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

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JUN 25 1974

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The Honorable Ronald V. Dellums and
Fortney H. Stark
House of Representatives

Dear Messrs. Dellums and Stark:

Your letter of October 3, 1973, requested that we study the six Naval Air Rework Facilities to determine:

--The type of work done at each. (See p. 2.)

--The Navy's projected needs for these facilities. (See p. 4.)

--The capability of the various facilities to handle the projected workloads, given the demands at each base, availability of additional employees, and proximity of ships serviced. (See p. 7.)

--The consequences of closing each facility, including the effect on remaining facilities.

--The possibility of reopening the facilities in wartime.

--Plans for opening any other Naval Air Rework Facilities in the United States or overseas. (See p. 11.)

At a January 25, 1974, meeting with your office, we were told that your concern with the consequences of closing the facilities and the possibility of reopening them had to do with the services' policies for disposing of or holding real estate. As agreed at that meeting, we have not addressed those questions in this letter.

As instructed by your office, we did not obtain official written comments from the Navy. However, we discussed the matters in this letter with Navy officials, and their comments have been incorporated in this letter.

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TYPE OF WORK DONE

The Navy has three levels of aircraft maintenance: (1) organizational, (2) intermediate, and (3) depot. 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 trouble-shooting. The intermediate maintenance activities do maintenance work beyond the capability of the organizational level and serve the 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.

Depot level maintenance includes the major reworking and overhauling of aircraft, engines, and components. This work is done primarily at the six U.S. Naval Air Rework Facilities; part of the work is done at rework facilities of the Air Force, Army, and other agencies and at contractor plants.

The table on page 3 shows the costs for the portion of work done by the Naval Air Rework Facilities during fiscal years 1965-73.

The type of work done at all six rework facilities is similar, although generally, no two facilities work on the same aircraft systems, engines, or aeronautical components. Each rework facility does work in the following nine shop categories, but a facility may use one shop more than others.

--Airframe
--Engines
--Accessories and components
--Electronics, communications, 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 reworked in the accessories and components shops and in the electronics, communications, and armament shops.

The skills within each shop category are essentially the same at all six facilities. Thus, since the type of workloads at all the facilities is similar, most skills within the same shop categories are readily transferable from one facility to another. Personnel transferred would, of course, require varying degrees of transitional training and orientation.

| | Fiscal year | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | Total |
| East Coast: | | | | | (millions) | | | | | |
| Norfolk | $51.5 | $58.5 | $65.6 | $71.5 | $109.2 | $106.2 | $92.2 | $93.3 | $86.4 | $734.4 |
| Pensacola | 35.7 | 39.1 | 43.1 | 54.7 | 77.9 | 70.8 | 77.6 | 77.7 | 78.1 | 554.7 |
| Jacksonville | 29.8 | 36.1 | 38.7 | 40.9 | 64.0 | 64.2 | 57.6 | 63.6 | 63.7 | 458.6 |
| Quonset Point (note a) | 27.3 | 34.0 | 34.3 | 36.6 | 49.7 | 50.9 | 48.1 | 50.5 | 48.2 | 379.6 |
| Cherry Point | 17.9 | 22.0 | 27.9 | 32.7 | 49.3 | 51.8 | 38.6 | 46.0 | 47.4 | 333.6 |
| West Coast: | | | | | | | | | | |
| North Island | 61.6 | 76.2 | 89.7 | 97.8 | 137.9 | 124.5 | 130.4 | 147.5 | 152.6 | 1018.2 |
| Alameda | 63.8 | 82.2 | 91.6 | 99.2 | 139.8 | 131.2 | 121.4 | 129.9 | 134.4 | 994.1 |
| Total | $287.6 | $348.1 | $390.9 | $433.4 | $627.8 | $599.6 | $565.9 | $608.5 | $610.8 | $4473.2 |

[a]Quonset Point discontinued operations after fiscal year 1973.

Similarly, the physical facilities are not so unique as to prohibit reassigning the workload of one facility to another or to commercial plants.

PROJECTED NEEDS FOR REWORK FACILITIES

According to Navy officials, there are no current plans for closing additional rework facilities.

