REPORT TO THE CONGRESS

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

Navy Aircraft Overhaul Depots Could Be More Productive

Department of Defense

There is continuing concern over the amount of industrial capacity available in the Department of Defense and the amount needed even under mobilization. This report gives some insight into industrial capacity needs for mobilization and shows that the present level is much too high. The implications on manpower and modernization budgets of operating too much capacity should be of particular interest to a number of congressional committees.

This report includes recommendations to improve the Navy's system for the maintenance of its aircraft, engines, and components.

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

B-133014

To the President of the Senate and the
Speaker of the House of Representatives

This is our report on the Navy's system of maintaining its aircraft, engines, and components. It identifies ways to improve the system by improving depot operations, establishing mobilization capacity needs and operating to those needs, consolidating or eliminating excess capacity, and modernizing only those facilities with long-term value.

We made our review pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

We are sending copies of this report to the Director, Office of Management and Budget and the Secretaries of Defense and the Navy.

Comptroller General
of the United States

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ABBREVIATIONS

ASO	Aviation Supply Office
DOD	Department of Defense
GAO	General Accounting Office

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

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Department of Defense

D I G E S T

Millions of dollars could be saved at the Navy's aircraft overhaul depots by improving its production control system and by revising its present concept of maintaining components. In addition, industrial capacity for both peacetime and wartime should be determined for better balance and use of manpower and modernization funds.

PRODUCTION CONTROL

Basic objectives of the Navy's maintenance policies are to do only necessary tasks quickly and efficiently. But, due to problems in the production control system--the key to managing any industrial operation--depots cannot make sure that these objectives are achieved, because:

--The work measurement subsystem, including labor standards, is not fully effective although it has been in effect for over 10 years. (See pp. 7 to 10.)

--The management information system no longer provides adequate identification of production control problems. (See pp. 10 to 14.)

--Workload forecasting and production planning are based on average past performance which generally includes errors and inefficiencies. (See pp. 5 to 7.)

COMPONENTS REPAIR PROGRAM

The Navy has emphasized repairing components at the depots, but many of the problems which have contributed to inadequate fleet support (pointed out in a previous GAO report 1/) still persist.

1/"Industrial Management Review of the Naval Air Rework Facility, Alameda, California" (B-133014, July 3, 1973).

--Aircraft components routinely are removed and reworked simultaneously with aircraft while high-priority systemwide components are backlogged. (See pp. 17 to 19.)

--Opportunities for productivity gains through economic-lot batch processing are lost. (See pp. 19 to 20.)

--Due to scheduling and production problems, scarce resources are consumed on components which cannot be repaired. (See pp. 21 to 23.)

--Components are retained in production shops longer than necessary, causing lengthy turnaround time and scheduling and shop backlog problems. (See pp. 23 to 25.)

INDUSTRIAL CAPACITY NEEDS

Under Department of Defense criteria, the Navy's six areonautical depots operate on a one-shift, 40-hour week, or less than one-fourth of the total time available. (See ch. 4.)

The reserve depot capacity, under this concept, could be tapped by adding extra shifts. The Navy, however, has no program to quantify systematically the amount of depot-level capacity needed for mobilization.

GAO developed a model which projects an approximation of workload and manpower on the basis of the Navy's current mobilization flying-hour scenario. On the basis of this model, current depot-level capacity far exceeds mobilization needs.

GAO proposed several alternatives which could reduce inhouse capacity needs without compromising readiness by:

--Developing a system for calculating mobilization workload and manpower requirements.

--Operating fewer depots, up to two full 8-hour shifts a day, 5 days a week in peacetime.

--Relying more on contractors for maintenance support.

--Making greater use of other services' capabilities and capacities.

--Making better use of resources located below the depot level.

--Exploiting the full potential of maintenance capability and capacity according to technology rather than by weapon system.

RECOMMENDATIONS

GAO made several recommendations involving production control and component repair. (See pp. 14 and 27.)

GAO also recommends that the Secretary of Defense consider a policy of operating maintenance depots more than one shift, 40 hours a week and:

--Establish true mobilization needs and prepare contingency plans for staffing to such needs.

--Consolidate, eliminate, or place in reserve status, as appropriate, all excess depot capacity.

--Concentrate modernization funds in only those depots with long-term value and tailor each modernization project to definitive long-range plans.

AGENCY COMMENTS

The Department of Defense generally agreed that large dollar savings could be realized by improving the management and operation of the Navy's aircraft overhaul depots. It said that in most instances the Navy was aware of the problems identified and had corrective action under way.

The Department of Defense said that the number and size of depot maintenance activities to be established or retained and their use had been a continuing concern, particularly in a period which demanded availability of combat ready weapon systems within fiscal constraints and civilian personnel ceilings.

Though a multishift operation of maintenance activities is not considered appropriate at this time, the Secretary plans to establish a requirement for annual projections of depot maintenance workloads, capacity, and facility usage, both for peacetime and under contingency conditions. These annual projections will cover 5 future years and will be reviewed at least annually.

The Department of Defense concurred in the recommendation to routinely examine projected depot maintenance workloads under mobilization conditions and the resulting facility requirements. Facilities found to be excess as a result, it agreed, should be eliminated or placed in a reserve status as appropriate.

In addition, the Department of Defense plans to concentrate modernization funds in those facilities identified as having a long-term DOD mission.

Comments by DOD and the Navy were, overall, highly responsive. The full text is contained in appendix I.

CHAPTER 1

INTRODUCTION

There is continuing concern in the Congress and in the Department of Navy over the rising cost of aeronautical maintenance programs, high rates of not operationally ready or not fully mission-ready aircraft, and complaints of insufficient repair and maintenance of components to support the fleet.

At the same time, the administration and the Department of Defense (DOD) are taking a new look at military requirements which reflect changes in current assumptions about the proper size and structure of U.S. Forces. A major thrust in this overall effort is to increase combat forces without overwhelming budget increases. The goal is to fund force increases by trimming support costs.

A primary support cost in the Navy is that associated with aircraft maintenance. This report considers the Navy's system of maintenance of aircraft, engines, and components including missiles, with emphasis on depot-level activities.

LEVELS OF MAINTENANCE

The Navy has three levels of aircraft maintenance. Day-to-day maintenance is done at the organizational level and includes flight preparations and checks, routine inspections, preventive maintenance, repair of downed aircraft, and troubleshooting. Intermediate maintenance activities do maintenance work beyond the capability of organizational level and serve squadrons deployed on carriers and at naval air stations. A major portion of this work is the repair of failed components which have been removed from aircraft. Both organizational and intermediate maintenance is done primarily by military personnel and funded by the operating forces.

Depot-level maintenance is the responsibility of and funded by the Naval Air Systems Command, under the Naval Material Command. It includes major rework and overhaul of aircraft, engines, and components. Although some of this work is done for the Navy by the Air Force, Army, other Federal agencies and by contractors, the bulk of it is done at six Naval Air Rework Facilities with a civilian work force.

The type of work done at all six depot facilities is similar. Each depot does work in nine shop categories. The skills within each shop category are essentially the same at the six depots, and the physical facilities and

equipment required are similar enough to permit the shifting of workloads from one facility to another or from Navy facilities to other services' and contractors' plants.

MAINTENANCE WORKLOAD FORECASTING

Determination of depot workloads includes three major steps.

--The aircraft forces to be supported are determined. This includes specifying the number, mix, deployment, and total hours the aircraft are expected to fly.

--Using such maintenance policies as frequency of aircraft and engine overhauls, the gross work requirements of the chosen aircraft force levels are calculated.

--A production plan and budget which meets the rework requirements is developed. This plan includes (1) assigning workload and required resources to each facility, (2) shifting workloads among the Navy or other facilities, as necessary, and (3) calculating the total costs of the production plan and resulting depot maintenance budget.

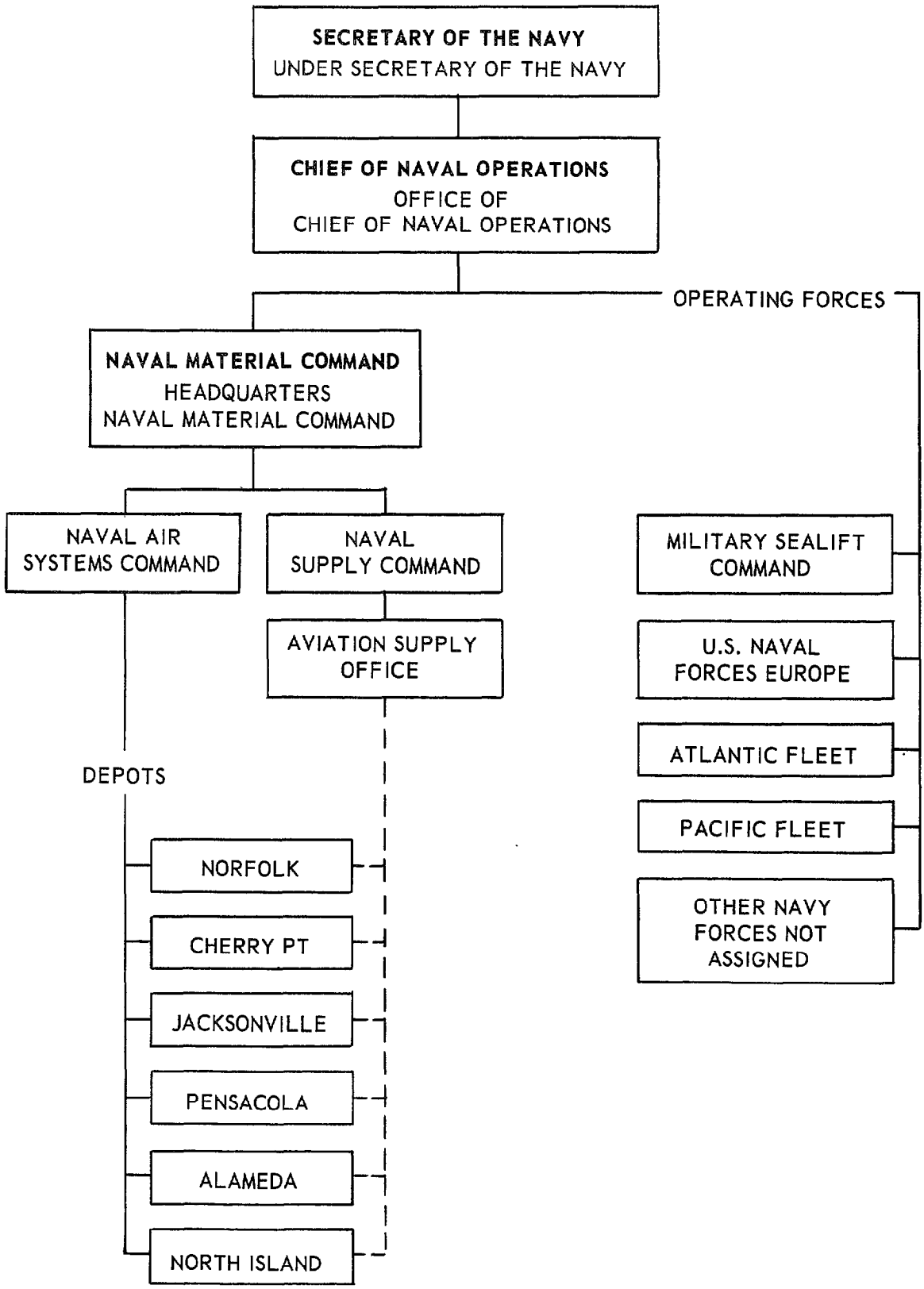
The forces to be supported and flying-hour programs are determined by the Office of the Chief of Naval Operations. The Naval Air Systems Command uses this information to determine the number of aircraft and engines which will undergo depot maintenance.

