysis of the Flying Hour Programs of the Military Services" (LCD-76-423, May 25, 1976).

The services attempt to fly up to the standards and are restrained only by funding levels and other outside constraints, such as fuel availability. The Navy and Air Force generally contend that flying below the standards would reduce military readiness because the standards are based on the amount of flying needed to achieve and sustain a certain level of readiness. However, they do not have systems that precisely measure decreases in military readiness brought about by decreases in flying. Further, as previously pointed out, other factors can reduce readiness.

The concern about pilot flying hours was that significant differences between the services may affect the depot maintenance backlog. We believe pilot flying hours per month is not a good management indicator to use in assessing the Navy's backlog of depot level aircraft maintenance.

The military services generally believed that, as airframe flying hours increase greatly, maintenance requirements also tend to increase and that OR rates are affected. However, other variables also affect the readiness rates and the maintenance workload, making the relationships difficult to quantify. For example:

--Sortie length will change the average number of takeoffs and landings per hour, which in turn affects maintenance.

--Straight and level flying does not use as much of the onboard equipment as complex maneuvers do.

--Pilot experience can cause differences in maintenance needs.

However, exactly what effect different utilization rates have on maintenance and readiness is not known. The Navy is attempting to quantify this relationship. The Navy realizes that utilization is one of the primary variables affecting maintenance requirements and that a clearer picture of its effects would help in managing the maintenance program and improving the OR ratings.

CONCLUSIONS

Differences exist between organizational aircraft maintenance in the Navy and the Air Force. Generally, we observed from our limited review that the services use the same phased concept of maintaining aircraft at the organizational level. However, the Navy inspects its aircraft more

frequently. Despite this the NORM rates for the two services have been about equal at 20 to 25 percent.

Further, the Navy appears to be flying about 90 percent of its scheduled sorties. We therefore conclude that the services' organizational maintenance practices, while slightly different, have about the same impact on the materiel readiness rates and therefore are not the major reason for the difference in the services' OR rates.

Differences in depot maintenance practices which could influence the airframe backlog include (1) length of the interval between overhauls, (2) practices relating to extending aircraft beyond the intervals, and (3) time required to do the depot work.

Concerning the third item, we found the Navy and Air Force depot turnaround times for the F-4 aircraft were about equal at an average of 114 and 109 calendar days, respectively. We concluded, therefore, that turnaround time was not a major reason for F-4 aircraft being in the Navy's backlog of airframes.

Factors which currently influence the size of the Navy's backlog of airframes are the time interval between overhauls and the policy of extending aircraft beyond the depot intervals. Essentially, the Navy schedules its airframes for depot maintenance more often than the Air Force does. Further, the Navy has been cautious about changing the frequency of the depot maintenance intervals. The Navy also follows a strict practice of listing its aircraft in the maintenance backlog the day after the end of the maintenance interval. In contrast, the Air Force allows its managers a 3-month grace period before requiring that a airframe be reported in a backlog status. If the Navy had followed the Air Force criteria, 339 (about 40 percent) of the more than 800 Navy aircraft on maintenance extension would not have been classified in the depot backlog.

As an aircraft is used more, the military services generally believed that the maintenance requirements would also tend to increase and that OR rates would be affected. Considering the entire inventory of F-4 aircraft in the Navy and Air Force, we found little difference in the hours flown per month in fiscal year 1976. However, the Navy's A-7Es were flown a lot more than the Air Force's A-7Ds. In addition, considering only aircraft assigned to combat units, we found that the Navy F-4 and A-7 aircraft were

flown more hours per month than the comparable Air Force models.

Exactly what impact different utilization rates have on maintenance and readiness is not known. The Navy is attempting to quantify this relationship, but in doing so, it also must sort out the impact of sortie length, pilot experience, and various types of strenuous maneuvers.

CHAPTER 3

ANALYSIS OF THE NAVY'S BACKLOG OF DEPOT LEVEL AIRCRAFT MAINTENANCE

In reporting on its fiscal year 1976 budget, the Navy indicated a need for $637.5 million to do standard depot level maintenance on 1,473 aircraft. The Navy also reported an unfunded requirement of $121.8 million. Included in this was $47 million reported to be needed to do depot level maintenance on an estimated additional 825 aircraft that would have surpassed their maintenance due date by June 30, 1976.

The questions the Senate Committee on Appropriations asked about this backlog were:

--What is the Navy's support for the 825 aircraft on maintenance extension at the end of fiscal year 1976?

--What is the Navy's projection of aircraft on maintenance extension for the end of fiscal year 1977, and how is this supported?

Based on the following observations, we conclude the airframe backlog requirement is not a current priority item.

--Only $47 million of the $121 million requirement is for airframe maintenance, and $41 million is for the repair of components. (See p. 20.)

--About 540 of the aircraft are scheduled for storage or loan or are not currently available and were not expected to be repaired in the next year. (See pp. 23.)

--On June 30, 1976, the aircraft on maintenance extension were flying and performing their missions and the operational readiness rates approximated the rates of the Navy aircraft not yet due for depot maintenance. (See p. 24.)

--Variations between the Navy and Air Force in setting the point at which depot maintenance becomes overdue and in reporting maintenance extensions can greatly affect the reported backlog figures. (See p. 25.)

--The Navy is introducing a new reliability-centered system of aircraft maintenance which is expect to

reduce this reported backlog of aircraft maintenance to a minimum. (See p. 25.)

--As of June 30, 1976, the Navy had enough operating aircraft to meet its operational needs. (See p. 24.)

--The Navy indicated that any additional funds received would first be applied to the component repair requirement. The airframe depot maintenance was given a low priority. (See p. 24.)

To restrict budget presentations to a reasonable length, the data presented often does not go into much detail. This was the case with the Navy's unfunded aircraft maintenance workload. Analysis of the $121.8 million requirement revealed the following breakdown.

Estimated Navy Aircraft Depot Level Backlog of Maintenance Work as of June 1976

Program	Backlog
	(millions)
Engineering support	$ 26.8
Engines	6.4
Airframes	47.3
Components	41.3
Total	$121.8

ENGINEERING SUPPORT

This portion of the program is for such items as engineering support, emergency repair, aircraft preservation, and field modification teams. Each year this requirement is computed based on the level of effort desired. Previous backlogs, such as the fiscal year 1976 deficit of $26.8 million, are generally not carried forward as they are in the airframes and component area. Each new year's requirements are built on current needs.

In fact, the fiscal year 1977 constrained budget was less than the computed requirement, resulting in a deficit of $19.9 million. However, staff to eliminate this

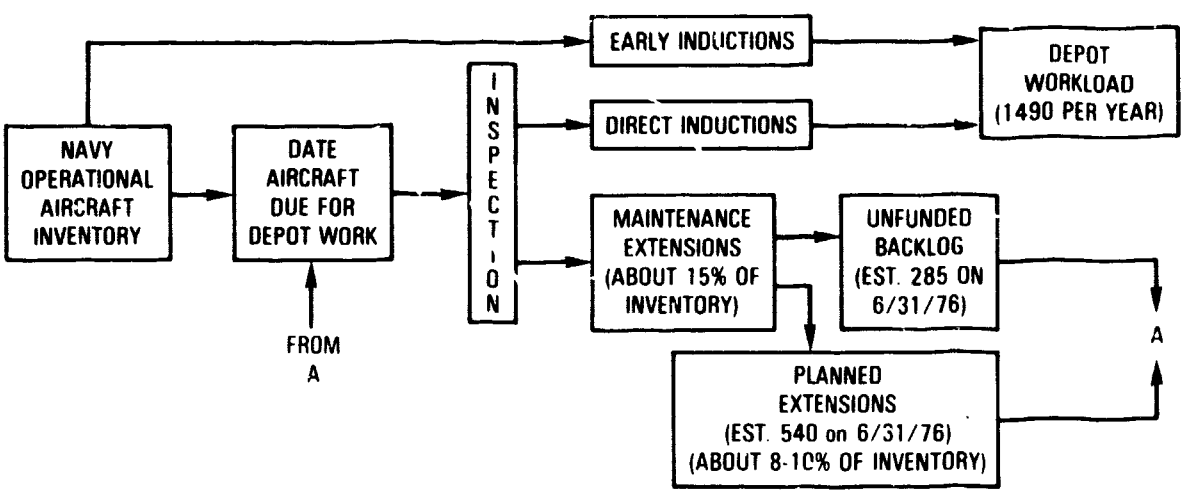
deficit was not available, and therefore the $19.9 million was not included as part of the fiscal year 1977 request.

