# REPORT TO THE CONGRESS

## Savings And Greater Effectiveness Obtainable In Army Helicopter Maintenance Program B-146888

Department of the Army

*BY THE COMPTROLLER GENERAL OF THE UNITED STATES*



DEC. 7,1970

*COMPTROLLER GENERAL'S REPORT TO THE CONGRESS*

SAVINGS AND GREATER EFFECTIVENESS OBTAINABLE IN ARMY HELICOPTER MAINTENANCE PROGRAM B-146888

# D I G E S T

## *WHY THE REVIEW WAS MADE*

The General Accounting Office (GAO) made this review of the depot-level maintenance program of Army helicopters, engines, and components because large quantities of those costly types of equipment were awaiting repair at the Army Aeronautical Depot Maintenance Center, Corpus Christi, Texas, at a time of unusual military need for them. Depot-level maintenance involves major overhaul or rebuilding of military equipment.

## *FINDINGS AND CONCLUSIONS*

The Army's backlog of helicopters, engines, and components requiring repair increased substantially during the 18-month period ending January 1970 because of increased military operations and insufficient use of maintenance capabilities.

--Over 200 helicopters valued in excess of $63 million were awaiting repair and overhaul on January 31, 1970. (See p. 6.) At the same time, the Army had on order or was planning to buy, through fiscal year 1971, about 1,700 additional helicopters. (See p. 11.)

--Large quantities of engines and components, with an original cost of about $88 million, were also awaiting repair while orders for similar or identical items were outstanding. (See pp. 14 and 19.)

GAO believes that the Army can attain the same or increased availability of helicopters at a lower cost by increasing its maintenance program and by reducing or stretching out its procurement program. The overhaul and repair of helicopters, engines, and components result in fully serviceable items at a substantially lower cost than that of new, purchased items. For example, an AH-1G helicopter costing $450,000 can be overhauled or rebuilt for an average cost of $150,000 to $200,000. Furthermore, overhauled items are generally available for reuse sooner than new items because overhaul time is generally much less than new production leadtime. (See p. 8.)

The Army has sufficient physical plant and equipment available to expand its capacity. Additional funding would be needed, however, for the personnel costs involved in establishing a second work shift and, if needed, a third shift, at the Army Aeronautical Depot Maintenance Center. In additional work shifts at the Center

Tear Sheet

DEC. 7,1970

January 1970 there was one shift. Additional funding would also be needed to expand the quantity of work being done under contract. (See p. 8.)

## RECOMMENDATIONS OR SUGGESTIONS

GAO proposed that the Army:

--Reappraise its depot maintenance program for aviation and take full advantage of both in-house and contractor maintenance capabilities to reduce to a minimum the backlogs of aircraft, engines, and components awaiting overhaul. (See p. 11.)

--Review the supply status of aircraft, engines, and major components to reevaluate both the need for those on order and their delivery schedule. (See p. 11.)

## AGENCY ACTIONS AND UNRESOLVED ISSUES

The Army said that it agreed to GAO's recommendations, that overhaul programs had been or would be increased, and that procurement requirements for some new items had been reduced. (See p. 11.)

The Army said that these actions should reduce the quantity of aircraft awaiting repair to a "normal level." (See p. 11.) Since the Air Force and the Navy do not maintain a backlog of aircraft awaiting repair (see p. 12), GAO believes that what the Army considers a normal level is too high and that attempts should be made to keep the backlog substantially smaller. (See p. 12.)

The Army did not agree that the existence of a large backlog of aircraft awaiting repair indicated that aircraft being purchased were not needed. The Army said that it needed even more helicopters than it was now buying. (See p. 12.) GAO did not evaluate the Army's need for helicopters. Prompt overhaul, however, would make more helicopters available sooner to units needing them. (See p. 12.)

The Army said that it had made a substantial reduction in the quantity of spare engines being bought and had increased the quantity scheduled to be repaired. But the quantity of T63 engines on hand on January 31, 1970, was three times the Army's own criteria for a backlog of engines awaiting repair. GAO believes that, if the backlog were kept at a lower average level, the Army might be able to further reduce the quantity of engines being bought. (See p. 18.)

The Army said that, although components were still backlogged because of fund shortages, new contracts had been awarded, overhaul quantities would be increased, and the total inventory of components would be

reduced. GAO believes that those actions will improve the condition that existed on January 31, 1970. GAO is requesting, however, that the Army keep it advised of progress in reducing the backlog of components awaiting repair. (See p. 21.)