The Aviation Supply Office, under Naval Supply Command, has inventory management responsibility for all supply support for aircraft, including depot repair of components.

The Systems Command controls all depot maintenance funds, including those for components. The chart on the next page shows the organizational alinements.

DEPOT FUNDING

The depots operate under an industrial fund concept in which operating costs are recovered by charging their customers--the fleet and force commanders--for work performed. Over the last 10 years, operating costs have generally gone up while units produced have gone down. During the same period, however, only two new aircraft models have been introduced into the fleet--the A-7 and the F-14. The A-7's have been purchased in considerable quantity to date, and Navy officials say they are much less sophisticated to maintain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DEPOTS
NORFOLK
CHERRY PT
JACKSONVILLE
PENSACOLA
ALAMEDA
NORTH ISLAND
MILITARY SEALIFT
COMMAND
U.S. NAVAL
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then some older aircraft, like the F-4. The F-14 is new to the Navy's fleet and has accumulated very little depot-level maintenance experience. The nature of depot work, therefore, has remained fairly constant.

SCOPE OF REVIEW

We examined the Navy's entire system of maintenance of aircraft, engines, and components, including

- --organizational relationships;
- --the types of work done at each depot;
- --the capacity and projected needs for these depots;
- --the impact of fleet size and flying hours on maintenance workloads;
- --the maintenance philosophy at both headquarters and depot levels;
- --day-to-day operations at two specific depots, Norfolk, Virginia and North Island, California; and
- --the reliability of management information systems as a basis for management decisions.

We attempted to evaluate the efficiency and effectiveness of the depot maintenance program by determining

- --whether the capacity at six depots was needed for peacetime as well as mobilization workloads, and
- --whether there are significant ways to improve depot maintenance operations.

CHAPTER 2

DEPOT MAINTENANCE

The basic objectives of the Navy's maintenance policies are to do only those tasks which are necessary and to do them in a timely and efficient manner. To be effective, depot workloads should be forecasted, planned, scheduled, and controlled on the basis of what should be required to do the work, using valid labor standards and accurate and timely information.

Due to a combination of problems, the aircraft depots cannot insure that the Navy's objectives are achieved and consequently opportunities to reduce operating costs are lost. The problems identified have a spiraling or inflationary effect adversely impacting subsequent periods of operation.

--Workload forecasting and production planning, scheduling, and control are based on average historical performance which generally includes the effects of past mistakes and inefficiencies.

--The work measurement system, including the labor standards program, lacks quality and quantity and is not fully effective although it has existed for over 10 years.

--The management information system, which would identify production problems is being badly abused or misused so that it does not reveal to managers true operating inefficiencies nor provide adequate information to identify and correct problems.

WORKLOAD FORECASTING AND PRODUCTION CONTROL

Each quarter workload conferences are held by Air Systems Command, fleet, and depot representatives to agree on the number and price of aircraft, engines, missiles, and components to be repaired by a depot in a subsequent quarter.

The importance of the problems outlined above can best be judged by first describing how the depots determine the amount of work they expect to complete.

Norms and performance measurement

It is difficult for a depot to develop reliable estimates of work content or expected cost, because the volume and depth of work varies even within the same type, model,

and series of product. Detailed work requirements are not known until the equipment has actually been inducted, examined, and evaluated. The task is even more difficult, because depots' work measurement programs are not adequate to make realistic workload and cost estimates or to control cost growth.

Lacking definitive predictive data, the depots use historical averages, called norms, as a basis for negotiating the amount of work they are willing to undertake.

Since the depot is committed to perform the amount of work negotiated and at the price specified in the quarterly workload conferences, it does not want to use norms which are too low because this would result in scheduling more work into the depot than could be done.

High norms, on the other hand, can result in underusing plant and labor resources, escalating unit repair costs, and further increasing the norms, which in turn, underloads the depot in future quarters. Experience shows that norms do tend to increase over a period of time. The table below shows actual norms used by one depot to negotiate workloads for aircraft and engines.

Item	Type of maintenance	Norms: man-hours		
		Beginning	Ending	Percent increase
		(thousands)		
Aircraft:				
A6A (310E)	Progressive aircraft rework (PAR)	10.0	11.6	16
A6A (200E)	PAR	10.4	11.8	13
RF-8G	PAR	9.6	11.8	23
A6A (200E)	PAR-repair	10.0	11.4	14
A6A/ KA6D	PAR-conversion	9.7	13.1	35
A6A	Aircraft condition evaluation	1.4	4.0	186
	Average increase all aircraft			25
Engines:				
TF-30	Repair	.80	1.04	28
TF-30	Overhaul	1.38	1.58	14
J-57	Overhaul	1.36	1.56	15
	Average increase all engines			18

This overall increase in the norm of 25 percent for aircraft and 18 percent for engines, during a 2-year peirod, is equivalent to overhauling 52 fewer aircraft and 42 fewer engines a year at one depot.

We recognize that a distinction has not been made in the above table between increases in norms caused by expanding the work done and increases caused by the accumulation of hours attributable to past mistakes and inefficiencies. Specific examples of the types of errors and inefficiencies included in the norms are shown on pages 10 to 13. Even increases in work content are not always justifiable, as borne out by the Navy's revision, revitalization, restructuring of aviation maintenance program. Navy studies found, through analytical examination, that 65 percent of the items on an aircraft could fly until failure without danger to aircraft or crew. Many of these items, under current maintenance policies, are being repaired or replaced routinely on the basis of the overhaul cycle of the aircraft rather than the actual condition of the items.

WORK MEASUREMENT

The advantages of using a good work measurement system over using historical averages to control job growth and to indicate what a job should take has been recognized in both private industry and Government for years. In the mid-1960s DOD initiated the defense integrated management engineering system which required each DOD agency to establish a work measurement system to be used for developing budget estimates and manpower requirements, for planning and controlling work, for developing productivity performance indicators, and for other management purposes.

Although the Air Systems Command issued instructions to carry out the intent of the defense integrated management engineering system, we found that neither depot we visited had progressed sufficently to achieve the system's objectives.

There are two dominating elements of a good work measurement system:

--Accurate labor standards, which take into account properly developed work methods. These tell a manager how long a job should take and how much it should cost.

--A properly designed and integrated management information system which, among other things, tells a manager how much time the job actually took and how much it actually cost.

Both the Norfolk and North Island depots have labor standards programs and management information systems. However, the standards program lacks both quality and quantity, and the management information system is too erroneous and, in many cases, too late to be fully effective as a management tool.

Labor standards

Labor standards, or performance standards, indicate the time necessary for an experienced operator to do a job at a normal pace, in a predetermined manner, allowing adequate time for fatigue and personal needs. A conceptual premise for using labor standards in a production process is that workers will strive to complete a task within the time allotted by the standard. This assumes the standards are reasonable and attainable. Thus, accurate standards are indispensable to efficient production, good work measurement, and valid norms.

According to Naval Air Systems Command instructions, full standards coverage of productive direct labor is expected and attainable by using two classes of performance standards.

1. Class A (engineered performance standards) which is developed by various techniques, such as methods-time measurement, time and motion studies, standard data developed from time studies, and others.

2. Class C (estimated time allowed) includes all other labor performance measuring techniques which do not qualify as class A.

Class A standards are more reliable than class C and usually range from 15 to 40 percent lower estimates than class C for the same work, but they are also more expensive to develop and maintain. Consequently, class A standards should be developed with the emphasis on repetitive and high-volume jobs or jobs which need to be tightly controlled.

North Island claimed productivity gains during 1974 of 10 to 15 percent, or about 500,000 man-hours, by converting estimated standards (class C) to class A. This is equivalent to overhauling about 50 additional F-4J aircraft, or saving about $3.7 million in direct labor costs.

All work at the depots should be covered by a logical mix of standards; that is, engineered or estimated standards should be combined to provide the total work measurement package.

Need to develop and accumulate induction occurrence factors

According to the defense-integrated management engineering system, there are four distinct levels of labor standards: detailed, intermediate, summary, and budget. The first three are germane to this discussion.

A detailed standard identifies and assigns a standard time to each individual operation which could possibly occur in the repair of an item. Depots refer to these as operation standards.

An intermediate standard is the sum of all detailed standards, minus induction occurrence factors; i.e., allowances for the fact that some detailed standard operations may not be required each time an item is repaired. Depots call these production standards.

Summary standards, also called workload standards, are a combination of several intermediate standards, adjusted for anticipated shop performance.

When properly developed, these three levels of standards form an accurate basis for determining the amount of work that a shop, and ultimately a depot, should be able to do, as well as for measuring how effective they were in doing the work.

Generally depots have confined themselves to developing only detailed standards. Little has been done in developing or updating induction occurrence factors, without which intermediate standards may be overstated, leading to workloading and scheduling being grossly understated.

The importance of induction occurrence factors on intermediate or product standards was well illustrated in a May 1974 report by North Island, which stated that the development of induction occurrence factors for 112 of that depot's 27,000 components resulted in a 27-percent reduction in manhours required for those 112 components. Such reductions, if applied at all depots and managed properly, could have a dramatic impact on increasing the number of operationally ready aircraft in the fleet.

These problems have been recognized by both the depots and Air Systems Command. A September 1973 report by the Air Systems Command Representative, Pacific, who is responsible for allocating workload among the depots, stated that, due to (1) a lack of a system to provide occurrence factors,

(2) inaccurate labor reporting, and (3) a corresponding lack of documentable control, norms have an inflationary trend. The report stated, however, that there was no good basis for adjusting workload norms in allocating depot workloads because of the absence of good standards and other factors which prevent validation of the norms.

A North Island official agreed that the present standardized depot management information system did not accumulate induction occurrence factors, but stated that the system could be programed to do so.

Although the Air Systems Command recommended that North Island manually develop induction occurrence factors, North Island officials believed that the cost of a manual system would be too great (estimated initial cost of about $316,000) and that such a system would not be reliable. Consequently, North Island has taken the position that it will not attempt to develop induction occurrence factors until this can be done mechanically through the existing management information system.

LACK OF CONTROL OVER NORM GROWTH

A major obstacle to control of norm growth by depot management has been the failure of the management information system to produce data of real value in decisionmaking. Accurate norms based on reliable information should improve workload planning and scheduling and increase overall productivity of the depots.

Inaccurate labor transactions

Our tests at both Norfolk and North Island showed that 9 to 37 percent of all labor charges were incorrect. Charging time to incorrect job codes was generally found to be the reason for these errors.

At one depot, 52,837 hours valued at $389,000 in direct labor costs, or about 12 percent of the hours credited to the depot during June 1974, could not be used to judge performance due to improper recording.

We found that shops received full credit for jobs started but later suspended for a variety of reasons. The balance of unused time of these jobs was then used as cushion to absorb overruns on other jobs. Following are some specific cases.

Case number	Standard hours	Expended hours	Balance
1	93.0	3.0	90.0
2	12.31	1.03	11.28
3	300.0	27.0	273.0
4	10.00	.35	9.65
5	10.00	.34	9.66
6	3.66	.98	2.68
7	16.80	1.08	15.72
8	16.80	.87	15.93
9	28.82	1.27	27.55

According to depot personnel, these types of transactions occur regularly. According to these personnel, when this equipment is eventually repaired, the full standard time will again be authorized.

This practice can go relatively unnoticed, since the management information system is programed to measure total shop performance on a weekly rather than on a job-by-job basis.

Depot officials agreed that the information system was in need of correction, and they recognized that shops were receiving credit for the total standard hours when time was expended on units returned to supply in a nonserviceable condition.

They further explained that the problems were resulting from a computer program problem and indicated that the situation would be corrected.

They also agreed that the erroneous charging of labor required increased management attention. They planned to do this through additional independent labor checks.