ENGINES

Engine work is considered a high-priority area. The fiscal year 1977 Navy budget projected a fiscal year 1976 engine depot maintenance backlog carryover of $6.4 million. However, the 1977 budget did not fund this deficit. This is the result of management action to redefine the requirements determination. Considering such factors as the weapon system and mission, the Navy has determined that overall engine requirements could be reduced and not adversely affect the OR rates. Thus, this portion of the $121.8 million backlog for fiscal year 1976 is not significant, since it does not carry over to fiscal year 1977.

AIRFRAMES

Three times a year the Chief of Naval Operations forecasts the number of aircraft (referred to as airframes) that will need standard depot level maintenance. These estimates are made at times to coincide with the preparation of the Navy's operation and maintenance budgets. The following diagram shows the flow through various decision points and classifications the Navy uses in managing its inventory.



Before 1970 the Navy had been able to do depot maintenance work as the need arose. However, budget constraints

after 1970 forced the Navy to use aircraft beyond the date they were due for depot maintenance. This is the unfunded backlog shown on the above diagram.

Planned extensions not requiring immediate funding

The actual number of aircraft on maintenance extension that need depot maintenance is smaller than the 825 aircraft reported as requiring, but not receiving, depot level maintenance. In separating the maintenance extension requirement, which is based solely on the fact that a certain number of months has expired, from the aircraft that actually need depot work, one must keep in mind that not all aircraft on maintenance extensions are considered by the Navy to be an unfunded requirement. Some of these aircraft will not be reworked, and funding is not a limiting factor. Many are reaching the end of their useful life and are scheduled for retirement. Placing these aircraft on maintenance extension extends the useful life, but since no rework is anticipated, no funds are needed for this purpose.

Other aircraft falling into a planned extension category are research and development aircraft with low flying hours and aircraft not available because of operational commitments. The Navy will include many of the latter in later requirements determinations. Planned extensions usually amount to 8 to 10 percent of the active operational inventory.

As the Navy budgeting cycle progresses, estimates are updated to reflect current planning factors. The end of fiscal year 1976 projected aircraft extensions, the actual status of reported backlog at June 30, 1976, and preliminary projections for the end of fiscal year 1977 are shown on the following page.

The Navy Aircraft Depot Level Maintenance Backlog

	Number of units on maintenance extension		
	End of FY 1976 (projected)	End of FY 1976 (actual)	End of FY 1977 (projected)(note a)
Planned extensions	540	483	376
Unfunded extensions	285	274	381
Total	825	757	757

a/In prior years these figures included the number of aircraft that were beyond their depot maintenance due date and scheduled for retirement. Due to a change in accounting for planes, the end of FY 1977 planned and unfunded extension figures do not include aircraft to be retired.

The estimated cost to rework the 285 aircraft in the unfunded extension line of the projected end of fiscal year 1976 figures was $47.3 million. Based on the estimated staff-hours required to rework a certain class of aircraft, the Navy assigned an average unit cost to each class to make these calculations. (See app. I.)

The question that remains is how urgent is the need for the funds to rework the 285 aircraft in the unfunded extension category. Answering this question involves considering many factors, such as

--the current operating condition of the aircraft,

--the priority for accomplishing the maintenance,

--the requirement for aircraft,

--differences between the Navy and Air Force starting dates in reporting aircraft on maintenance extension,

--the validity of the Navy's interval between performance of the standard depot level work, and

--the impact of the Navy's new reliability-centered maintenance concept.

Current operating condition of the aircraft

In terms of capability to fly, the materiel operating condition of the aircraft on maintenance extension was equal to the condition of the rest of the Navy aircraft inventory. On June 30, 1976, the actual 757 aircraft on extension (see p. 23 for difference from 825) were assigned to operating units, were flying, and were performing their assigned missions. They did not appear to be less capable than other aircraft in the inventory. The OR rate of the aircraft on extension was equal to the rate of the other aircraft. In addition, no significant difference in the NORS or NORM rates was found. This is understandable, since it is the Navy's practice to inspect all aircraft at the period end date. Aircraft in the poorest condition are sent to the depots, and only aircraft capable of meeting their mission are placed on extension. The 274 actual aircraft in the unfunded maintenance category are as operationally ready as the rest of the fleet. When they are not capable of performing their mission, they will be brought into the depot.

Airframe maintenance priority

In establishing priorities for eliminating the maintenance backlog addressed in this report, Navy officials told us that the first priority would be for depot level repair of components, not airframes. The officials reasoned that repair of components would have a direct effect on improving the Navy's aircraft OR rate.

Operational need for aircraft

The Navy, as of June 1976, had a need projected to the end of fiscal year 1977 for about 4,986 aircraft to meet its program requirements. At the end of fiscal year 1976, the Navy had on hand 6,618 aircraft, of which 4,931 were in operating condition, 821 were undergoing depot repair, 610 were in storage with service life remaining, 241 were administratively grounded, and 15 were being shipped from the manufacturer.

Since fiscal year 1975 the depots have been repairing about 1,490 aircraft yearly. Our December 23, 1975, report 1/ on Navy aircraft overhaul depots concluded that the Navy's peacetime use of its six aeronautical depots was

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1/"Navy Aircraft Overhaul Depots Could Be More Productive" (LCD-75-432, Dec. 23, 1975).

far below capacity. It was projected that the peacetime workload through 1980 would remain at about the 1974 workload level, and existing capacity at that time exceeded projected mobilization needs.

At all times, a limited number of aircraft are awaiting depot repair. These aircraft are not capable of meeting their missions. Most of these are aircraft requiring extensive unscheduled repairs, often because of crash damage. Some are scheduled for repairs that cannot be made because of the unavailability of long leadtime parts. These aircraft have been placed in an inactive status until a decision is made to bring them into the depot. During fiscal year 1976 an average of about 98 aircraft were in this status at any time. Since there are sufficient aircraft available to meet the Navy's operational needs, these aircraft are not considered to be a current priority requirement for repair. When these aircraft are needed, they will be included in the depot requirements determination along with the other aircraft reaching the end of their operating cycle.

The above data indicates that enough aircraft are on hand and being made available by the depots to meet Navy needs.

Navy maintenance extension starting dates differ from the Air Force

Most Navy aircraft are put on at least one maintenance extension at some time in their life cycle. The Navy's practice is to list its aircraft on maintenance extension immediately after the due date for depot maintenance. This practice is rigidly applied. For Air Force aircraft that still have a period end date, a 3-month grace period is allowed before the aircraft is considered on maintenance extension. If the Navy used this approach, an aircraft on its first extension would not appear as being on maintenance extension and thus not show up as a maintenance requirement. About 40 percent of the extended Navy aircraft are on their first 3-month extension.