Workload projections for fiscal years 1976-1980 show that the Navy plans to use between 31 million and 32 million direct labor hours a year at the six facilities. This compares with 30 million to 35 million hours for the 1970-1974 timeframe. These workloads are projected on the basis of one shift, 8 hours a day, 5 days a week, at a historical average rate of efficiency. In addition, the Navy is projecting between 5.7 million and 7.3 million direct labor hours a year to be distributed among contractors and other Government facilities.

| | Direct labor hours | | | | |
|---|---|---|---|---|---|
| | 1976 | 1977 | 1978 | 1979 | 1980 |
| | | | (millions) | | |
| Alameda | 6.5 | 6.9 | 6.8 | 7.1 | 7.0 |
| North Island | 8.1 | 8.0 | 8.0 | 7.5 | 7.4 |
| Norfolk | 6.5 | 6.3 | 6.5 | 6.7 | 6.8 |
| Jacksonville | 3.1 | 3.1 | 2.9 | 2.6 | 2.8 |
| Pensacola | 4.0 | 3.9 | 3.8 | 3.8 | 3.6 |
| Cherry Point | 3.6 | 3.8 | 3.9 | 3.5 | 3.5 |
| Total by Navy | 31.8 | 32.0 | 31.9 | 31.2 | 31.1 |
| Contractors: | | | | | |
| Continental U.S. | 5.2 | 5.0 | 4.2 | 3.9 | 3.9 |
| Outside continental U.S. | .9 | .8 | .8 | .6 | .5 |
| Army | .5 | .6 | .6 | .6 | .6 |
| Air Force | .3 | .3 | .3 | .3 | .3 |
| Other | .4 | .4 | .4 | .4 | .4 |
| Total outside Navy | 7.3 | 7.1 | 6.3 | 5.8 | 5.7 |
| Total Navy projections | 39.1 | 39.1 | 38.2 | 37.0 | 36.8 |

## REWORK FACILITY ACTIVITY AND CAPACITY UTILIZATION

Direct labor consumption per unit produced has risen sharply at the rework facilities, while workloads have steadily decreased. Despite the closing of Quonset Point, the capacity of the six remaining rework facilities exceeds projected workloads. This is especially evident when three-shift or even two-shift capacity is considered.

Our analysis of rework facility activity in fiscal years 1965-80 considered the following major areas.

--Impact of force structure and flying-hour programs on workload formulation and allocation.

--Aircraft, engine, and component workloads accomplished and projected.

--Related trends in labor consumption.

--Past and projected capacity utilization.

### The workload formulation and allocation process

To understand the Navy's total aeronautical maintenance program, it is first necessary to understand how the force structure and flying-hour programs affect the maintenance workload formulation and allocation process. This process includes three major steps.

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

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

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

The force structure of aircraft to be supported and the flying-hour programs are determined by the Office of the Chief of Naval Operations.

The Naval Air Systems Command uses the force structure to determine the number of aircraft to undergo depot level maintenance based on established calendar cycles. The Command uses the flying-hour program and the Navy's criteria for flying-hours between overhauls to calculate the number of engines to be overhauled.

The Aviation Supply Office calculates supply support, including requirements for repairing aeronautical components, by a computerized algorithmic formula which relies heavily on the flying-hour programs.

Trends in labor consumption

The table below shows the trends in labor consumption for the three major categories of work done during the 1965-73 period.

| | Average direct labor hours per unit | | | | | |
|---|---|---|---|---|---|---|
| Fiscal | Aircraft | | Engines | | Components | |
| Year | Number | Man-hours | Number | Man-hours | Number | Man-hours |
| 1965 | 3469 | 4160 | 8732 | 472 | 319080 | 14.6 |
| 1966 | 3624 | 4896 | 9516 | 454 | 406379 | 15.9 |
| 1967 | 3104 | 6134 | 10098 | 499 | 472561 | 16.1 |
| 1968 | 2448 | 7890 | 9998 | 489 | 402978 | 19.6 |
| 1969 | 2705 | 7368 | 10235 | 499 | 525464 | 18.3 |
| 1970 | 2090 | 7472 | 8791 | 531 | 379091 | 19.5 |
| 1971 | 2050 | 7057 | 7763 | 515 | 355438 | 19.4 |
| 1972 | 2018 | 6924 | 6889 | 561 | 365917 | 19.8 |
| 1973 | 1618 | 7901 | 6677 | 513 | 278576 | 23.7 |
| Average increase or decrease (-) from 1965 to 1973 | -1851 | 3741 | -2055 | 41 | -40504 | 9.1 |
| Percent of increase or decrease (-) | - 53 | 90 | - 24 | 8 | - 13 | 62.3 |

While some of the increased labor per unit may be ascribed to the more complex and sophisticated nature of work, we believe that much of it is due to increases in the amount of work done with each successive cycle of aircraft, engines, and components undergoing rework. The amount of work done on the average airplane during aircraft rework, for example, had grown to such an extent that the Navy introduced a program limiting certain aircraft to only minimum essential maintenance.