Handwritten work orders

For the majority of work required on each unit inducted for repair, computer cards accompany the unit which described the work to be done and the number of standard hours that should be required to complete the work. The standard hours required and the actual hours expended are recorded on the cards and entered into the management information system through remote computer terminals. From this information, the shop's performance is determined and the data base for norm computation is developed.

Frequently, however, the cards do not include all the work which is judged to be necessary after shop inspection. In these cases, designated personnel prepare handwritten work

orders to allow additional job time. Because handwritten orders cannot be audited or their validity assessed once the work has been completed, it is important that they be reviewed, validated, and approved before the work is done, or at least before the work has been completed.

We selected at random a number of inprocess handwritten work orders to determine the basis for their preparation and whether the hours allowed appeared reasonable. Due to the large number of these orders and the length of time required to analyze a single transaction, no attempt was made to perform a statistical sample. However, the following are some specific examples which indicate the type of liberties depot personnel took.

--Handwritten orders were prepared to give additional time when the allowed time had been exceeded. This practice tended to inflate the data base for computing the norm.

--A handwritten order was prepared to authorize unnecessary rework on aircraft. The time was then used to prevent overruns on other jobs.

--A handwritten order was prepared authorizing more time than the standard allowed. An item, received without the mechanized work card, had a handwritten order prepared for 48 hours. The mechanized work order for this item allowed only 23 hours. Thus, more than twice the standard hours were earned for reworking this item.

--The depot receives dual time to correct rework that does not pass inspection. Discrepancy work orders are prepared when a completed item is rejected due to poor workmanship or other cause, or when a component fails testing. In these instances, the shop is not supposed to receive additional earned time to correct the deficiencies. An analysis of all Norfolk rejects for 1 month showed that, on 58 percent of their work, the shops earned additional standard hours. The additional time received to correct defective work, in some instances, exceeded the standards hours originally allowed to repair the component.

We found that about 18 percent of the standard hours earned at Norfolk and 10 percent at North Island were authorized by handwritten work orders during one quarter. The volume of handwritten orders varied from 326 to 670 orders a day, involving up to 600 hours each. Not only is the

processing of these orders expensive, estimated at $20 each, but also if this is representative of the volume and extent of use at all depots, this would mean that from 2.5 to 5.0 million direct labor hours of work during fiscal year 1974, valued at $18.5 to $37.0 million, were loosely controlled within the entire production control system.

At Norfolk we found that handwritten orders were prepared by employees at various levels, depending on the rework program. For aircraft rework, the examination and evaluation team authorized the handwritten orders and the methods and standards officials provided the time and type standard. Production control or examination and evaluation personnel authorized the orders in the engine program. In the missile program, production control or methods and standards personnel prepared the orders.

However, there was no overall or central screening point to insure that each order was necessary and the appropriate time was authorized. Further, the volume was too great to validate each handwritten order processed.

The lack of uniformity and central control in preparing handwritten orders allows them to be improperly issued and used, thereby distorting shop performance as well as the data basis for norm development and jeopardizing management control of the production process.

Depot officials agreed that the use of handwritten orders needed further management attention. At Norfolk they explained that they would consider establishing a central screening point for the aircraft, engine, and components programs to insure that handwritten orders were necessary and properly executed. North Island planned to implement a new transaction recording system for handwritten orders to reduce the number of labor transaction errors.

Inaccurate and untimely reporting

The management information system (Naval Air Integrated Logistics Command-MIS) was designed in 1964 as a standarized system for depots to assist all levels of management in day-to-day decisions by accurately measuring past and current performance. There has been no large change in the system, and it is costly to operate.

The Performance Summary Report is the primary management information system report and is to be used as a management tool at all levels to provide meaningful efficiency and productivity data and man-hours expended and allocated.

North Island officials advised us that the Performance Summary Report, like other reports, was unreliable and not often used for management purposes because it contained erroneous and incomplete data due to a lack of control over earned hours and untimely reporting. They stated that the data was usually reported 2 to 3 weeks late because of the limited capacity of the current computer system.

CONCLUSIONS

The success, efficiency, and economy of a depot's operation depends on good management. Good management in turn depends on good systems and subsystems. This chapter has demonstrated some of the weaknesses in two major subsystems: work measurement and management information systems. The weaknesses found were similar or identical to those reported at Alameda, California, in July 1973.

Performance standards are not used at either Norfolk or North Island to determine norms for planning, workloading, scheduling, cost estimating, or budgeting as envisioned by the defense-integrated management engineering system program. Instead, historical averages of actual time expended are used for these purposes and these averages show past mistakes and inefficiencies. Depot officials stated that the lack of a properly programed standardized management information system precluded the development of proper data to achieve the system's objectives.

We believe there are opportunities to (1) increase production output by the present work force and (2) achieve savings valued at many millions of dollars through reduced unit costs, by implementing changes to meet both the Navy's maintenance policy objectives and defense-integrated management engineering system's objectives.

This will require intensive study and management of the entire depot production control system by headquarters and depot managers.

RECOMMENDATIONS

We recommend that the Secretary of Defense require the Navy to:

--Provide greater management support and reenforcement of the entire work measurement concepts and principles at all echelons.

--Critically examine the workloads at each depot to determine the high-volume work for which labor

standards development and maintenance efforts should be concentrated.

--Develop and systematize induction occurrence factors to gain greater production efficiencies from the standards program.

--Require system discipline and integrity needed to overcome existing inadequacies and errors in the present standardized management information system.

--Closely monitor the above actions and establish a realistic target date for determining norms based on standards rather than on historical averages.

NAVY COMMENTS AND OUR EVALUATION

The Navy generally agrees with the recommendations and has taken some corrective actions. Both activities visited have started methods and standards technician training classes during the past year in an effort to improve standards.

The Navy is currently implementing an automated system to generate, update, and apply occurrence factors. This program, it said, would be completed in 6 to 9 months (about June 1976).

Both headquarters and depot management personnel have recognized the need for improved control over the accuracy of data introduced into the information system through labor transactions and handwritten work documents. Action is underway to provide managers with better input-output control for timely review, coordination, and control of system functions, through new computer hardware and programs. Further, periodic audits of the management information systems will be subjected to top-level review, according to the Navy.

One area the Navy did not agree with is that norms are being based only on expended man-hours. It said that performance standards were being used to develop norms and added that standards should not be the only factor considered for predicting work content or scope. While we agree that other data should be considered, we believe that the depots, for reasons discussed above, have placed little reliance on standards and instead relied primarily on expended hours. The reliance on expended hours introduces all the past mistakes and inefficiencies into the future and provides little incentive to become more productive.

For example, in developing the norm for the A6A aircraft, the depot's information system showed an average of 8,702 standard hours earned in the overhaul of nine aircraft selected specifically for the purpose of establishing the norm.

According to Navy's description, the norm would have been derived by factoring the 8,702 average standard hours to allow for expected performance efficiency.

Instead, depot managers used a figure of 9,780 standard hours, factored this amount to 10,383 standard hours, and then factored the latter figure by 86.5 percent planned efficiency to arrive at a total norm of 12,000 hours. Expended hours averaged 11,735 for the nine aircraft.

The 12,000 hour figure was then used for planning the amount of A6A aircraft overhaul workload the depot would do in a subsequent quarter.

Depot officials were unable to reconcile the differences in standard hours but felt that the information system was not reliable.

Due to the importance of norms in the management of depot operations, we have a continuing interest in Navy's progress toward overcoming the deficiencies observed during this review. This interest is reinforced by the fact that most of the deficiencies noted in the current review were also prevalent at Alameda in 1973.

CHAPTER 3

WAYS TO IMPROVE EFFICIENCY AND EFFECTIVENESS IN THE DEPOT COMPONENTS REPAIR PROGRAM

The Navy's objective in component repair is to produce the most urgently needed items as economically, efficiently, and quickly as possible within existing budgetary constraints. The Air Systems Command has stated that the success of the component repair program depends on total indepth management and active participation at all levels toward achieving this objective.

In this connection, the efficiency and effectiveness of the Navy's depot component repair program could be increased through:

1. Changing component induction philosophy.
2. Reducing excessive "fallout" of components scheduled for rework.
3. Reducing component turnaround time.

CHANGES NEEDED IN INDUCTION PHILOSOPHY AND PRACTICES

The Navy's component rework program could be improved by (1) reducing concurrent rework of aircraft and engine components and obtaining these directly from supply and (2) batch processing similar components.

Concurrent rework

Concurrent rework is the term used to define components taken from an aircraft undergoing depot maintenance and simultaneously reworking the components while the aircraft is in the depot. As these components are removed, they are routed through the various components shops, repaired, and returned to the aircraft and engines for reassembly. The primary purpose of concurrent rework is to insure that components needed to overhaul aircraft and engines will be available. Simultaneously, similar components from systemwide inventories compete for depot repair resources.

In actual practice components in the concurrent rework program are frequently scheduled in front of and, in many cases, instead of systemwide inventory needs, and when work is in process, repair of systemwide items is frequently suspended, giving priority to items in the concurrent program.

The table below shows the distribution of shop labor resources between systemwide and concurrent rework programs at two depots.

	Resources: direct labor hours			
	Norfolk (FY 1974)	Percent of total	North Island (4th quarter, FY 1974)	Percent of total
System components	888,400	72	335,000	55
Concurrent rework	351,300	28	275,000	45

Through the Navy integrated comprehensive reparable item scheduling program, the Aviation Supply Office (ASO) schedules rework based on the priority of Navy-wide needs. However, components in the concurrent program were removed from aircraft and engines and routinely inducted for rework. Managers did not determine the availability of the components in local supply and did not consider systemwide needs. One exception to this practice exists if the depot is unable to repair a component by the time it is needed for reinstallation in the aircraft or engine. In this situation, the depot will go directly to the local supply department for the item.

To examine the feasibility of reducing concurrent rework, we reviewed the systemwide supply status of components removed from one EA-3B and one A-6 aircraft. In most cases, serviceable assets were available in the supply system and many were available locally.

	Percent available	
	EA-3B	A-6
Serviceable components available locally	54	54
Serviceable components available in the system	78	89

Both Norfolk and North Island officials favored a reduction in concurrent rework where possible. North Island officials stated that concurrent rework (1) increased aircraft turnaround time for some models, (2) created inefficiencies and reduced productivity, (3) increased overhead costs because separate routing cards were maintained for similar components, and (4) resulted in understating component usage, which affected supply demand and the procurement of replacement components, because concurrent rework was not reported to ASO. An Air System Command instruction required the depots to exchange reparable items for ready-for-issue

components in long supply instead of concurrent rework. The advantages listed by the instruction were (1) conservation of man-hours and repair costs at the depots, (2) reduction of leadtime for processing aircraft and engines through repair depots, and (3) expedited availability of components.

Both depots adopted the instruction on a limited basis but soon abandoned it, because some components on the long supply lists were either not available or were not suitable for the latest model and series of aircraft and engines. North Island officials stated, however, that the standard depot-level maintenance program for aircraft, due to begin implementation in the third quarter of fiscal year 1975, required eliminating concurrent rework, except where the component was not in the supply system or supply response could cause an unacceptable delay in aircraft processing.

In its reply to our proposed report, the Navy said that routine concurrent rework was not presently practiced. It said that under current maintenance concepts, concurrent rework had been limited to replacement of only those components which had failed or would reach maximum operating time before the aircraft could be returned to the squadron. Replaced components, it said, were not concurrently reworked except in cases in which they were in short supply and thus would have caused protracted delays in delivery of the aircraft to the fleet.

Batch processing

Batch processing--scheduling similar items in economical lot sizes--permits an increased flow of components through the depot. This concept reduces scheduling interruptions and results in greater worker efficiency, thereby reducing the repair cost for each unit and increasing the number of units that can be repaired. For batch processing to be effective, however, good coordination must exist among all activities and commands which input information for workload planning--Air Systems Command, ASO, and supply activities at the Naval Air Stations.