GAO is recommending that the Secretary of the Army direct the Commander of the Army Aviation Systems Command to:

--Consider adopting the procedures used by the Air Force and the Navy in scheduling aircraft for depot-level repair, with the objective of reducing the average quantity of aircraft awaiting repair. (See p. 13.)

--Continue reducing the backlog of engines awaiting repair. GAO further recommends that the quantity of engines due from new procurement be reevaluated to determine whether additional reductions can be made by decreasing the quantity of engines awaiting repair. (See p. 18.)

## *MATTERS FOR CONSIDERATION BY THE CONGRESS*

GAO is providing this report to the Congress in view of the substantial savings and improvement achievable in the Army's aviation maintenance program.

Tear Sheet

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

B-146888

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

This is our report on the savings and greater effectiveness obtainable in the Army helicopter maintenance program.

Our review was made 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).

Copies of this report are being sent to the Director, Office of Management and Budget; the Secretary of Defense; and the Secretary of the Army.

Elmer B. Staats

Comptroller General
of the United States

# Contents

*COMPTROLLER GENERAL'S REPORT TO THE CONGRESS*

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# CHAPTER 1

## INTRODUCTION

Management of Army aircraft, engines, and components is the responsibility of the Army Aviation Systems Command, St. Louis, Missouri, a subordinate command of the Army Materiel Command, Washington, D.C. Included in the Aviation Systems Command's management mission is the responsibility for requirements computations, inventory management, supply and stock control, maintenance, and procurement, of aircraft, engines, and components.

The Army Aeronautical Depot Maintenance Center, Corpus Christi, Texas, under the direct jurisdiction of the Aviation Systems Command, is the Army's principal in-house facility for depot-level maintenance of rotary wing aircraft (helicopters), engines, and components. Recently a second in-house maintenance activity was developed at the Naval Air Rework Facility, Pensacola, Florida.

In addition to the overhaul and maintenance provided by in-house facilities, this type of service has been provided by several companies under contract to the Army. For example, Lockheed Aircraft Service Company, Lake Charles, Louisiana, formerly overhauled the UH-1 helicopter; Bell Helicopter Company, Fort Worth, Texas, overhauls UH-1 and AH-1G helicopters and components; AVCO Corporation, Lycoming Division, Charleston, South Carolina, overhauls the T53 and T55 turbine engines that power the UH-1 and AH-1G helicopters; and the Allison Division of General Motors Corporation, Indianapolis, Indiana, overhauls the T63 turbine engine that powers the OH-6A and the OH-58A helicopters.

During the past few years the Army's inventory of helicopters has substantially increased primarily because of the Southeast Asian conflict. This growth is illustrated by the following table.

| Date | Quantity of helicopters |
|---|---|
| June 1965 | 4,412 |
| June 1966 | 5,632 |
| June 1967 | 7,115 |
| June 1968 | 8,239 |
| June 1969 | 9,328 |
| Jan. 1970 | 9,652 |

The above increase in the Army's inventory of helicopters has resulted in a substantial increase in the requirement for depot-level overhaul and maintenance in support of these aircraft. The Army Aeronautical Depot Maintenance Center's annual expenditures increased from about $30 million in fiscal year 1965 to more than $110 million in fiscal year 1970.

The Army has a general criteria that aircraft, engines, and components may be overhauled or rebuilt provided that the cost does not exceed 65 percent of the original acquisition cost. Usually the repair cost is much less than the 65-percent criteria. Moreover, overhauling aircraft, engines, and components restores them to a "like new" condition. Such items are generally available for reuse more rapidly than new items because overhaul shop time is generally much less than new production leadtime.

The scope of our review is shown on page 23 of this report. A list of principal officials of the Department of Defense responsible for the administration of activities discussed in this report is shown as appendix III.