Capacity utilization

A facility's capacity is usually thought of as its maximum capability to produce outputs by its personnel and equipment. To determine capacity, it is first necessary to define the output required. A facility continuously producing the same output can determine its capacity more easily than one producing a mix of outputs.

An ideal product mix, for example, enables all machines to be equally utilized. Shop capacity is reached when the volume of workload with the ideal product mix cannot be increased with existing manpower and equipment. Conversely, the extent of underutilized machines may be a measure of the amount of unneeded capacity.

When the product mix varies extensively, as appears to be the case with the wide variety of items reworked by the rework facilities, calculation of capacity becomes much more difficult. Capacity can be calculated for each shop category or for all shops combined. When workload is divided unevenly among the shop categories, however, practical capacity of the entire facility becomes limited by the individual shop which is first to reach its maximum workload volume. The remaining shops cannot reach maximum capacity.

In addressing capacity of military facilities, reserve capacity for mobilization contingencies must be considered. Department of Defense guidelines on the use of contractor and Government resources for depot maintenance 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 mimimum 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."

Following these guidelines, 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 one-shift basis. This calculation assumes that (1) the stations are manned with appropriately skilled personnel operating at an efficiently paced workrate and (2) the existing plant layout and product mix are conducive to minimum loss of labor effort. The number of workers derived represents workload capacity at 100 percent utilization and remains constant unless major changes occur in layout, work content, or product mix.

This measure is not expected to be totally precise due to the subjective judgments related to the variables. However, we believe it is acceptable for showing gross capacity and the amount of reserve capacity available for mobilization contingencies and for indicating the current balance in the product mix.

Gross capacity and reserve for mobilization

The following table shows the estimated gross capacity of each air rework facility by extending the Navy's one-shift calculation to a three-shift theoretical capacity and compares it with utilization in 1973. The difference represents gross capacity currently available for mobilization contingencies.

| Facility | One-shift capacity | Three-shift capacity (note a) | 1973 utilization | Reserve capacity for mobilization |
|---|---|---|---|---|
| | (Direct man-hours in millions) | | | |
| Alameda | 7.7 | 23.0 | 6.5 | 16.5 |
| North Island | 7.1 | 21.5 | 8.0 | 13.5 |
| Norfolk | 6.5 | 19.4 | 4.9 | 14.5 |
| Jacksonville | 3.8 | 11.3 | 2.8 | 8.5 |
| Cherry Point | 2.5 | 7.6 | 2.5 | 5.1 |
| Pensacola | 4.3 | 13.0 | 3.9 | 9.1 |
| | 31.9 | 95.8 | 28.6 | 67.2 |

[a]Extensions vary due to rounding.

As shown on p. 4 , the Navy expects the workload at its six rework facilities to be at about the same level in 1980 as it was in 1973. It appears, therefore, that there will be ample overall mobilization capacity at these facilities for the next several years. As discussed below, however, it is not realistic to expect capacity to triple by moving to a three-shift operation.

Product mix

Analyzing capacity of the rework facilities on a gross basis, as in the table above, can be misleading because it misstates the practical availability of capacity. Capacity should be analyzed at a lower organizational level.

As discussed earlier, some shops are used more than others. Also some currently exceed one-shift operations. The table on page 10 compares one-shift capacity with the actual utilization at each rework facility during fiscal year 1973 and shows the percent of one-shift capacity used.

The above table demonstrates that the present workload is not well balanced in relation to the capacity of the different shop categories. The reported high utilization in the airframe shops and the low utilization in the components shops is, however, attributable to some extent to the rework facilities' method of accounting. Some components are removed from aircraft in the airframe shops, processed through the components shops, and reinstalled on the aircraft. This is called concurrent rework, and all direct labor associated with repairing these components is charged to the airframe shops. This method of accounting overstates utilization in one category while understating utilization in another.