ASO recognized the potential benefits of batch processing and implemented the high burner program in the fourth quarter of fiscal year 1974. The basic concept of this program is that, through analysis of the total component repair program, those items which are repaired repetitively and consume the most resources over time can be batch processed to (1) promote efficient use of labor and equipment, (2) reduce repair turnaround time, and (3) insure better response to fleet needs. North Island officials generally agreed with the program concept but believed frequent

adjustments in production requirements had diminished its effectiveness and raised doubts as to whether the program was meeting the Navy's needs.

A North Island official advised us that batching the components could result in an average reduction or 5 percent in direct man-hours due to the learning curve. However, an Air Force study showed that, for certain items, as much as 70 percent of the time could be saved. A primary reason for the high learning curve factor was that the workers had to frequently refer to technical manuals for instructions. Once familiar with the whole routine, the workers were consistently able to complete a unit in about 13 minutes that they had consistently required about 45 minutes to complete the first time. The standard time was about 17 minutes.

With the exception of the high burner program (which accounted for approximately 28 to 34 percent of the component rework in the fourth quarter of fiscal year 1974), neither North Island nor Norfolk generally batch processes components.

Workload distribution

Norfolk has been repairing components not urgently needed in the supply system while high-priority components lay in backlog at North Island awaiting repair. A similar backlog of high-priority work existed at Alameda, the other west coast depot.

The Air Systems Command designates particular depots as overhaul points for specific components on the basis of their ability to overhaul the components at a lower cost. The workload allocated to the designated depots is based on fleet demands.

Requirements are separated into four major priority categories based on criticality of need by the fleet. Priority 1 and 2 are to fill back ordered requisitions, and priority 3 and 4 are to build up supply inventories of ready-for-issue components.

Each quarter the depots negotiate with ASO the number of direct labor hours to be spent in reworking components. The negotiated hours are then allocated to the shops which rework the components. Total hours available at shop level are further broken down to show hours to be spent each week of the quarter.

ASO submits a weekly report to the depots, identifying components required by priority level. Shop planners decide which components will be inducted, using as their

criteria the shop's capacity and available direct labor hours.

At Norfolk, 18,600 units of 41,400 units, or 45 percent of the components inducted during the 9 months ended September 30, 1974, were priority 3 and 4 level requirements, and only 55 percent were level 1 and 2 requirements, which included the high burner items. During the 9 months ended March 31, 1974, at North Island, however, 98 percent of inductions were priority 1 and 2 components, with additional priority 1 and 2 requirements left in backlog. Officials told us that Alameda's workload consisted similarily of level 1 and 2 components.

In its reply to the proposed report (see app. I), the Navy said that the problem resulted from a maldistribution of reparable carcasses and that a redistribution of high-priority carcasses early in 1975 corrected the problem.

RESOURCES LOST ON COMPONENTS DUE TO SCHEDULING AND PRODUCTION PROBLEMS

Air Systems Command requires the depots to bill customers for actual direct cost of operations plus an amount to recover overhead expenses. Under this concept, productive work absorbs the depots' costs for nonproductive activities. As a result, processing costs incurred for incomplete work increase the cost of completed units to the customer.

Norfolk originally scheduled 55,200 components for rework during the 9-month period ending September 30, 1974, but only 31,600, or 57 percent, were actually restored to ready-for-issue condition.

A total of 13,800, or 25 percent, of those scheduled for repair fell out before being inducted into the repair shops, because the unserviceable components were not available as indicated by the stock records or the repair requirement was canceled due to lack of capability.

The remaining 18 percent, 9,762 items, were inducted for repair but were subsequently returned to the local supply department unrepaired. The table below shows the reasons for not repairing 9,762 items at Norfolk and 6,522 items at North Island.

Status	Components inducted but not repaired: Norfolk--quantity (note a)	North Island--quantity (note b)
Lack of parts	5,348	1,892
Scrapped	2,442	2,659
Wrong material	928	809
Other (note c)	1,044	1,162
Total returned unrepaired	9,762	6,522

a/Three quarters ending September 30, 1974.

b/Two quarters ending June 30, 1974.

c/Scheduling errors, equipment failure, etc.

Of the 73,200 components inducted at both depots during a 6- to 9-month period, 21 to 24 percent were returned to supply in an unusable condition. We were unable to identify total actual man-hours spent on these units as the depot's reporting system did not show this data. However, a selected test of items completed at Norfolk during a 2-week period showed that the production shops spent 6,754 hours reworking components which included 1,941 hours, valued at about $13,500, on items returned to supply in an unusable condition. This amounts to an average of nearly $9 extra for each component successfully reworked at Norfolk during the 2 weeks. The man-hour expenditures follow.

Expenditure category	Actual man-hours expended	
Completed ready for issue		4,632.94
Returned:		
Lack of parts	1,322.54	
Scrapped	364.93	
Miscellaneous	177.09	
Misidentified	41.44	
Canceled	34.90	
Total fallout		1,940.90 (30%)
Total hours expended		6,573.84

Depot officials agreed that the fallout rate was a problem and that an excessive investment was incurred in

such items, with the greatest single contributing cause being inadequate parts support. The lack of parts support in some cases has become so common that planners routinely induct additional components as sources for repair parts. The parts problem is further complicated by the lack of reconciliation and inaccuracies in ASO, local supply department, and depot records of component status and availability.

Depot officials stated that efforts were being made to reduce fallout by:

--Placing increased emphasis on earlier identification of components with potential parts problems and those destined to be scrapped to minimize labor hours charged against such items.

--Monitoring the components program performance more closely.

--Positioning an examination and evaluation technician at the point of induction to screen components before being inducted to reduce the number of misidentified items entering the rework process.

--Properly instituting the high burner program, which would help provide better positioning of replacement parts.

--Implementating the "shop cubicle" scheduling system which was designed to provide more accurate shop skill and equipment availability information, thereby reducing the number of components returned.

NEED TO REDUCE COMPONENT TURNAROUND TIME

As pointed out in our 1973 Alameda report, large numbers of components in process and overdue necessitated increased inventory investments to compensate for the additional time required to repair these assets or resulted in aircraft not being fully operational.

The Air Systems Command has established an average component turnaround time of 14 calendar days which it considers to be a realistic and attainable goal. We found that the turnaround time at Norfolk, currently at 26 days, was its highest level in 2 years. For fiscal year 1974, the average at North Island ranged from a low of 18 days to a high of 58 days.

Our analysis of overdue components in May and September 1974 at Norfolk showed that 7,328 of 10,684 items inducted,

or 69 percent, were overdue 15 days or longer. Days overdue averaged 22 days and ranged from 15 to 348 days.

A depot instruction states that components inducted into the repair shops for which needed parts support is not received within 10 days should be returned to supply. Examples of items held for excessive periods are listed below.

Component	Standard hours	Hours spent	Days held awaiting parts
Receiver-transmitter	8.03	2.70	83
Receiver-transmitter	8.03	1.27	55
Valve	4.77	3.40	19
Valve	1.30	1.57	35
Door	8.00	8.12	80
Hubcap	12.18	5.13	208
Powerplant	310.60	96.97	31
Powerplant	300.00	8.00	23

Scheduling and backlog problems

Retaining components in the shops when they cannot be completed can have an adverse impact on scheduling and on shop backlogs.

Most of the components are scheduled for induction through the weekly induction scheduling system. This is a computerized system by which magnetic tape information files are matched to determine for each component whether (1) a fleet requirement exists, (2) the depot has the capability to rework the component, (3) the carcass is available and, when applicable, essential repair parts are on hand in supply, and (4) the depot has sufficient man-hours to rework the component. If each of these factors is met, the requirement is scheduled and the applicable resources (including carcasses, support material, and man-hour capacity) are reserved.

The computer does not recognize components which cannot be completed for various reasons but simply considers such items as valid work in process. The shop planner and scheduler must take extra management action to override the computer and induct additional components into the system to compensate for invalid backlog. The low backlog in several shops is one indication that the planners are not adequately monitoring the program.

The Norfolk components project officer stated, for example, that all shops should maintain a backlog of at least 2-1/2 weeks for all rework programs. Although he was not

aware of any formal criteria in this area, most shops reviewed had considerably less than the desired 2-1/2 week backlog.

Also, as explained in a previous section, components are being retained awaiting parts for 19 to 208 days.

Further, up to 50 percent of the production shops' available man-hours are spent on indirect functions, such as supervision, delay time, shop tools, training, inhouse calibration, and backrobbing; i.e., removing parts from one component for use in repairing another. Depot officials said that 20 percent was an acceptable goal for such overhead functions.

Norfolk has directed that the oldest items be given priority before processing a new quarter's inductions; that is, process second quarter components before work on third quarter inductions begins. However, we found that this practice was not always followed. For example, on August 30, 1974, after two-thirds of the first quarter of fiscal year 1975 had elapsed, we found that 16,879 standard hours of work relating to 442 fourth quarter 1974 components were still in process. Since this represented only about 2-1/2 weeks of workload, it was evident that most of the work performed in the first quarter of 1975 was 1975 workload.

There was nothing to suggest that completing this work was deferred to perform higher priority work. In fact, two reasons stated by Norfolk officials for extended component inprocess time included delays in returning items to supply for lack of parts support and the practice of reworking easier components first and hard-to-work items last.

Depot officials stated they were making an effort to complete components in the same order as inducted to deliver them by the scheduled delivery dates, thereby reducing reconciliation problems and turnaround time.

ROLE OF ASO IN COMPONENT REPAIR

ASO, located in Philadelphia, Pennsylvania, is the Navy's worldwide manager for all aeronautical equipment and components for the support of naval aircraft. It is responsible for determining

--how much and when to buy material;

--how and where it is distributed or redistributed;

--when, where, and how much to repair; and finally,

--when and how much to dispose of.

The supply system operates much like a giant mail-order business with warehouses in principal centers, distribution points close to consumers, business on a worldwide basis, and ASO as the nerve center for the entire system.

In addressing its repair responsibility, however, ASO does not have direct or total authority to satisfy its customers through repair, because it has no authority or control over depot repair activities, nor over the funds to pay for depot repair of its material. Authority and control over depots are vested in the Air Systems Command. (See chart on p. 3.)

In reviewing the allocation of resources between concurrent rework and systemwide stock, we observed that one way to improve control would be to give more authority over repair to ASO.

In its comments to the proposed report (see app. I), the Navy said that ASO was not responsible for the repair of components but only for determining the repair requirement and for furnishing repair parts to make the necessary repairs. The Navy maintains that ASO has sufficient authority to meet these responsibilities.

The Navy also emphasized that any inference that component repair occupied a backseat to engine and aircraft programs was not correct. It said that 41 percent of the rework budget was now devoted to component repair and that the management attention given to improving component repair dwarfed that currently applied to other areas.

In view of the progress made, as evidenced by 41 percent of the rework budget now being applied to the component program, and in consideration of Navy's position that the Air Systems Command must have authority and control of maintenance work, we have no further question at this time regarding ASO's authority over depot operations.

CONCLUSIONS

The Navy has placed increased emphasis on repairing components, but many of the operating problems which contribute to inadequate fleet support and which were pointed out in our 1973 Alameda report still persist.

Concurrent rework was routinely carried out while high-priority systemwide needs were backlogged; opportunities for productivity gains through batch processing were lost; scarce resources were consumed on components which could not be completed due to scheduling and production problems; and

components were retained in production shops longer than necessary, causing lengthy maintenance turnaround time and scheduling and shop backlog problems.

RECOMMENDATIONS

We recommend that the Secretary of Defense require the Navy to discontinue routine concurrent rework of components and limit this to only essential testing and/or minor repair.