## CHAPTER 2

## AIRCRAFT MAINTENANCE PROGRAM

The quantities of aircraft which received depot-level maintenance at the Army Aeronautical Depot Maintenance Center increased from 428 in fiscal year 1968 to 488 in fiscal year 1969. The fiscal year 1970 program was 478. During these years the quantities of aircraft on hand and awaiting overhaul grew at a substantial rate as shown in the following table.

| Date | Awaiting overhaul |
|---|---|
| July 1968 | 50 |
| Dec. 1968 | 150 |
| July 1969 | 213 |

By January 31, 1970, this quantity had further increased to 238 helicopters awaiting overhaul. (See photos, p. 7 .) Since the original acquisition cost of these aircraft was between $225,000 and $450,000 a unit, aircraft awaiting overhaul represent a total Army investment of over $63 million. (See app. I.) As of January 31, 1970, these aircraft had been at the Center from 5 to 423 days, or an average of 129 days. Most of these aircraft were returned to the Center from Vietnam by air transportation.

The inventory of 238 aircraft on hand in January 1970 was composed of different types and models of aircraft, as summarized below.

| Type of aircraft | Quantity on hand |
|---|---|
| UH-1B | 24 |
| UH-1C | 20 |
| UH-1D | 34 |
| UH-1H | 133 |
| AH-1G | 27 |
| Total | 238 |

HELICOPTERS AWAITING REPAIR ADJACENT TO HANGER 43 AT THE ARMY AERONAUTICAL DEPOT MAINTENANCE CENTER. NOTE PRESERVATION TREATMENT OF CERTAIN AIRCRAFT AND COMPONENTS.

HELICOPTERS AWAITING REPAIR ADJACENT TO HANGERS 45 AND 46 AT THE ARMY AERONAUTICAL DEPOT MAINTENANCE CENTER. CORPUS CHRISTI BAY IN THE BACKGROUND.

The UH-1H and the AH-1G helicopters, which constitute over 65 percent of the total shown above, are the most advanced models of Army helicopters and are identical to ones currently being bought by the Army. (See photos, pp. 9 and 10.) The AH-1G, having a unit price of about $450,000, is also the most costly. The total value of the 27 AH-1G helicopters awaiting repair is about $12 million. The AH-1G's had been at the Center an average of 91 days, ranging from 5 to 367 days.

Overhaul cost for a helicopter varies with its condition. Recent experience at the Center has shown that normal depot maintenance to restore an aircraft to fully serviceable status costs an average of 32 percent of the original acquisition price. Crash-damaged aircraft overhaul has required work costing about 47 percent of the original acquisition price. On the basis of these figures, we estimated that the overhaul of the helicopters on hand at the Center as of January 31, 1970, would cost about $22 million, or about $41 million less than the cost of equivalent new aircraft.

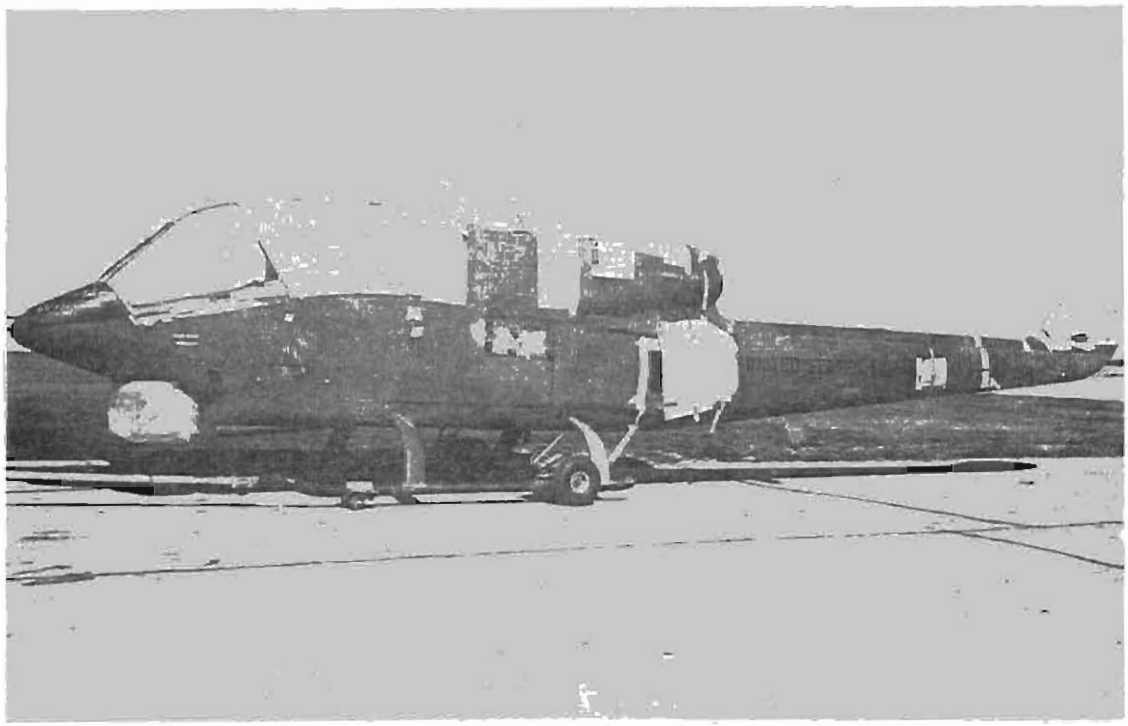
Overhaul shop flow time is much less than production leadtime for new aircraft. Overhaul of the UH-1 aircraft at the Center takes about 70 work days (fiscal year 1969 average), whereas recent information shows that the leadtime for a new UH-1 or AH-1G is about 15 months.