Impact of reliability-centered maintenance

The Navy has recognized the potential for a change in the maintenance criteria which would cut this backlog and funding requirement. The Navy and other services are adopting a maintenance philosophy called reliability-centered maintenance currently used by the commercial

airlines. By analysis and surveillance of maintenance data concerning components, unnecessary repair tasks will be eliminated. This maintenance concept has the potential for reducing scheduled maintenance by 40 percent and maintenance costs by 20 percent. This potential is discussed in more detail in a recent GAO report. 1/

In its initial stage of implementation, this new maintenance approach will tend to lengthen the average time between depot level maintenance; eventually, it will remove many aircraft and components from a fixed cycle. Under this philosophy, much of the current unfunded work would not be a requirement. One objective of the new philosophy is to reflect the true maintenance requirement. However, this approach will not be fully implemented for some time.

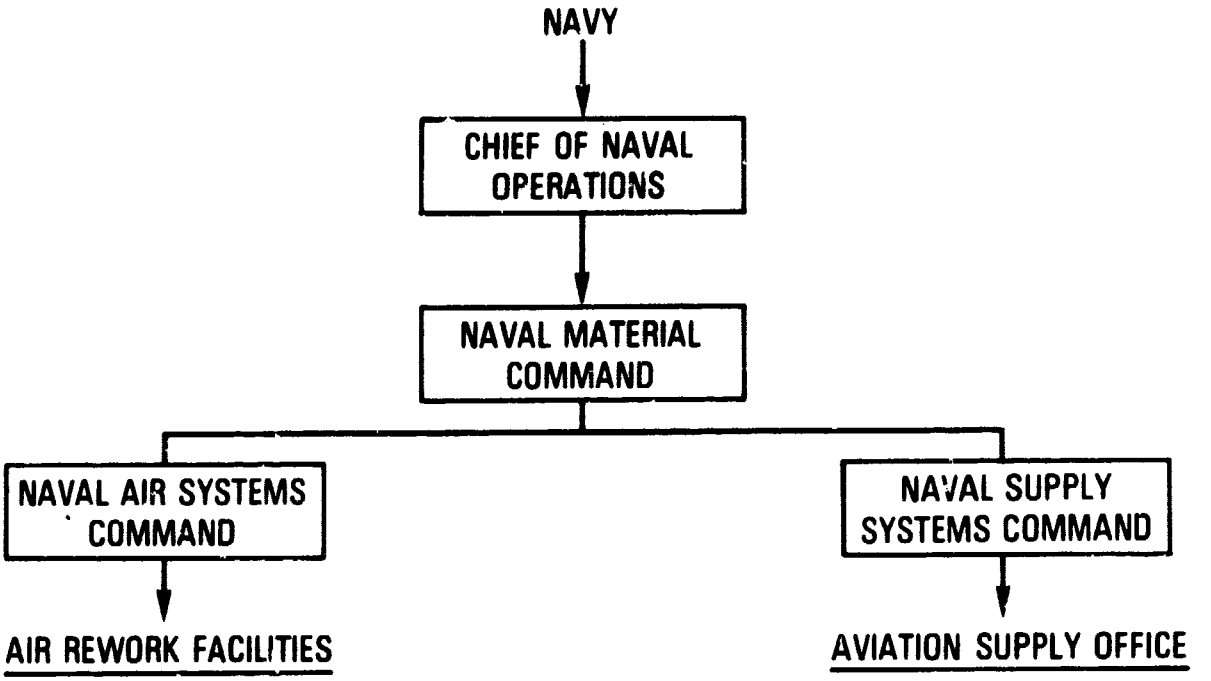
COMPONENTS

The estimated component backlog of $41.3 million is the difference between the fiscal year 1976 requirement of $311.3 million and the constrained budget limit of $270 million imposed by the Navy on this program. The actual end of fiscal year 1976 requirement was $39.4 million, and the latest projected end of fiscal year 1977 component backlog was valued at $53.9 million.

Computation of the requirement

The determination of requirements for depot level repair of components is based, item by item, on historical and anticipated demand. The requirements are derived from such factors as past demands, the flying hour program, stock level objectives, and projected leadtimes. The Navy organizations involved are shown in the following chart.

1/"Management Action Needed in the Department of Defense to Realize Benefits From a New System of Aircraft Maintenance" (LCD-76-443, Nov. 10, 1976).



The component requirements are determined by the Aviation Supply Office, under the Naval Supply Systems Command. This data is used by the Naval Air Systems Command (NAVAIR) in preparing the budget and controlling the funds for aircraft component rework which is done at the air rework facilities.

In preparing the aircraft rework budget, NAVAIR is constrained by dollar limitations for the total aircraft program handed down from DOD and the Chief of Naval Operations. The amount allocated, within the limitations, for each phase of the total depot program (that is, airframes, components, engines, and other engineering support) is based on relative priorities determined by NAVAIR.

Components scheduled for repair

For scheduling purposes, the component requirements are separated by computer into four major priority categories, based on criticality of need by the fleet. Priorities 1 and 2 are to fill NORS and other backordered requisitions, and priorities 3 and 4 are to maintain shelf supply inventories of ready-for-issue components.

In addition to the mechanized system, two manual systems are used for intensified management of certain components. The Navy's High-Burner program is the means of managing selected high-cost high-usage type components. The closed loop aeronautical management program (CLAMP) is a method of managing selected components of priority weapon systems. All the items in the High Burner program and CLAMP are given a high repair priority, as shown in the following chart.

Priorities for Component Rework

Priority 1	CLAMP High Burner NORS requisitions
Priority 2	Backorders, non-NORS
Priority 3	Shelf supply of ready-for-issue components
Priority 4	Safety level supply for ready-for-issue components

Currently, only priorities 1 and 2 are fully funded, and these items should not be included in the backlog. The backlog figure of $41.3 million indicates the need to repair the components for priorities 3 and 4 shelf supply and safety level requirements.

Under this priority system, only the CLAMP and High Burner designated items have a regularly scheduled production run of items being repaired and returned to the supply system. These production runs are geared to providing enough items to meet anticipated NORS or normal repair needs as they occur. All other items are repaired after the need arises but only to meet requirements, such as NORS requisitions and requisitions to support normal repair of equipment. As of December 1976 the Navy's F-4 aircraft had about 1,848 family groups of repairable items. Of these family groups, 62 were managed under the High Burner mode of operation. For the other 1,786 family groups, repairs were made when a requisition was submitted indicating a need.

Management controls

Each quarter the Naval Air Systems Command and the rework facilities negotiate with the Aviation Supply Office on the number of direct labor hours and associated funds to be spent in reworking components for the CLAMP, High Burner, and NORS-backorder requirements. The negotiated hours are then allocated by NAVAIR to the shops that rework the components. Total hours available at the shop level are further broken

down to show hours to be spent each week of the quarter. ASO reports weekly to the rework facilities, identifying components required by priority level.

We have previously identified problems with the Navy's component repair program. In an earlier report 1/ on Navy aircraft overhaul depots, we concluded that because ASO does not control the component rework funds and workload imbalances exist, components not urgently needed in the supply system are sometimes repaired while higher priority components lay elsewhere in backlog.