We also recommend that the depots be required to concentrate on opportunities to batch process component repair, to reduce scheduling and production fallout, and to reduce maintenance turnaround time and purify shop backlog of returning or reclassifying work which cannot be completed.

NAVY COMMENTS

The Navy agreed with our recommendations and has actions underway which should greatly improve overall components support to the fleet. According to the Navy:

--Routine concurrent rework has been discontinued except for those items in short supply.

--Forty-one percent of the current aircraft rework budget is being applied to the components program.

--Actions are being taken to improve repair parts deficiencies.

--Manual override procedures have improved record inaccuracies which have decreased scheduling fallout from 40 percent to 10 percent during a 3-month period.

CHAPTER 4

POTENTIAL TO CONSOLIDATE DEPOT SUPPORT WITHOUT COMPROMISING READINESS OR MOBILIZATION

In recent months the Department of Defense and military services have been emphasizing funding increases in combat forces through reductions in overhead and support costs. One area of emphasis has been the continued search for opportunities to consolidate depot workloads.

Identifying additional opportunities for consolidation of depot-level aircraft maintenance workloads depends largely on the ability to predict the amount of workload and capacity needed to meet mobilization.

This chapter addresses Navy's calculations and GAO's analysis of available capacity versus that needed on the basis of Navy's mobilization flying-hour scenario and the additional capacity being built into the depot-level aircraft maintenance complex through the modernization program.

MOBILIZATION CAPACITY REQUIREMENTS

Since mobilization contingencies are a fundamental reason for operating military depots, the capacity needed to meet mobilization workload should be the primary factor used to determine the amount of depot capacity to be retained during peacetime.

The Navy, however, does not routinely determine mobilization workload and manpower requirements for depot-level aircraft maintenance and therefore it has no basis for knowing whether existing capacity is too much or too little. Therefore, we developed our own macromodel to analyze capacity and mobilization requirements.

We (1) determined the amount of existing capacity at the six aircraft depots, (2) developed and tested our

macromodel 1/ which relates aircraft flying hours to depot maintenance workloads, and (3) applied Navy's mobilization flying-hour scenario to the model to determine mobilization capacity and manpower requirements.

Determining capacity

DOD guidelines state that:

"The extent of facility capability and capacity within the Military Departments for depot support of mission essential equipment will be kept to the minimum required to insure a ready and controlled source of technical competence and resources necessary to meet military contingencies. Generally, organic depot maintenance capacity will be planned to accomplish no more than 70 percent of the gross mission-essential depot maintenance workload requirements with a facility capacity loading at a minimum rate of 85 percent, on a 40-hour week, 1-shift basis."

DOD maintenance officials state that this criteria represents the best judgment of capacity and usage rates

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1/Use of this model, as with any mathematical representation, must be tempered by sound judgment, and therefore some caveats are appropriate. For example, there was no historical data available of actual mobilization experience. However, the data used covered the period 1965 to 1974, which included the entire Southeast Asia era--the closest to a mobilization scenario available. The model does not take into account a probable increase in depot-level maintenance from crash and battle damage, other than that experienced in Southeast Asia. And it does not consider the decrease in depot-level maintenance as a result of changes in maintenance policy due to mobilization. That is, aircraft are periodically returned to depots for overhaul during peacetime, whereas in mobilization, they are maintained by organization and intermediate maintenance units as long as possible.

There are probably other variables which could have an impact under a mobilization scenario that our model does not consider. We stress, however, that (1) we developed the model from necessity and (2) the correlation between aircraft flying hours and maintenance workload generated was high enough to assure a high degree of reliance as a macroindicator.

required to meet mobilization needs and make efficient use of facilities in peacetime. The criteria have been in effect since 1970.

Using DOD criteria, the Navy calculates capacity as the "optimum manning level"; i.e., the number of direct production workers required to man all work stations in the production shops on a single shift, 8 hours a day, 5 days a week (1-8-5), 2,000 hours a year. This calculation assumes that (1) the work stations are manned with appropriately skilled personnel operating at an efficiently paced work rate and (2) the existing plant layout and product mix result in minimum loss of labor effort.

The table below shows Navy's calculated annual one-shift capacity, as compared to the fiscal year 1974 workload level.

Depot	Direct labor hours		Percent of one-shift capacity used
	One-shift capacity	1974 workload	
	(millions)		
Alameda	6.7	5.0	74.6
North Island	7.7	7.5	97.4
Norfolk	5.2	4.5	72.6
Jacksonville, Fla.	3.7	2.8	75.7
Cherry Point, N.C.	2.6	2.5	96.1
Pensacola, Fla.	5.0	3.7	74.0
	31.9	26.0	81.5

Although the Navy's 1974 workload and rate of usage closely approximated DOD's 85 percent criteria, the workload included about 7 million hours of work which could have been done by contract.

Projected peacetime workload through 1980 remains at about the 1974 workload level.

Determining mobilization requirements

Using Navy's projected mobilization flying-hour scenario in our macromodel, we estimated that a workload of about 45

million direct labor hours would be generated 1/ annually.

DOD officials stated that an inprocess DOD study to identify opportunities for depot maintenance consolidation showed capacity and mobilization workload levels to be almost identical to GAO's.

	Direct labor hours	
	DOD	GAO
	(millions)	
Depot maintenance capacity (1-8-5)	32	31.9
Mobilization workload	43.4	45

The capacity figure used in our review was obtained from the Navy. (See p. 30.) The figure used by DOD may have been derived from the same Navy source. The methods used to determine mobilization workloads, however, were entirely different. The mobilization workload in the GAO model was a straight line mathematical extrapolation, based on a regression equation, whereas DOD used a much more detailed approach in which the number, mix, deployment of aircraft, and total hours expected to be flown in mobilization were taken into account. This calculation, according to DOD officials, was a specific one-time effort and not a recurring program.

The fact that both methods produced almost identical results tends to be mutually supportive.

To determine the amount of depot capacity which would be available in mobilization, an assumption had to be made as to the length of workweek most likely to be used. For this purpose, we assumed the depots could be operated two 10-hour shifts a day, 6 days a week (2-10-6) in mobilization, if necessary. Navy officials agreed this was reasonable.

Using this rationale, we found that the existing physical capacity would enable the six depots to use 95.7 million direct labor hours.2/ While this does not consider a probable

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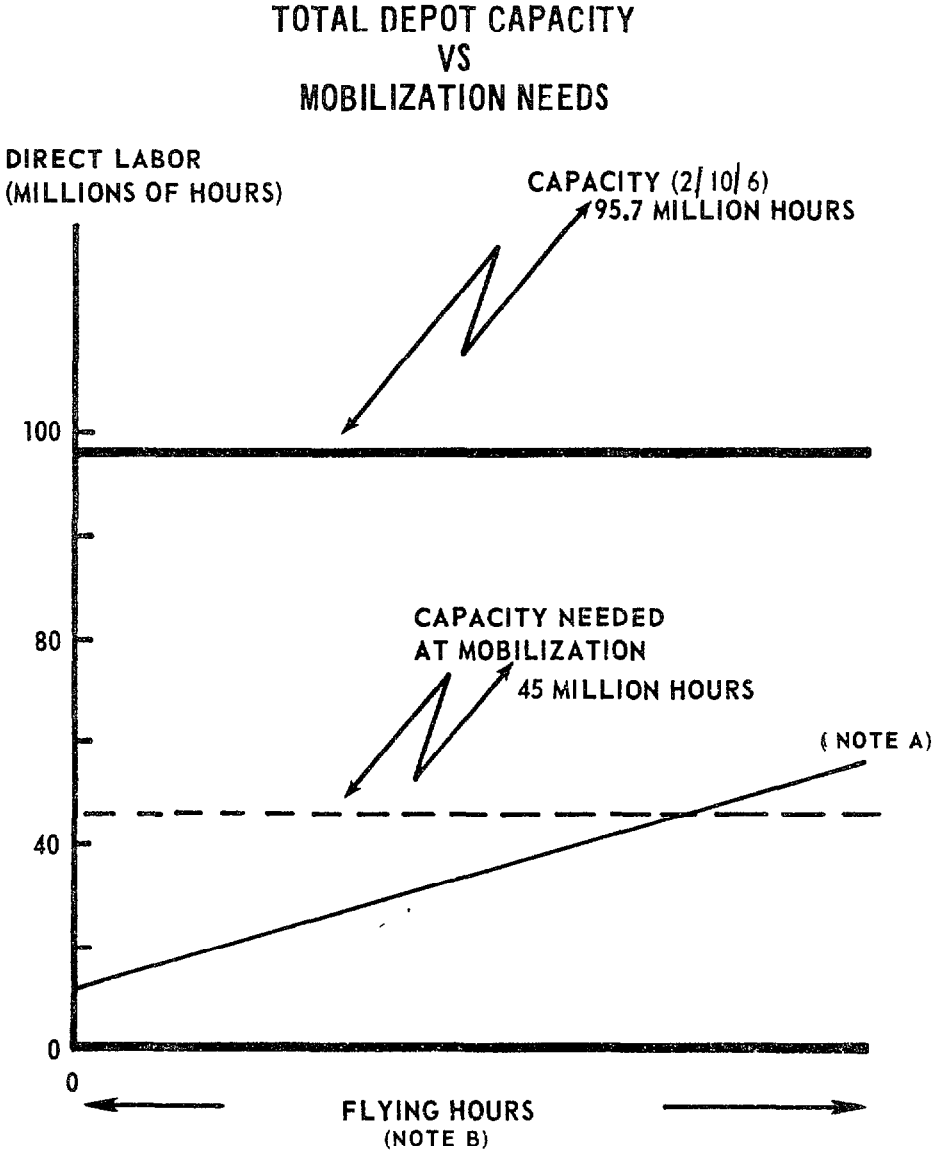
1/Using a computerized linear regression analysis program, we found that, on the basis of the Navy's flying-hour program, annual direct labor could be predicted to fall within a range of 4.3 million hours (2 standard deviations) from the standard regression line 95 percent of the time, with a confidence level of 97.5 percent.

2/The 2-10-6 operation results in 120 hours per week; $\frac{120}{40} \times 31.9 = 95.7$.

loss of efficiency in operating on a 2-10-6 basis, existing capacity far exceeds that needed as illustrated in figure 1.



NOTE A – REGRESSION LINE DENOTING RELATIVE INCREASES IN DIRECT LABOR HOURS AS THE FLYING HOURS INCREASE.

NOTE B – FLYING-HOUR FIGURES OMITTED FOR SECURITY REASONS.

FIGURE 1

Although we believe the potential to consolidate depot workloads can be greatly increased by operating two shifts in peacetime, Navy officials are strongly opposed to such a plan.

Nevertheless, substantial consolidation potential exists, even on a one-shift basis.

The table below, for example, compares the level of effort in fiscal year 1969 (peak load in the Vietnam era) with that in 1974. The depots were operating basically on a single-shift basis throughout both periods.

Depot	Direct labor hours	
	1969 workload	1974 workload
	(millions)	
Alameda	8.9	5.0
North Island	9.2	7.5
Norfolk	6.9	4.5
Jacksonville	4.2	2.8
Cherry Point	3.4	2.5
Pensacola	5.4	3.7
	38.0	26.0

Fewer depots, working at 1969 levels, could easily absorb the approximately 26 million direct labor hours a year projected through 1980.

The same facilities, operating on a 2-10-6 basis, could then provide mobilization capacity well above the 45 million labor-hour level.

Thus, the potential exists for consolidating workloads while operating a single primary shift in peacetime with ample surge capability to meet projected mobilization workloads.

Savings potential through consolidation

The total cost of operating the six aircraft depots in fiscal year 1974 was $693 million, of which $353 million was for overhead. The savings potential through consolidation of maintenance workloads lies mainly in the overhead area.