Nevertheless, the table does indicate an unbalanced workload which, in turn, suggests that total capacity, and therefore reserve mobilization capacity, is limited by the capacity of the airframe shops.

Impact of decreasing force structure and flying hours on Navy's maintenance program

The following table shows a 15-year trend in the number of aircraft and engines reworked compared with the number of aircraft and flying hours supported.

| Year | Total aircraft supported | Flying hours (millions) | Aircraft in depot maintenance | Engines in depot maintenance |
|---|---|---|---|---|
| 1965 | 7922 | 3.7 | 3469 | 8732 |
| 1966 | 7739 | 3.7 | 3624 | 9615 |
| 1967 | 7643 | 3.7 | 3104 | 10098 |
| 1968 | 7842 | 3.6 | 2448 | 9998 |
| 1969 | 8279 | 3.7 | 2705 | 10235 |
| 1970 | 8309 | 3.2 | 2090 | 8791 |
| 1971 | 7959 | 2.9 | 2050 | 7763 |
| 1972 | 7171 | 2.7 | 2018 | 6889 |
| 1973 | 6901 | 2.6 | 1618 | 6677 |
| 1974 | 6737 | 2.6 | 1761 | 6156 |
| 1975 | 6475 | 2.5 | 1441 | 5661 |
| 1976 | 6083 | 2.4 | 1258 | 7115 |
| 1977 | 6171 | 2.4 | 1291 | 6989 |
| 1978 | 6058 | 2.4 | 1366 | 6843 |
| 1979 | 5965 | 2.4 | 1278 | 6632 |

| | Airframe | | | Engine | | | Component | | | Other | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Capacity | Actual | Percent of Actual | Capacity | Actual | Percent of Actual | Capacity | Actual | Percent of Actual | Capacity | Actual | Percent of Actual |
| | (Direct man-hours in millions) | | | | | | | | | | | |
| Alameda | 2.1 | 2.5 | 119 | 1.4 | .7 | 50 | 2.9 | 1.6 | 52 | 1.3 | 1.7 | 131 |
| North Island | 1.5 | 3.5 | 233 | .8 | .6 | 75 | 3.2 | 1.6 | 50 | 1.6 | 2.3 | 144 |
| Norfolk | 1.8 | 2.1 | 117 | .8 | .7 | 87 | 2.5 | .9 | 36 | 1.3 | 1.2 | 92 |
| Jacksonville | .8 | 1.0 | 125 | .7 | .4 | 57 | 1.6 | .6 | 37 | .8 | .7 | 88 |
| Cherry Point | .7 | .9 | 129 | .4 | .4 | 100 | .8 | .6 | 75 | .6 | .6 | 100 |
| Pensacola | 1.2 | 2.1 | 175 | .4 | .3 | 75 | 2.1 | .9 | 43 | .6 | .7 | 117 |
| Total | 8.1 | 12.1 | 149 | 4.5 | 3.1 | 69 | 13.1 | 6.2 | 47 | 6.2 | 7.2 | 116 |

Since the size of the Navy's maintenance program is a direct reflection of the number of aircraft supported and hours flown, a reduced aircraft fleet and flying-hour program should result in a reduced maintenance workload.

PLANS FOR OPENING OTHER REWORK FACILITIES

According to Navy officials, there are no current plans for opening other rework facilities either in the continental United States or overseas. Overseas depot maintenance work is done predominantly in the Far East under contract with Japanese firms. The volume of this work, however, has declined significantly from about $28 million in fiscal year 1970 to about $10 million in fiscal year 1974.

The Far East work is basically a matter of logistics expedience. That is, the transportation costs and the time involved in returning this material to the continental United States for rework are deemed impractical by the Navy.

We have begun a review of the Navy's total system for managing its aeronautical maintenance and supply operations. As we informed your office, we shall be happy to furnish you copies of any report we issue as a result of that review.

We trust the information in this letter is sufficient for your purposes. We will not disclose or further distribute this letter unless you publicly disclose its contents or give us permission to do so.

Sincerely yours,

Elmer B. Staats

Comptroller General
of the United States