The Naval Audit Service has also pointed out recently that ASO lacks funding control and is not able to insure compliance with the requirements. They found that the rework facilities tend to take in too many components based on the premise that a certain number of the items will be unworkable for one reason or another. However, if all items turn out to be workable, then they are reworked even though they may exceed the requirements. In addition, no accountability by end item is needed for billing purposes (billings are based on staff-hours expended), and the limited funds are spent on quantities not currently required while other requirements go unfunded.

The Navy argues that batch processing of the components for repairs is the most effective way to operate. If 15 items are inducted to fill a requirement for 14 items and all items are workable, completing the 15th item as part of the production run is economical. Further, the Navy believes that the extra item will be used to meet part of the next quarter's demand. This will allow the Navy to reduce the next quarter's rebuild need by one item.

The Navy's position, when explained in terms of one extra item, appears to be reasonable. However, when this situation occurs often when funds were not available to meet all the Navy's repair needs, then some priority repair work will not be completed on time to meet the need when it arises. We believe that management needs to control this practice to assure proper component support.

1/See note, p. 24.

In our December 1975 report, we cited other problems that inhibited the Navy in effectively using the existing funding. For example, components were routinely removed from aircraft undergoing depot overhaul and reworked simultaneously with the aircraft while high-priority systemwide components are backlogged.

The Navy said at that time that this concurrent rework would not continue under the current maintenance concepts. However, the Naval Audit Service found in 1977 that these components were still being routinely taken in for rework without a determination of supply system availability. Components are inducted for concurrent rework without a determination by ASO that the concurrent rework components are of a higher priority than systemwide requirements that are not being satisfied because of staffing limitations or shop capacity at the facility.

Impact of reliability-centered maintenance on components

We pointed out in our November 1976 report 1/ that, through use of the new maintenance philosophy, savings can also be realized in the cost of components. Analytical maintenance programs extend the life of many components because (1) components previously removed automatically from replacement or rework after a specified period of operation can be used longer and (2) design changes may increase component reliability (data analysis identifies high-failure-rate parts and points out the need to increase their reliability by redesigning them). As a result, part requirements could be adjusted and inventories could be reduced. Investment in spare parts in the Navy is 20 percent of the aircraft costs; the commercial airlines have been able to limit their investment to 10 percent.

MANAGEMENT ACTIONS NEEDED TO IMPROVE OPERATIONAL READINESS

As in the airframe portion of the aircraft rework program, the examples in the previous section illustrate that factors other than increased funding could affect the stated component backlog and that increased funding alone is not the solution to the component backlog problems. More efficient use of existing component funds appears to be at least part of the solution to the backlog of ready-for-issue components.

1/ See note, p. 26.

In our 1974 report 1/ on the Air Force NORS rates, we concluded that there was no predictable relationship between the amount of funds spent on component repair and the NORS rate. We further concluded that a lack of funds to repair exchangeables was not a major cause of NORS and that the effects of the level of component funding on operational readiness could not be measured. The common, recurring logistics problems cited in this report were

--unexpected part failures,

--lengthy order-to-shipment times,

--late repair of parts,

--modification or updating of parts, and

--long contract administration.

We observed similar situations at all levels of the Navy's aircraft component supply system.

The DOD standard for elapsed time between order, shipment, and receipt of high-priority material is 8 days. However, the average response time in January 1977 for over 6,000 Navy priority requisitions, not satisfied from on-station inventories, was 28.4 days for consumable items and 30.5 days for repairable items; the median times were 15 and 19 days, respectively.

Examples of the delays that we observed during different phases of the requisition process were:

--At the squadron level, improperly completed requisition forms caused unnecessary delays in processing the requisition.

--Poor communication between the squadron, supply, and intermediate maintenance caused unnecessary delays in determining the need to pass the requisition on to ASO.

--After the item is declared unrepairable on station, excessive delays occurred in processing the paperwork necessary to send the requisition to ASO.

1/"An Analysis of Air Force Rates of Aircraft Not Operationally Ready Due to Supply" (B-179294, Mar. 29, 1974).

--ASO had excessive administrative leadtime in making a buy for replacement items.

--A 5-day, one-shift workweek can account for several days of delay. For example, requisitions going to ASO are placed in the system once every workday. Requirements generated late Friday or on the weekend are not processed until Monday. Also, ASO acts on requisitions on a one-shift basis. Requisitions received after hours are held until the next regular workday.

--At one naval air station, items shipped to the squadron are not accepted between Friday night and Monday morning.

We also observed ASO taking priority action on NORS requisitions when the NORS condition no longer existed.

--In one case, ASO was not notified that the NORS was satisfied through shipment by another activity.

--In another case, after initiating a NORS requisition, the squadron obtained the part from base supply sources. However, the repairable part was processed under the NORS requisition, creating a false priority at ASO.

Regarding the use of readiness data for budgetary purposes, there is no identifiable direct correlation between funding levels and OR, NORM, or NORS rates. This data measures maintenance and logistic systems performance and is designed as an indicator of areas requiring intensified management action. For example, there is evidence that reduced funding levels may drive NORS rates up; however, there is no evidence that increased funding will drive NORS rates down.

The Navy and Air Force have both had shortages in ready-for-issue stocks, yet the Air Force has maintained a higher OR rate, indicating that shelf stock does not account for all the differences in OR rates. (See ch. 4.)

The Navy, however, considers the component backlog to be a more realistic requirement than the airframe backlog. Navy officials have said that funding to reduce the backlog in priorities 3 and 4 would increase the inventory of ready-for-issue components and therefore offer a potential increase in aircraft OR rates. The Navy is moving in this direction. In fiscal year 1975 $6 million was shifted from

airframe repair to component repair. However, as shown on page 40, the Navy's operational readiness from fiscal year 1975 to fiscal year 1976 decreased 2 percent. Also the fiscal year 1977 budget for Navy aircraft rework included an $84.8 million increase over fiscal year 1976. About $60.2 million of the increase was to repair an estimated 50,000 components and 900 engines.

CONCLUSIONS

The Navy has an airframe backlog while the Air Force does not partly because the services use different criteria in classifying aircraft as being in need of depot maintenance. The Navy's backlog of depot level airframe maintenance does not indicate an urgent need for additional funding. The backlog does not appear to have impeded the Navy's operational readiness. Further, management actions to implement the new reliability-centered maintenance concept and to lengthen the interval between performance of depot level maintenance could greatly change the reported backlog figure.

Where possible, changes should be made to eliminate the differences in the services' methods of classifying airframes as backlogged. The congressional committees who make the budget decisions and assess defense needs would benefit from having the military services' aircraft requirements developed and presented in a similar manner.

The Navy programed additional funds for component repair in fiscal years 1975 and 1977. However, the Navy is still not able to repair all its needed components in a timely manner. Many components are not repaired until a need arises. The Navy maintains that additional funds are needed to reduce the component maintenance backlog and improve the ready-for-issue shelf stock position of the components despite the lack of evidence as to what impact increased funding will have on the Navy's NORS rates.

Because of the continuing management problems in this area, we question whether additional funds should be put into the program until reasonable efforts have been made to correct known deficiencies and a better assessment can be made as to how much funding this program should receive.

Concerning the engines and engineering support backlogs, these items are not a high priority and the Navy has acted to eliminate the requirements.

RECOMMENDATIONS

We recommend that the Secretary of Defense:

--Require the Navy and Air Force to establish common criteria for determining when an aircraft should receive depot level maintenance and require that only aircraft actually in need of depot work be reported as an unfunded backlog requirement.

--Require the Navy to resolve the problems contributing to the lengthy order-to-shipment times.