DOD and Navy officials were in general agreement that excess capacity existed at the six aircraft depots. However, their economic analyses of consolidating various

maintenance workloads showed that cost savings were not automatically achieved. They said that, under certain options, the estimated cost of relocating the workload far exceeded potential cost benefits.

DOD officials pointed out, however, that their economic analyses considered only the relocation of the depot maintenance function and did not contemplate the closure of the entire host naval air station.

The depot is only one of many tenant activities at a naval air station. A typical naval air station, for example, may host 30 or more tenant activities, of which the maintenance depot is by far the largest. The station provides such support functions and programs as:

--Public affairs.

--Legal assistance.

--Budgeting, statistics, accounting, and internal review services.

--Civilian personnel and manpower management, including wage and classification, employment, employee relations, training, and employee services.

--Data processing services, including analysis, programing, keypunch, and clerical services.

--Repair and maintenance of plant equipment.

--General and aviation-oriented material support, including receiving, storing, issuing, and shipping services.

--Intermediate-level aircraft maintenance.

--Material support to organizational and intermediate-level maintenance operations.

--Medical and dental services.

--Communication and cryptographic services.

--Air crash and rescue boat services.

--Maintenance and repair service for public works, including waterfront installations, buildings, facilities, and grounds.

--Procurement of utility services.

--Aircraft firefighting, crash, and rescue services.

The costs incurred by a naval air station for support services are charged to the various tenants on a proportional basis. For example, the six aircraft depots' share of station support during fiscal year 1974 was nearly $50 million.

Although some depot operation costs would be saved by consolidating only maintenance workloads, station support costs would continue.

On the other hand, if all station functions can be relocated, results similar to those achieved with the 1974 closing of the Quonset Point Naval Air Station, Rhode Island and Quonset Point Aircraft Rework Facility should be realizable. The table below, for example, shows recurring personnel cost savings of the rework depot compared to the one-time closure costs.

	(millions)
Approximate annual personnel costs before closure	$30.0
Less: Personnel costs of 708 employees transferred to other Federal jobs	8.3
Estimated annual personnel cost savings for 2,043 employees who retired, resigned, or reduced in force	21.7
One-time closure cost (note a)	$14.7

a/Includes about $8.0 million in costs which are not clearly attributable to closure. For example, $3.7 million for salaries and wages earned in 1973, $1.37 million for severance pay including lump sum accrued to each employee for his years of service, $1.8 million in underapplied overhead costs and, $0.5 million for inventory shortages discovered in the process of closing the inventory account.

MODERNIZATION

The Navy's concept for its aircraft depots is that each should be self-sufficient. The self-sufficiency concept, along with the inability to determine mobilization needs, has led to capacity redundancies being built into the depot complex through the depot modernization program.

The type of work done at all six depots is similar, although generally, no two work on the same aircraft systems,

engines, or components. Each rework depot is equipped to provide a full range of support to those systems assigned to it.

At each depot all work is divided into the following nine shop categories:

--Airframe

--Engines

--Accessories and components

--Electronics, communication, and armament

--Armament

--Support equipment

--Manufacture and repair

--Test and calibration

--Other

The airframe shop does such work as stripping, cleaning, disassembling, refinishing, modifying, and overhauling aircraft. Many components are removed in the airframe shops and then repaired in the accessories and components shops and in the electronics, communications, and armament shops.

Although each depot has some unique features, the functional equipment and facilities within each shop category are essentially the same. Workloads can be and are reassigned from one depot to another or to contractor facilities, as when Quonset Point was closed and its workload shifted to other locations.

In maintaining and equipping the depots, each is considered to be an independent, ongoing entity. Each independently justifies its modernization and equipment projects to the Air Systems Command. Although projects are examined and assigned a priority at headquarters level, including at DOD, there is no overall plan or tracking mechanism which recognizes the extent to which redundancies are being built into the six depots.

For example, each depot maintains engine shops to remain self-sufficient in the overhaul and repair of engines. In addition to engine rework depots already existing, the table below shows additional engine depot modernizations since 1969.

Project	Depot	Military construction funds (note a) (millions)
Engine accessory shops	Cherry Point	$2.3
Jet engine test cells	Norfolk	6.2
Jet engine test cells	Jacksonville	7.0
Aircraft power check facility	North Island	3.0
Engine parts coating facility	North Island	.9

a/The cost figures shown are for military construction only. Equipment costs associated with these projects were not readily available. Equipment costs are usually about equal to military construction costs.

The independence of each depots's modernization program and the lack of a master plan was further demonstrated by two projects approved for fiscal years 1973 and 1974 at Quonset Point. Although these projects, estimated to cost $2.2 million, were later canceled, they were approved shortly before the April 1973 announced closure of that installation.

The types of modernization projects which result from the selfsufficiency concept and which appear to be redundant are illustrated below.

Modernization Projects (1969-74)	Quonset Point	Cherry Point	Norfolk	Jacksonville	Pensacola	North Island	Alameda
Aircraft strip and paint facility		X	X	X	X	X	
Engine accessory shops	X	X					
Integration and test facility			X	X	X		
Aircraft power check facility			X			X	
Shop extension or improvement	X	X	X	X	X	X	X
Jet engine test cells			X	X			
Helicopter overhaul and repair shop	X					X	

As of fiscal year 1974, the Navy estimated that, in addition to $165 million already spent since 1969, it would take an additional $240 million during the next several years to modernize the six aircraft depots.

CONCLUSIONS

The Navy does not routinely determine mobilization workloads or manpower requirements for depot-level aircraft maintenance. As a result, the Navy has no basis for measuring whether existing capacity is too much or too little, and peacetime use is far below capacity.

On the basis of the correlation between aircraft flying hours and depot maintenance workloads generated and of DOD study results, existing capacity exceeds mobilization needs and significant consolidation potential exists. To capture maximum savings through consolidation of maintenance workloads, economic analyses should consider the feasibility of relocating or eliminating all activities at an affected naval air station.

The depot modernization program is geared toward independently modernizing the six existing aircraft depots to be self-sufficient rather than toward an overall modernization plan designed to develop needed capacity to meet specific mobiliztion needs. There is no overall plan or tracking mechanism which recognizes redundancies built or being built into the six depots.

CHAPTER 5

ALTERNATIVES AFFECTING CONSOLIDATION POTENTIAL

The need to establish inhouse industrial capacity criteria based on specific mobilization requirements is not simply self-serving to the Navy and DOD. It is also a means by which the Congress can judge the appropriateness of total defense maintenance operations as well as levels of funding for operations and maintenance, military construction, and procurement for maintaining industrial facilities.

On the basis of the evidence developed in the preceding chapter, the question appears to be how much, rather than whether, Navy aircraft depot workloads and capacity can be consolidated.

This chapter presents a number of alternatives which, individually and in combination, increase the potential for consolidation, including

--potential for increasing contract work,

--improved balance between depot-level and below-depot-level maintenance,

--increased interservice maintenance support, and

--increased emphasis on maintenance by technology rather than by weapon system.

POTENTIAL FOR INCREASING CONTRACT WORK

The extent of reliance on contractors for maintenance support affects the amount of inhouse depot-level capacity needed, both during peacetime and mobilization.

DOD's policy is that generally contractors should do at least 30 percent of the mission-essential workload and do all the nonmission-essential depot workload. The rationale of this policy is to insure an adequate and competitive maintenance base in private industry and, at the same time, hold inhouse capability and capacity to the minimum required for a ready and controlled source of technical competence and resources to meet military contingencies.

The Navy, however, does not follow this criteria closely, as shown in the charts on page 41.

Under DOD policy, of a projected workload of about 33.5 million man-hours a year, the Navy could contract out about 12.5 million man-hours--9 million mission essential and 3.5 million nonmission essential. The Navy plans to contract out only about 5.7 million man-hours--4.3 million mission essential and 1.4 million nonmission essential. Moreover, since the DOD-prescribed 30 percent is a minimum, the Navy is not restricted from contracting out even more than 12.5 million man-hours and still operate with the DOD intent of maintaining in house a ready and controlled source of technical competence and resources.

In addition, the ability of contractors to meet the added challenge of mobilization surge should not be ignored. Maintaining an adequate and competitive maintenance base in private industry, for example, is equally as important as inhouse technical competence in meeting mobilization requirements.

Also, if large-scale expansion of maintenance capacity becomes necessary to meet the needs of a protracted military conflict, both Government and contractor facilities should be able to expand.

Navy officials believe that increased contractor support would be more costly than inhouse support.

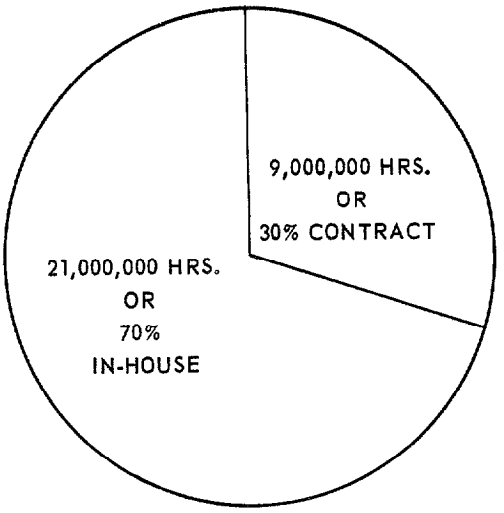
We did not analyze the Navy's data in detail. However, we briefly reviewed a cost comparison made by the Navy for contractor versus inhouse overhaul of CH-46 helicopters. That comparison was essentially an incremental cost comparison. That is, the contractor's fixed price proposal took into account depreciation of capital investments, labor costs, overhead, general and administrative costs, and profit, plus the questionable inclusion of the value of a 90-day stock level of components and parts to be furnished by the Government. The Navy's cost estimate, on the other hand, was made up almost entirely of estimated personnel costs.

Any tradeoff should include more than an item-by-item incremental cost comparison. It should include not only the Navy's full cost to do the work, such as labor, depreciation, training, and interest, but also, as one alternative, the relative costs that could be saved by phase down or closure of a facility.

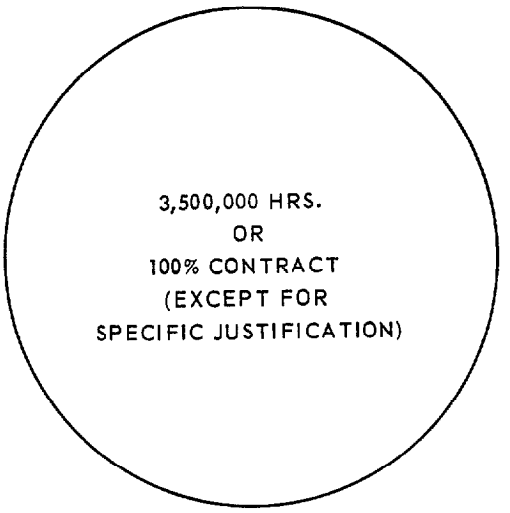
IMPROVED USE OF RESOURCES BELOW DEPOT LEVEL

Better use of resources currently available below the depot level offers the potential for increasing the amount

DOD CRITERIA

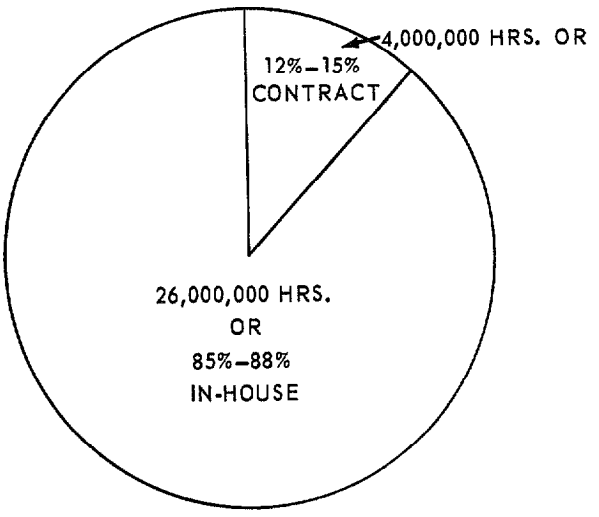


MISSION ESSENTIAL WORKLOAD

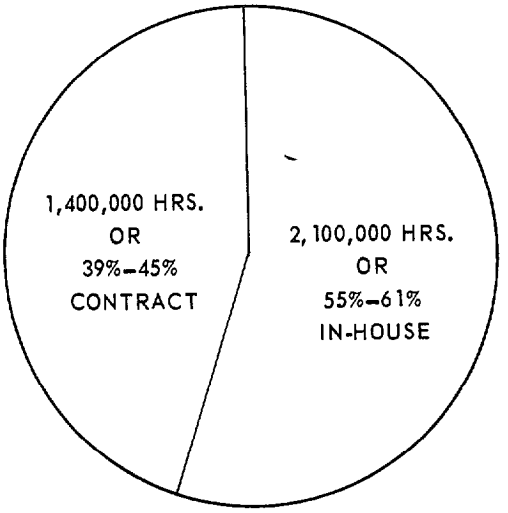


NON-MISSION ESSENTIAL WORKLOAD

NAVY ACTUAL



MISSION ESSENTIAL WORKLOAD



NON-MISSION ESSENTIAL WORKLOAD

of maintenance work done. Developing management systems to optimize this potential could have a material effect on the amount of depot-level capability and capacity needed.

Our report, "Productivity of Military Below-Depot Maintenance--Repairs Less Complex than Provided at Depots--can be Improved," B-163762, July 29, 1975, identified considerable potential for increasing the amount of work which could be performed by personnel below the depot level.

Our report to the Congress, "Management of Aircraft Modification Programs in the Army, Navy and Air Force," B-157373, October 1, 1974, showed that the Navy had a large volume of approved aircraft modification work which was planned to be done at the depot level. The report concluded that much of this work could be done below the depot level.

The two reports mentioned above address specific issues of below-depot-level maintenance and contain conclusions and recommendations about those issues, including the following:

--Some work currently planned in the depots could be done below the depot level.

--Personnel assigned below the depot level, mostly uniformed military personnel, could be detailed or assigned to depots for varying periods. This would not only add labor resources to depots, but also when the equipment is maintained in the field, it could provide invaluable training in the event of mobilization.

--Personnel costs associated with these resources are sunk costs so that better use at any level represents increased productivity at little or no increased cost.

POTENTIAL FOR INCREASED INTERSERVICE MAINTENANCE

Increased emphasis on interservice support of depot-level maintenance could further reduce the amount of capacity needed by the Navy.

Although the Army and Air Force have depot-level aircraft and engine maintenance capability and capacity to perform much of the same types of work currently done by the Navy, only about 2 percent of Navy's work is planned for Army and Air Force to do.

	Direct labor hours				
	Projected interservice support				
	1976	1977	1978	1979	1980
	(millions)				
Army	.5	.6	.6	.6	.6
Air Force	.3	.3	.3	.3	.3
	.8	.9	.9	.9	.9

INCREASED EMPHASIS ON MAINTENANCE BY TECHNOLOGY RATHER THAN BY WEAPON SYSTEM

The technology repair center concept, used now primarily by the Air Force, could be applied DOD-wide. That is, repair specialization is based on a technology rather than on specific systems. For example, F-4 radar equipment was previously repaired at one Air Force depot while the F-111 radar was repaired at another. Because the technical expertise, equipment, and facilities required to repair the two radars is essentially the same, according to the Air Force, this and other equipment with similar technology will now be repaired at one location.

Other hardware, such as missile components, electronic aerospace ground equipment, and weapons, are also candidates for this concept.

The use of the technology repair center concept is an effort by the Air Force to increase productivity, reduce maintenance costs, and make better use of depots. Available capacity at Air Force technology repair centers could be used to meet some Navy aircraft maintenance needs rather than further proliferate and fragment Navy inhouse capacity.

The Navy then could develop repair expertise in the technologies needed to meet its remaining workload. The Air Force and Army might also use these depots.

The Air Force anticipates initial costs to implement the concept at about $28.3 million for relocating equipment, transferring and training personnel, and losing some productivity. However, these one-time costs would be offset by annual savings estimated at nearly $14 million through the reduction of about 1,150 support personnel and over $20 million in the 5-year depot modernization program for depots which would not be needed under the new concept.

CONCLUSIONS

Considering the factors which affect requirements for depot maintenance and existing and projected depot capacity, we believe it is both feasible and desirable to consolidate depot operations. The extent of consolidation depends on developing a system for determining mobilization requirements and on whether DOD and the Navy are willing to (1) depend on contract support, (2) use below-depot-level capability more fully, (3) rely on interservice maintenance support, and (4) further develop the technology center concept.

We believe reductions are possible, because:

--Existing capacity is more than needed to meet mobilization requirements.

--Under existing DOD policy much of the current and projected depot workloads should now be done by contractors to insure an adequate and competitive maintenance base in private industry, and under this policy additional workloads could be assigned to contractors.

--More workload could be done with resources below the depot level.

--Current policy does not encourage seeking greater support from other services.

--The full potential of the technology center concept has not been exploited.

The workload of the six Navy depots has been based on DOD's criteria of operating one shift, 40 hours a week. Several concomitant and very costly elements of depot operations--depot capacity, level of use, staffing, facilities, equipment, plant modernization, and overhead--are also determined on this basis.

To maximize the potential benefits which could be gained from current administration and DOD emphasis to reduce support costs, the Secretary of Defense should critically reexamine the DOD policy of workloading depot facilities on a one-shift, 40-hour week basis.

RECOMMENDATIONS

We recommend that the Secretary of Defense consider adopting a policy of using maintenance depots more than one shift a day, 40 hours a week, and:

--Establish true mobilization needs and prepare contingency plans for staffing to such needs.

--Include in economic analyses of consolidation options the feasibility of relocating or eliminating all activities at naval air stations at which depot maintenance functions are candidates for elimination.

--Consolidate, eliminate, or place in reserve status, as appropriate, all excess or redundant depot capacity where considerable benefits can be achieved by such action.

--Concentrate modernization funds on those depots with long-term value and tailor each modernization project to definitive long-range plans.

DOD COMMENTS

DOD commented that the number and size of depot maintenance activities to be established or retained within the Department of Defense, as well as their planned use, are of continuing concern. The primary justification for retaining inhouse capability and capacity is to insure timely maintenance in military contingencies.

DOD agreed that projections of depot maintenance workloads for contingencies should be made routinely as part of overall contingency planning. Such planning, it said, had been accomplished on an ad hoc rather than a routine basis. It said that Naval Air System Command's long-range planning system had the capability for projecting contingency workloads, although it was used basically to routinely project peacetime workloads.

To overcome the lack of routine contingency planning for maintenance work, DOD plans to require annual 5-year projections for contingencies as well as peacetime, for depot workloads, for capacity, and for facility use. This will insure at least annually a review of facility requirements, projected use, and capacity to accommodate contingency workloads.

In commenting on the recommendation to consider a policy of using depots more than one shift a day, 40 hours a week, DOD said that such a policy would not be appropriate at this time. However, it said that while planned use of three or more shifts did not appear prudent due to contingency workloads, a single shift as currently used appeared inefficient.

For this reason DOD said it was currently exploring alternatives to determine if facility usage criteria for

mobilization was appropriate and that, if so, it planned to develop appropriate guidelines.

In summary, DOD concurred in the recommendation to routinely examine projected depot maintenance workloads under mobilization conditions and the resulting facility requirements. Facilities found to be excess as a result, it agreed, should be eliminated or placed in a reserve status as appropriate.

As a corollary, DOD plans to concentrate modernization funds in those facilities identified as having a long-term DOD mission.

APPENDIX I

ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

INSTALLATIONS AND LOGISTICS

24 SEP 1975

Mr. Fred Shafer, Director
Logistics and Communications Division
United States General Accounting Office
Washington, D. C. 20548

Dear Mr. Shafer:

The Secretary of Defense has asked me to respond to your letter of July 7, 1975 and the General Accounting Office draft report entitled "Navy's Aircraft Overhaul Depots Could Become More Productive" (OSD Case #4114).

We generally concur with the finding that substantial dollar savings can be realized by improving the management and operation of Naval Air Rework Facilities (NARF's). Detailed comments on those findings and recommendations involving the Navy alone are provided in the attachment. As you will note, in almost every instance, Navy is aware of the problem identified and has corrective action underway. Findings and recommendations presented concerning industrial capacity needs have potential application to all of DoD and are addressed below.

The number and size of depot maintenance activities to be established or retained within the Department of Defense, as well as the planned utilization of those facilities have been a continuing concern to the DoD. This is particularly true as we attempt to adapt to a period which demands availability of combat ready weapon systems within fiscal ceilings and, especially in the case of depot maintenance activities, under civilian personnel ceilings.

The primary justification for retention of a depot maintenance capability/capacity within the DoD is the requirement to have an assured capability for timely accomplishment of maintenance workloads in military contingencies. As noted in the report, DoD planning is based on availability of a mix of both DoD organic and contractor resources.

It follows that projections of depot maintenance workloads for contingencies should be made routinely as part of overall contingency planning. In fact, such planning has been accomplished on an ad hoc rather than a routine basis. It should be pointed out, however, that the Naval Air System Command does possess a long-range planning system which is used to routinely project and update peacetime workloads for depot maintenance. This same system has the capability for projection of contingency workloads and has produced such plans upon relatively short notice.

To overcome the lack of routine contingency planning for depot maintenance workloads, the OSD plans to establish a requirement for annual projections, for each of the five years covered, as well as under contingency conditions, of depot maintenance workloads, capacity, and facility utilization. This will assure at least annual review of depot maintenance facility requirements, projected utilization, and capacity to accommodate contingency workloads.

While we agree that the MACRO model developed by the GAO staff can be useful in prediction of gross depot workloads, we do not feel it is sufficiently detailed to address specific capability/capacity requirements. These must be addressed at the level of specific aircraft mission/design/series-e.g. F4-J, and by specific shop category within individual depots. To do this, a more detailed system such as NAVAIR's is necessary. We plan to review service capabilities to adequately program out-year workloads both in peacetime and for contingencies and take appropriate action where improvements are required.

The recommendation for workloading of maintenance depots beyond 1-shift 40-hour week is related to the above. Before discussing that question, however, we should point out that current guidance is for workloading to the equivalent of a 1-shift 40-hour week. In actual practice certain shops or work centers are workloaded beyond a single shift because of high capital investments, production "bottlenecks," or the nature of the operation. Engine test cells, plating facilities, and shops utilizing high cost test equipment or numerically controlled tools are areas where multi-shift operation is frequently utilized.

Since facilities are generally justified by contingency workloads, due consideration must be given to the planned utilization under mobilization. Keeping in mind the inherent imprecision of mobilization workload projection, planned utilization of three full shifts or more does not

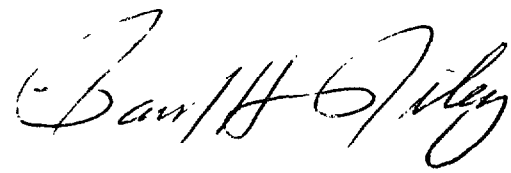
appear prudent. On the other hand utilization on a single shift appears inefficient. For this reason we are currently exploring alternatives to determine if a specific facility utilization criteria for mobilization is appropriate and, if so, what that criteria should be. Indications to date are that such criteria would be useful, and we expect to develop appropriate guidance.