CHAPTER 4

WHAT IS OPERATIONAL READINESS?

Because the Navy was reporting an unfunded backlog of depot level aircraft maintenance and a declining operational readiness rate, the Senate Committee on Appropriations wanted to determine if there was a cause and effect relationship. Several of the Committee's questions were aimed at clarifying the Navy's and Air Force's OR rates and how the reporting systems work. The questions asked were:

--What are the current not operationally ready due to supply and not operationally ready due to maintenance rates being experienced by the Navy?

--How do these rates compare with those of the Air Force, and to what extent are any differences attributable to reporting criteria? Why are the criteria different? Is DOD planning to standardize the criteria? If not, why not?

--In connection with DOD's OR criteria, how and why do the Air Force's and Navy's criteria for aircraft in "reportable" and "nonreportable" status differ. Please provide comparisons for all Air Force/Navy similar aircraft (for example, F-4, A-7, and helicopters).

During fiscal years 1972-76, the Navy's OR rates averaged about 60 percent and the Air Force's averaged about 70 percent. Each service's reports included its jet fighters, transports, etc., that are located in units which operate the aircraft to achieve their mission. The Navy and Air Force criteria for determining when an aircraft will be reported and when it will be excluded from the OR reporting system are similar. The OR rates reflect the materiel condition of those Navy and Air Force aircraft assigned to operating units. (See p. 37.)

There are differences between the materiel readiness reporting systems of the Navy and Air Force. These differences had been believed great enough to negate the value of comparing some of the services' reported rates. A recent study by the military services, however, found that the differences are not as great as previously believed. Unfortunately, many terms associated with these reporting systems are confusing. In some cases they seem to overlap, while in

others their usage varies between the services. Attempts are being made to standarize the reporting system for aircraft. (See p. 41.)

It was also our observation that the aircraft the Navy was considering to be part of its unfunded depot maintenance backlog were flying and performing their missions as well as other Navy aircraft. Therefore, these aircraft were not lowering the Navy's operational readiness. (See p. 24.)

OR REPORTING SYSTEMS

In the management of Navy and Air Force aircraft, various data is accumulated and used in making management and maintenance decisions. This information is frequently brought into the budget process to demonstrate a program's progress or to explain a problem in order to justify the need for funds. A frequently used indicator is the OR rate. DOD set the objectives for the OR reporting system, but left the implementation up to the individual services.

Readiness rates keep management informed of the operational status of aircraft in the inventory. The Navy and Air Force established the Navy Maintenance and Materiel Management System (3-M) and the Air Force Standard Aerospace Vehicle and Equipment Inventory, Status, and Utilization Reporting System. Under these daily reporting systems, aircraft are classified hourly into one of the following categories.

--Operationally ready--capable of performing at least one of their primary missions.

--Not operationally ready due to maintenance of aircraft.

--Not operationally ready due to supply problems.

Aircraft are assumed to be operationally ready unless reported in one of the not operationally ready categories. In the not ready categories the number of hours the aircraft are in these conditions are reported. Each of the three categories is expressed as a percentage of the total time the aircraft is possessed. When totaled, the categories equal 100 percent of available operational time. For example, on a given day a base assigned a squadron of F-4s might report the operational status of these aircraft as 73 percent operationally ready, 21 percent NORM, and 6 percent NORS. The reporting system averages this data on a daily, weekly, monthly, and yearly basis.

Like the acronyms used in many jobs, the understanding of these categories' true meaning varies widely. Marginal differences among the services make comparison of aircraft status difficult and analysis at least potentially confusing. For example, in the Air Force, the reporting system divides the NORS and NORM figures to show the percent of aircraft grounded (NORS-G/NORM-G) and flyable (NORS-F/NORM-F). It is the NORS-G/NORM-G figures that are comparable to the Navy NORS/NORM figures. Use of more standard criteria, along with a clearer understanding of what the OR system is and is not designed to measure, could help the system become more meaningful than it has been.

What does operational readiness measure?

The objective of the maintenance program is to maintain as many aircraft assigned to operational units as possible in a full systems capability status, ready to perform any mission for which designed.

OR reporting systems measure the materiel condition of aircraft in the physical possession of each operational unit. A safe flyable aircraft that has on board and operable the equipment it needs to perform one of its primary missions is considered by the Navy and Air Force to be operationally ready. Most aircraft are assigned two or three missions.

Aircraft in operating units which are not capable of performing any of their primary missions are reported as not operationally ready. Also reported for management purposes is the problem causing the degradation of readiness.

For example, the reporting systems identify aircraft that cannot perform any of their primary missions because they need organizational or intermediate level maintenance as being in a NORM condition. On the other hand, aircraft that cannot perform any of their primary missions because repair parts or components needed to make the aircraft operational are inoperative or missing are reported in a NORS condition. Only one category can be used to cover a specific interval.

Reportable aircraft

The Navy OR rates reflects the materiel condition of the 4,842 aircraft assigned to operating units of the Regular Navy, the Marine Corps, and their Reserves. The Air Force OR rates cover the 7,681 aircraft of the Regular Air Force, the Reserves, and the Air National Guard. For both services this includes

jet fighters, attack aircraft, patrol planes, trainers, transports, and helicopters. The criteria the services use in determining which aircraft will be considered in computing the readiness rates are similar. Excluded from the OR reporting system figures are Navy and Air Force aircraft undergoing depot maintenance, in storage, or in research and development projects and those which have suffered extensive damage and have not had a decision made on their disposition.

Operational readiness is not combat readiness

The OR rates for equipment are often thought of as indicating the combat readiness of a unit. This is not completely true. The OR reporting system only judges the materiel condition of equipment and gives only an immediate picture of this condition. It does not forecast what the condition will be tomorrow or 5 days from tomorrow.

A unit's combat readiness is measured through a separate system, DOD's force status and identity reporting system. This system indicates the availability of the basic resources required to operate combat units (that is, personnel, training, equipment and supplies on hand, and equipment readiness). In addition to measurements of these resources, the unit commander's judgment of his organization's ability to perform its mission is used to determine combat readiness.

Standards for operational readiness

The DOD guidelines on materiel readiness reporting require the military services to establish minimum standards. The standards represent objectives for operational performance, and large deviations from the standards indicate potential problems.

The Navy has established minimum standards of materiel readiness. These standards differ slightly by model of aircraft and status of the reporting units. Generally the Navy standards are 70 percent operationally ready, 20 percent NORM, and 10 percent NORS.

Instead of setting standards, Air Force headquarters currently emphasizes establishing an orderly flow of maintenance, which it believes will continue to make enough aircraft available to support its mission. Standards are, however, set by some commands. For example, the Tactical Air Command has established OR standards to aid managers

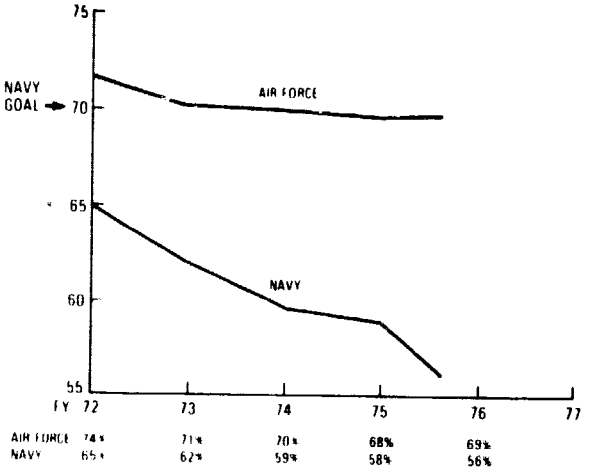
at all levels. These standards, which vary slightly for certain aircraft, generally are 71 percent operationally ready, 24 percent NORM-G, and 5 percent NORS-G.