Establishment of facility utilization criteria for peacetime operations will be a function of the mobilization utilization criteria and the nature of the operation, i.e. whether it is capital intensive or labor intensive process. At one end of the spectrum a capital intensive process with a minimal surge from peacetime to mobilization workloads could be expected to operate on a multi-shift basis in peacetime as well as in contingencies. At the other end of the spectrum for a labor intensive process with a significant workload surge in mobilization an analysis might indicate a single shift operation in peacetime as more efficient. Basically we believe that the decision must be on a case-by-case basis.

In summary, we concur in the recommendation to routinely examine projected depot maintenance workloads under mobilization conditions and the resulting facility requirements and are taking action as outlined above. Facilities determined to be excess as a result should be eliminated or placed in a reserve status as appropriate. As a corollary, we will plan to concentrate modernization funds in those facilities identified as having a long time DoD mission. We do not consider it appropriate at this time to direct multi-shift use of depot maintenance activities. Instead we plan to establish guidance for utilization under mobilization conditions with peacetime utilization standards to be derived on a case-by-case basis.

We appreciate your continued interest and assistance in improvement of the management of depot maintenance in the DoD.

Sincerely,



PAUL H. RILEY
Acting Assistant Secretary of Defense
(Installations and Logistics)

Attachment
a/s

REFERENCE CHAPTER 2

DEPOT MAINTENANCE

Recommendation: "We recommend that the Secretary of the Navy provide greater management support and reinforcement of the entire work measurement concepts and principles at all echelons."

Comments: Concur. Greater emphasis and support of scientific management practices and tools are normally desirable. The present staffs of the Methods and Standards Division reviewed are considered to be of sufficient quantity and quality to attain and maintain the NAVAIR engineered standards goal of 80%. Both activities visited by the GAO auditors have started Methods and Standards technician training classes during the past year. However, despite this, abnormal workload changes such as the newly introduced F-14 program at Norfolk will cause a temporary set-back in efforts to attain the 80% goal without an unacceptable temporary increase in Methods and Standards resources. For job shop type operations which, in effect, NAVAIREWORKFACs largely support, 80% engineered coverage is considered a maximum goal attainable under the most advantageous circumstances.

NAVAIREWORKFACs are now using modern, economical methods of setting labor standards by utilizing Elemental Standards Data applied to various tasks both manually and by computer. It is true that in-depth NAVAIR audits of the standards programs have disclosed standards that did not fully meet the requirements for engineered standards. However, most of the discrepancies noted do not negate the value of these standards. The largest discrepancy found, overage, does not in itself negate the value of a labor standard. Efforts will continue to improve all standards.

NAVAIR itself has strongly supported a quality work measurement system six years ago by initiating and maintaining an in-depth audit system which provides for an annual review of the entire Performance Standards Program at each of the NAVAIREWORKFACs.

Recommendation: "In the area of labor standards, critically examine the workloads at each depot to determine the high-volume work for which labor standards development and maintenance efforts should be concentrated."

Comments: Concur. This criteria for the assignment of work within the standards development function requires an accurate forecast of workload per each type worked by each NAVAIREWORKFAC. The precise workload by item number is almost impossible to forecast accurately under present circumstances, particularly in the components program.

The system currently followed for work assignment of standards personnel is functionally oriented. Shop man-hours expended by trade skill or function is the criterion for assignment of standards effort. Those skills or functions in total which consume the higher number of man-hours receive priority treatment in order to utilize more efficiently the standards talent available. Efforts will be made to better match this approach with that suggested in the recommendation.

Recommendation: "Develop and systematize induction occurrence factors to gain greater production efficiencies from the standards program."

Comment: Concur. Occurrence factors on operations are dependent upon the collection of a sufficient history of occurrences so that occurrence reliability can be established. The depot level management information system currently collects this history. However, the program for utilizing this history data to generate occurrence factors, update them on a periodic basis using the most recent history data, and apply them automatically on the Master Data Record will not be completed for some 6 to 9 months. In the meantime, several activities including Norfolk are developing occurrence factors on a manual basis. This action is not universal nor will it be forced in view of impending completion of the automated program.

Recommendation: "Require system discipline and integrity needed to overcome existing inadequacies and errors in the present standardized management information system."

Comments: Concur. Both Headquarters and depot management personnel have recognized the need for improved control over the accuracy of data introduced into the information system through labor transactions and handwritten work documents. On the occasion of field visits by Headquarters management systems personnel, this need has been emphasized resulting in a marked improvement of such control in the recent past. For example: the number of handwritten work documents has been cut in half during the past 16 months at Norfolk.

Furthermore, action is now being pursued to replace present computer equipment at each depot Data Processing Support Center with new third generation equipment. This, coupled with new source data automation equipment containing tutorial features, will provide managers with significantly improved management data input and output control on a real time basis. It is the tool essential to timely review, coordination and control of system functions.

Finally, NAVAIR will establish periodic audits whereby the accuracy of operation of the management information systems will be subjected to top

level review, including input data and output reports. Audits will be conducted by members of the Workload Control Team, which is responsible for the development, implementation and control of depot management information systems.

Recommendation: "Closely monitor the above actions and establish a realistic target date for determining norms based on standards, rather than on historical averages."

Comments: Partially concur. The recommendation indicates that only historical averages of expended man-hours are presently used as a basis for workload norms. This is incorrect since workload performance standards definitely are used to develop workload norms. However, standards cannot be the only factor considered due to the inability of a depot to accurately predict work content or scope prior to induction of an item. Again, the management system enhancements that will be available upon installation of new computer equipments and more comprehensive system programs will enable all levels of management to place more emphasis and confidence in the use of standards to develop norms.

The workload norms computed by Norfolk are now based on labor standards in the aircraft and component areas. For aircraft the standards are used as the basis for compiling "total earned hours" per individual aircraft tail number. The total earned hours are those standards hours earned for all operations actually performed on that aircraft. The earned hours are then totaled and averaged by type, model and series of aircraft and factored by planned efficiency as required. Workload norms for components are being computed by the Methods and Standards personnel based on their own standards factored manually as required. These factors include shop efficiency, production occurrence factors, and induction occurrence factors.

As indicated in the comments regarding the induction factor recommendation, the computerized system to develop norms based on standards will be available within 6 to 9 months. It must be emphasized that application of such norms to project workload will always be subject to some degree of adjustment due to the numerous variables involved in any large maintenance process. As experience is gained and more data is stored within the management system, norms will become increasingly more accurate for projection of workload, particularly for a reasonable number of like items. Yet, any given item could vary substantially from the projected norm for sound reasons. As long as management is aware of the variation and its reason, the system for work projection is considered valid.

APPENDIX I

REFERENCE CHAPTER 3

Recommendation: "We recommend that the Secretary of the Navy discontinue routine concurrent rework of components and limit this to only essential testing and/or minor repair."

Comments: Concur. However, the contention that concurrent rework is routinely carried out while system-wide needs are backlogged is not presently correct. The Navy recognized two years ago the need to limit concurrent rework of components. Under the old Aircraft Condition Evaluation (ACE) and the new Standard Depot Level Maintenance (SDLM) concepts, concurrent rework of components has been limited to replacement of only those components which have failed or which will reach maximum operating time before the aircraft can be returned to the squadron. Replaced components are not concurrently reworked except in cases where they are in short supply. Only if in short supply will they be reworked to preclude protracted delays in delivery of the airframe to the fleet and a disruption to the aircraft production schedule. This procedure is cost effective in that packaging, preservation, handling and retesting of the carcass and the repaired item are both avoided. In addition, a very expensive airframe is returned to operating status expeditiously.

Recommendation: "In addition, the Navy should consider assigning sufficient authority to ASO to enable that organization to better meet its responsibilities and to be more responsive to fleet needs."

Comment: Concur in principle but not with the specific intent. This recommendation is based on the perception that ASO is responsible for depot level repair of components. This is not the case. ASO states the component rework requirements and provides bit and piece support for necessary repairs. ASO has sufficient authority to meet these responsibilities. The Naval Air Systems Command then schedules and produces components to satisfy fleet requirements as collected and stated by ASO. Efficient management of the depots requires NAVAIR to consider all programs in a rework facility and to assign work based on overall priority, available capacity, facilities, and trade skills. Workload distribution inequities alluded to by the report resulted from a non-RFI carcass maldistribution. A redistribution of high priority carcasses in early 1975 corrected this situation. Current induction records show all rework facilities inducting predominantly level 1 and level 2 (high priority) components. This firmly indicates that available funds and capacity are being utilized to repair the proper components. There is an inaccurate statement within the report that relates to this recommendation. The statement indicates that component rework occupies a backseat to both engine and aircraft reworks. This is not the case. Funding devoted to

components has increased during the past few years to the point at which it comprises about 41 percent of the aircraft rework budget. In addition, the management attention applied to improving performance in this area dwarfs that currently being applied to the other areas.

Recommendation: "We also recommend that the Secretary of the Navy require the Depots to concentrate on opportunities to batch process component repair; reduce scheduling and production fall out; and reduce maintenance turn-around-time and purify shop backlog of returning or reclassifying work which cannot be completed."

Comment: Concur. A partial return to the old concept of batch processing has been in existence for more than a year. The High Burner or Level Scheduling Program provides for level induction of these items that incur more than $80,000 in depot level repair costs annually. The production requirement is made known on a quarterly basis and the rework facilities have the option to batch process where possible. Sixty percent of the organic component repair budget is currently being applied to this program. It will never be possible nor will it always be economical to batch process all component repair requirements. To the extent, however, that batch processing is practical, it is being used. Scheduling and production fallout is primarily due to system record inaccuracies and lack of support piece parts. The need to correct system data inaccuracies and intensify the prepositioning of production support requirements is recognized and is continually being pursued. Manual override procedures applied to the weekly priority one requirements over the past three months, which have detected and corrected data inaccuracies, have resulted in the percent of requirement inducted to rise from 60% to approximately 90%. Special requisitioning procedures and intensified identification of piece parts deficiencies have improved the lack of support problem. The average in-process time at the rework facilities has been reduced from over 50 days per unit in FY-71 to 25 days per unit in FY-75. Continued attention is being applied to ensure that maintenance turn-around-time is kept at a practical minimum and shop backlog is optimized.

PRINCIPAL OFFICIALS OF THE DEPARTMENTS OF DEFENSE AND NAVY RESPONSIBLE FOR THE ACTIVITIES DISCUSSED IN THIS REPORT

	Tenure of office	
	From	To
DEPARTMENT OF DEFENSE		
SECRETARY OF DEFENSE:		
Donald H. Rumsfeld	Nov. 1975	Present
James R. Schlesinger	July 1973	Nov. 1975
William P. Clements, Jr. (acting)	Apr. 1973	July 1973
Elliot L. Richardson	Jan. 1973	Apr. 1973
Melvin R. Laird	Jan. 1969	Jan. 1973
DEPUTY SECRETARY OF DEFENSE:		
William P. Clements, Jr.	Jan. 1973	Present
Kenneth Bush	Feb. 1972	Jan. 1973
Vacant	Jan. 1972	Feb. 1972
ASSISTANT SECRETARY OF DEFENSE (INSTALLATIONS AND LOGISTICS):		
John J. Bennett (acting)	Mar. 1975	Present
Arthur I. Mendolia	June 1973	Mar. 1975
Hugh McCullough (acting)	Jan. 1973	June 1973
Barry J. Shillito	Jan. 1969	Jan. 1973
DEPARTMENT OF THE NAVY		
SECRETARY OF THE NAVY:		
J. William Middendorf	June 1974	Present
J. William Middendorf (acting)	Apr. 1974	June 1974
John W. Warner (acting)	May 1972	Apr. 1974
UNDER SECRETARY OF THE NAVY:		
David S. Potter	Aug. 1974	Present
Vacant	June 1974	Aug. 1974
J. William Middendorf	June 1973	June 1974
Frank Sanders	May 1972	June 1973

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