Current Navy and Air Force OR, NORM, and NORS rates

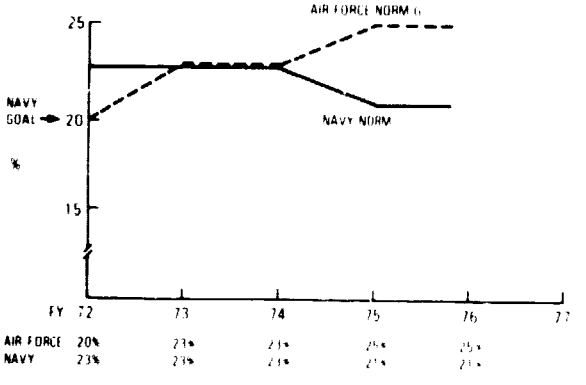
The yearly average worldwide Navy and Air Force OR, NORM, and NORS rates for fiscal years 1972-76 for all types of aircraft are shown in the following tables.

It can be seen that the Navy's average OR rate is much below its goal of 70 percent and below the Air Force rates throughout the period. One factor behind the Navy's declining readiness rate is the NORS area. To counter the rising NORS rate, the Navy has increased its component and engine repair programs by $60 million in fiscal year 1977. No precise measurement method is known to calculate the increase in readiness the additional funds will bring. The Navy, however, is hoping for a 4-percent increase in fiscal year 1977.

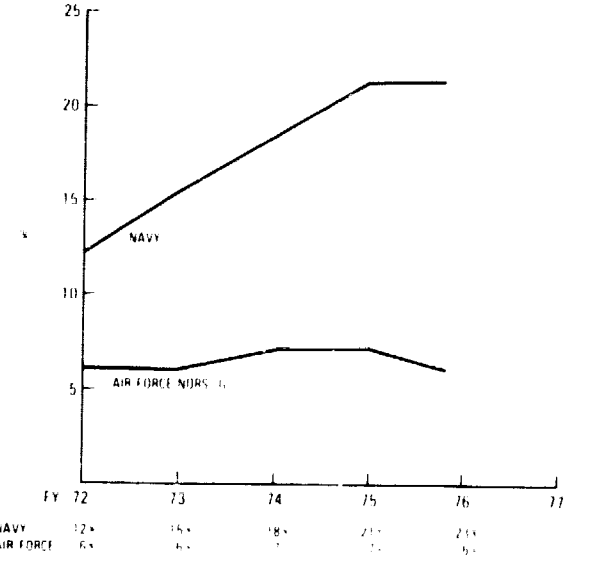
NAVY AND AIR FORCE
AIRCRAFT MATERIAL READINESS
"OR"



NAVY AND AIR FORCE
AIRCRAFT MATERIAL READINESS
NORM RATES



NAVY AND AIR FORCE
AIRCRAFT MATERIAL READINESS
NORS RATES



1/In the Air Force, the reporting system divides the NORS and NORM figures to show the percent of aircraft grounded and flyable.
G--indicates the aircraft is grounded.
F--indicates the aircraft is flyable, but needs maintenance or a part.
Therefore, the Navy NORS and NORM figures are compared to the Air Force NORS-G and NORM-G figures.

Aircraft not included in the OR computation

The OR rates shown for Navy and Air Force aircraft do not indicate the materiel condition of the total aircraft inventory of the services. Generally, about 27 percent of the Navy's total program aircraft inventory and 16 percent of the Air Force's active inventory are in various stages of a major repair cycle, are being modified or updated, are being used in testing or research projects, or are administratively grounded. The materiel condition of these 1,776 Navy aircraft and 1,455 Air Force aircraft is not included in the reporting index discussed in this chapter.

CAN THE SERVICES' OR RATES BE COMPARED?

The DOD guidelines on the materiel readiness reporting system point out that the objective is to measure what OR rating is expected on a sustained basis. This rating represents a target of achieved performance for materiel support activities. Performance below these standards indicates that the logistic support is insufficient or the operational mission the equipment is to perform is in jeopardy.

Both the Navy and Air Force stress that comparisons of their OR/NORS/NORM rates are not valid indicators of which service is doing a better job. Basically, they believe that the OR rates will differ because of (1) differences in the reporting systems accumulating the data and (2) equipment and mission differences. It is logical that these two categories may affect their OR rates, but there is no consensus that they are either the sole or main contributors.

We believe a third category, effectiveness of logistics management, plays a major role in explaining the differences in the readiness rates. That part of the difference in operational readiness attributed to effective logistics management can be compared between services.

Differences in the reporting systems

With regard to that portion of the OR rate affected by differences in the methods used in computing OR rates, the Air Force recently directed a multiservice committee to identify these differences between the services' reporting systems and recommend changes to standardize the systems. The committee concluded that although the services are using varying terms and acronyms leading to confusion in interpreting

results, actual definitions and applications of these terms do not differ much. For example:

I--Primary mission definition. The services do not differ greatly in designating primary missions. Each Navy aircraft type has multiple primary missions, which are defined at Navy headquarters. A mission essential subsystem listing (MESL) is established for each type, model, and series of aircraft. These subsystems are necessary for the aircraft to perform its missions and are the systems judged in formulating the OR rating. Each type of Air Force aircraft may have multiple primary missions which are assigned by the major command, such as the Tactical Air Command. MESLs are established for each aircraft and primary mission.

II--Condition status categories. The capability of the aircraft to meet its primary mission (or one of its primary missions) is indicated by condition status categories. Terms vary between the services, but categories have virtually identical definitions and applications.

Navy Terms

OR (FSC) Full Systems Capable--the aircraft is safe to fly and all subsystems on the MESL are operating.

OR (RMC)--Reduced Materiel Condition--the aircraft if safe to fly and capable of performing at least one of its primary missions but at least one of the MESL subsystems is not operating.

NORM/NORS--the aircraft is not capable of performing at least one of its primary missions because of maintenance/supply problems.

Air Force Terms

OR--the aircraft is safe to fly and all subsystems on the MESL for any of the primary missions are operational.

NORM/NORS-F--the aircraft is safe to fly but at least one of the subsystems required for at least one of the primary missions is inoperative.

NORM/NORS-G--the aircraft is unsafe for flight because of maintenance or supply problems.

III--NORS start time. Navy NORS time starts when the initial demand is placed on the supply system (unless the demand is satisfied within 1 hour), thus prohibiting further maintenance. Air Force NORS time starts when maintenance and supply verify that the parts requirement cannot be satisfied on station and that no further maintenance can be done on the aircraft. A maximum of 4 hours is allowed for verification.

IV--Schedule inspection start time (NORM). When Navy inspection requirements do not require a major disassembly of the aircraft and thus do not affect the aircraft's mission performance, it will remain in an OR status during all of the inspection phase. An aircraft will be considered not mission capable only if panels and equipment removed cannot be replaced in 2 hours. The Air Force places aircraft in NORM status during scheduled inspections at the time of induction.

V--NORS/NORM stop time. The services' terms are the same.

The committee further believes that use of the term "operationally ready" to report the materiel condition of equipment could cause confusion with the readiness statistics used in the force status and identity reporting system. They suggested that a new DOD instruction be prepared for use only by aviation units, with the following terms designed to depict only the materiel condition of aircraft.

Mission capable (MC)	rather than	(OR)
Not mission capable (NMC)	rather than	(NOR)
Not mission capable maintenance (NMCM)	rather than	(NORM)
Not mission capable supply (NMCS)	rather than	(NORS)

The multiservice committee believes that the services have the capability to reconcile differences associated with NORS and NOR start times. The amount of differences caused by the different start times is not quantified. However, the committee suggested that NORS start times begin when a NORS requisition is made above unit level, or 4 hours after the demand is initiated, whichever occurs first, and maintenance work stops as a result. This 4 hours would allow for normal delays in delivery time because of routine administrative procedures and distant locations of the parts bins or warehouses.

The committee also recommended that an aircraft not be considered NORM during an inspection for removal of such parts as cowlings and inspection plates when these parts can be reinstalled and the aircraft made flyable within 2 hours. This 2-hour criterion for disassembly and reassembly of aircraft being inspected more accurately portrays materiel readiness in consonance with such routine maintenance actions as preflight and postflight inspections.

Equipment and mission differences

The Navy and Air Force do have differing mission assignments, resulting in different operating environments and needs for different subsystems on aircraft. The most obvious difference is between the Navy's aircraft carrier operations and the Air Force land-based operations.

The Center for Naval Analyses has studied the differences between the Navy and Air Force missions, operating environments, and equipment used. It concluded that, for an aircraft and its subsystems, the mission and environmental differences are generally quantifiable and taken into account during equipment design. For example, Navy aircraft are designed for carrier operations and are much stronger and more corrosion resistant in many areas than are similar Air Force aircraft. As a result, Navy and Air Force F-4 and A-7 aircraft are slightly different. Although the study did not specifically say so, it would seem reasonable to conclude that taking equipment and mission differences into account in designing aircraft would tend to minimize the effect of such differences on the services' OR rates. The study did conclude that the shipboard environment may ultimately limit the length of time an aircraft can spend on a carrier before it will need depot level maintenance. On the other hand, the study pointed out that there was no indication that to date the limit to the safe extension of the depot maintenance intervals has been reached. Moreover, the Navy has many non-carrier-based aircraft, which are not subject to the shipboard environment.

Management inefficiencies which affect the OR rate

As shown in the tables on page 40, the Navy's OR rate is lower that that of the Air Force. The OR rate is dependent on the NORM and NORS rates. The tables show that the NORM rates of the services are about equal, but that the Navy's NORS rate is higher than that of the Air Force. We

therefore did some work in the Navy's logistic support system for aircraft to determine reasons for the high NORS rate.

Essentially we found that various logistics system problems lowered the Navy's OR rate. For example:

--At the squadron level, improperly completed requisitions caused delays in getting supplies in a timely manner.

--The Aviation Supply Office had excessive administrative leadtime in making a buy for replacement items, which were later not available when needed.

--Premature depot repair of items in excess of the immediate requirement is tying up limited funds so that other priority component repairs are not being made. (See p. 31.)

CONCLUSIONS

During fiscal years 1972-76 the Navy's operational readiness rates averaged about 60 percent and the Air Force's averaged about 70 percent. The Navy's rate is below its goal of 70 percent principally because of logistics system problems it encounters in getting requisitions processed in a timely manner and getting the necessary repairs made on components before they are needed. The aircraft the Navy was considering to be a part of its unfunded maintenance backlog were not lowering the Navy's operational readiness.

There are differences between the materiel readiness reporting systems of the Navy and Air Force. The services believe these differences to be great enough to negate the value of comparisons of their readiness rates. However, a service-directed study found these differences to be not as great as previously believed. We believe that the difference between services' OR rates is affected by management of the logistics system and would be an indicator that one service is supporting its aircraft better than the other. This information should be helpful to both congressional and DOD planners assessing the military services' plans and budgets. Since each service is given the authority and responsibility to plan and organize its resources for both equipment design and subsequent logistics support, the OR rate is an indicator of the overall ranking of the two services' success in maintaining their total aircraft inventory. This ranking could be an important data element in making the costly and far-reaching decisions expected of our military

planners. Further standardization of the service systems and a clearer understanding of what the data represents would help make the system's data and reports more meaningful to all users.

RECOMMENDATION

We recommend that the Secretary of Defense require the Navy and Air Force to eliminate, as much as possible, the differences between their operational readiness reporting systems. Desirable changes would include standardizing the condition status terms and the start times for the NORS and NORM conditions.

AIRCRAFT REWORK AND MAINTENANCE PROGRAM

AIRFRAME BACKLOG (EXTENSIONS)

	Total extensions	FY 1976 planned extensions	Unfunded extensions	Unit cost	Unfunded total cost
VF (Fighter)	132	62	70	$270,057	$18,903,990
VA (Attack)	162	130	32	141,992	4,543,744
VS (Antisubmarine)	13	13	-	-	-
VP (Patrol)	29	13	16	284,783	4,556,528
VW (Warning)	28	12	16	504,046	8,064,736
VR (Transport)	28	23	5	98,818	494,090
VG (In-flight refueler)	1	1	-	-	-
VO (Observation)	6	4	2	55,621	111,242
VU (Utility)	21	17	4	50,557	202,228
VT (Trainer)	187	132	55	60,598	3,332,890
H (Helicopter)	214	133	81	82,015	6,643,215
VK (Drones)	4	-	4	100,341	401,364
Total	825	540	285		$47,254,027

APPENDIX I

APPENDIX II

GAO REPORTS ON RELATED SUBJECTS

1. "Management Action Needed in the Department of Defense to Realize Benefits From a New System of Aircraft Maintenance" (LCD-76-443, Nov. 10, 1976)

   --Aircraft maintenance requirements and cost can be reduced without degrading safe operation.

   --Requirements for spare parts inventories can be reduced.

2. "Navy Aircraft Overhaul Depots Could Be More Productive" (LCD-75-432, Dec. 23, 1975)

   --Aircraft components routinely are removed and reworked simultaneously with aircraft while high-priority systemwide components are backlogged.

   --Opportunities for productivity gains through economic-lot batch processing are lost.

   --Because of scheduling and production problems, scarce resources are consumed on components which cannot be repaired.

   --Components are retained in production shops longer than necessary, causing lengthy turnaround time and scheduling and shop backlog problems.

3. "An Analysis of Air Force Rates of Aircraft Not Operationally Ready Due to Supply" (B-179264, Mar. 29, 1974)

   --Lack of funds not primary cause of NORS.

   --Major NORS causes include unexpected part failure, late repair of parts, and modification of parts.

   --No direct correlation exists between funds to repair spares and NORS rates.

4. "Potential for Savings in Aircraft Maintenance" (B-152600, May 7, 1970)

   --The Navy could save money by adopting the Air Force practice of using flight hours, rather than elapsed days, as a basis for performing organizational inspections and maintenance.

--The Navy does the entire scheduled maintenance at one time, whereas the Air Force does the maintenance on a cycle or phased basis that can be accomplished between periods of use to reduce downtime.

5. "Analysis of the Flying-Hour Programs of the Military Services" (LCD-76-427, May 25, 1976)

--Flying-hour standards are not comparable between services.

--The services do not have systems to measure decreases in readiness caused by decreases in flying.

APPENDIX III

CHRONOLOGY OF EVENTS

PERTAINING TO REVISION OF

F-4 AIRCRAFT MAINTENANCE INTERVALS

January 1961	F-4 depot maintenance interval set at 15 months.
November 1963	Navy officials concluded that extension of F-4 service tours from 15 to 20 months was feasible.
March 1964	McDonnell Aircraft Corporation (now McDonnell Douglas Corporation) recommended tour extension from 15 to 24 months.
April 1964	The Navy reviewed McDonnell's recommendation and suggested that a conference be held to consider adopting the 24-month tour period.
May 1964	NAVAIR requested comments and recommendations from various Navy organizations on the proposed 24-month interval.
June 1964	The Cherry Point, North Carolina, facility recommended a 24-month tour period provided that the aircraft operator would have the option of requesting earlier depot maintenance for aircraft in poor condition.
June 1964	The North Island, California, facility recommended a tour period of 21 months based on condition of aircraft processed in the F-4 program up to that time.
June 1964	NAVAIR's Pacific representative recommended a 21-month tour period based, in part, on the following factors: (1) usage required stringent corrosion control and (2) the deployment cycle of the F-4 aircraft was estimated at 21 months.

August 1964	Maintenance conference discussion by all attendees, except the Commander, Naval Air Force, U.S. Atlantic Fleet representative, indicated that, based on the materiel condition of aircraft arriving for maintenance, an increase in the tour period from 15 to 21 months was justified providing that the calendar inspection requirements were realigned, particularly in the area of corrosion detection.
October 1964	The Commander of the Atlantic Fleet advised NAVAIR that recent depot findings of cracked and fatigued structural members did not seem to warrant the extension of the F-4 tour period.
December 1964	In a message to NAVAIR, the Chief of Naval Operations stated that, based in part on the recommendation of the Atlantic Fleet Commander in October 1964, the 15-month tour period would continue. At the same time, the Chief recommended that the tour period be reviewed at a January 1965 maintenance conference.
May 1966	Maintenance conference was held and the North Island and Cherry Point facilities were assigned responsibility for evaluating the feasibility of extending the tour period to 24 months before the next type commander meeting. A North Island engineering division head told us that North Island made no study in response to this assignment; however, he could not recall specifically why the study was not made.
July 1966	McDonnell Aircraft Corporation reiterated its March 1964 recommendation that the tour period be increased to 24 months.
March 1967	At a maintenance review conference, McDonnell Aircraft Corporation presented two alternate tour period extension proposals--one to 18 months, the other to 20 months. The conferees recommended that the extension to 20 months be deferred pending a materiel condition analysis of F-4B aircraft operating under an interim 20-month tour period criterion implemented the same month.

APPENDIX III

August 1967	North Island recommended that the tour period be permanently extended to 20 months on the basis of a materiel condition analysis.
December 1967	Cherry Point recommended that the tour period be established at 20 months. It recommended also that the feasibility of further extensions be studied.
April 1968	The tour period was permanently extended to 20 months.
March 1969	Air Force study stated that a 36 to 40 maintenance cycle for F-4 is warranted.
April 1970	F-4B and F-4J interval extended to 24 months.
September 1971	Interim Navy study recommended retaining 24-month interval for F-4B and going to 30-month interval for F-4J.
September 1972	F-4J interval extended to 30 months (directed by the Office of the Secretary of Defense) F-4B, F-4G, F-4N, RF-4B interval maintained at 24 months.
January 1973	F-4Bs start to be converted to F-4Ns, after service life extension maintenance interval is 24 months.
March 1976	F-4J interval extended to 36 months or 960 flight hours.

PRINCIPAL OFFICIALS

RESPONSIBLE FOR ADMINISTERING

ACTIVITIES DISCUSSED IN THIS REPORT

	Tenure of office	
	From	To
DEPARTMENT OF DEFENSE		
SECRETARY OF DEFENSE:		
Dr. Harold Brown	Jan. 1977	Present
Donald H. Rumsfeld	Nov. 1975	Jan. 1977
James R. Schlesinger	July 1973	Nov. 1975
William P. Clements, Jr. (acting)	Apr. 1973	July 1973
Elliott L. Richardson	Jan. 1973	Apr. 1973
Melvin R. Laird	Jan. 1969	Jan. 1973
DEPUTY SECRETARY OF DEFENSE:		
Charles W. Duncan, Jr.	Jan. 1977	Present
William P. Clements, Jr.	Feb. 1973	Jan. 1977
Kenneth Rush	Feb. 1972	Jan. 1973
Vacant	Jan. 1972	Feb. 1972
David Packard	Jan. 1969	Dec. 1971
ASSISTANT SECRETARY OF DEFENSE (MANPOWER, RESERVE AFFAIRS AND LOGISTICS):		
Dr. John P. White	May 1977	Present
Carl W. Clewlow (acting)	Apr. 1977	May 1977
ASSISTANT SECRETARY OF DEFENSE (INSTALLATIONS AND LOGISTICS) (note a):		
Dale R. Babione (acting)	Jan. 1977	Apr. 1977
Frank A. Shrontz	Feb. 1976	Jan. 1977
John J. Bennett (acting)	Apr. 1975	Feb. 1976
Arthur I. Mendolia	Apr. 1973	Mar. 1975
Hugh McCullough (acting)	Jan. 1973	Apr. 1973
Barry Shillito	Feb. 1969	[illegible]n. 1973

APPENDIX IV

	Tenure of office	
	From	To
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 (acting)	Feb. 1977	Feb. 1977
David R. MacDonald (acting)	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
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 (INSTALLATIONS AND LOGISTICS):		
Vacant	Apr. 1977	Present
Dr. John J. Pennett	Sept. 1976	Apr. 1977
Jack L. Bowers	June 1973	Sept. 1976
DEPARTMENT OF THE AIR FORCE		
SECRETARY OF THE AIR FORCE:		
John C. Stetson	Apr. 1977	Present
Thomas C. Reed	Jan. 1976	Apr. 1977
James W. Plummer (acting)	Nov. 1975	Jan. 1976
John L. McLucas	July 1973	Nov. 1975
John L. McLucas (acting)	May 1973	July 1973
Robert C. Seamans, Jr.	Feb. 1969	May 1973
UNDER SECRETARY OF THE AIR FORCE:		
John J. Martin (acting)	Apr. 1977	Present
Vacant	Nov. 1976	Apr. 1977
James W. Plummer	Dec. 1973	Nov. 1976
Vacant	July 1973	Dec. 1973
John L. McLucas	Mar. 1969	July 1973

	Tenure of office From	To
ASSISTANT SECRETARY OF THE AIR FORCE (MANPOWER, RESERVE AFFAIRS, AND INSTALLATIONS):		
Joe Meis (acting)	July 1977	Present
James P. Goode (acting)	Jan. 1977	July 1977
ASSISTANT SECRETARY OF THE AIR FORCE (ACQUISITION AND LOGISTICS):		
John J. Martin	July 1977	Present
ASSISTANT SECRETARY OF THE AIR FORCE (INSTALLATIONS AND LOGISTICS) (note b):		
Vacant	May 1977	July 1977
Richard J. Keegan (acting)	Jan. 1977	May 1977
J. Gordon Knapp	Mar. 1976	Jan. 1977
Richard J. Keegan (acting)	Feb. 1976	Mar. 1976
Frank A. Shrontz	Oct. 1973	Feb. 1976
Richard J. Keegan (acting)	Aug. 1973	Oct. 1973
Lewis E. Turner (acting)	Oct. 1972	Aug. 1973
Philip N. Whittaker	May 1969	Sept. 1972

a/As of April 1977, this area became the responsibility of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics).

b/As of July 1977, this area became the responsibility of the Assistant Secretary of the Air Force (Acquisition and Logistics).

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