Center officials informed us that, if additional personnel spaces were authorized to work a second and third shift, the existing Center facilities would support the overhaul of 100 aircraft a month. Furthermore, the productive capacity available from contractors might also be utilized to a greater extent. In the past the Army has had UH-1 and AH-1G aircraft overhauled under contract, as shown below.

| | Bell Helicopter Company | | Lockheed Aircraft Service Company | |
|---|---|---|---|---|
| Fiscal year | UH-1 | AH-1G | UH-1 | Total |
| 1968 | 114 | - | - | 114 |
| 1969 | 98 | 6 | 52 | 156 |
| 1970 (through January) | 135 | 35 | 171 | 341 |

UH-1H HELICOPTER AWAITING REPAIR

UH-1H HELICOPTER AFTER REPAIR



AH-1G HELICOPTER AWAITING REPAIR

AH-1G HELICOPTER AFTER REPAIR

At the end of January 1970, the Army had on order 1,389 UH-1H and 178 AH-1G aircraft, costing over $315 million excluding the cost of the engines (see app. I), and had requested funds for fiscal year 1971 to acquire 190 additional UH-1H and AH-1G aircraft.

## AGENCY COMMENTS AND OUR EVALUATION

On April 1, 1970, we brought our findings and our proposals for corrective action to the attention of the Secretary of Defense. We suggested that the Army reappraise its depot maintenance program for aviation materiel and make greater use of both in-house and contractor maintenance capabilities to reduce the backlog of items awaiting overhaul to the minimum level required to sustain an efficient maintenance program. In addition, we suggested that the Army undertake a complete review of the supply status of all aircraft and major components to reevaluate the need for and delivery schedule of those new items now on order from contractors.

The Deputy for Supply, Maintenance and Transportation, within the office of the Assistant Secretary of the Army (Installations and Logistics) commented on our findings and proposals in a letter dated June 1, 1970 (see app. II). The reply stated that the Army concurred with our recommendations. The Army said that it had increased or would increase repair programs and had decreased the procurement of engines and components.

To reduce the quantity of aircraft awaiting repair, the Army said that it had reprogrammed funds in February 1970 to increase, up to maximum capacity, the quantity of aircraft which could be inducted into overhaul facilities during fiscal year 1970. Also, the Army's maintenance capacity has been expanded by establishing a repair activity for helicopters at the Naval Air Rework Facility, Pensacola, Florida. According to the Army, these actions should reduce the backlog of aircraft awaiting repair to a "normal level."

The normal level of backlog planned to be attained represents a 45-day production quantity for UH-1 helicopters, or about 135 aircraft, and a 30-day production quantity for the AH-1 helicopter, or about 15 aircraft. These

quantities were said to be necessary to schedule a balanced workload into the repair facilities. The size of the backlog was determined after considering streamlining procedures soon to be implemented, such as direct shipment of aircraft from Vietnam to the overhaul facilities and inspection of aircraft by special Army aviation teams in Vietnam to determine their condition prior to shipment.

We believe that these backlog quantities are excessive and should not be tolerated as a normal condition.

To form a basis of comparison, we obtained information regarding depot-level repair programs in the Air Force and the Navy. Air Force procedures for depot repair of F-4 aircraft at the Ogden Air Materiel Area require that the using organization be given 10 days' advance notice to make an aircraft available; aircraft normally arrive only 1 day before scheduled induction. The Air Force F-4 program has essentially no backlog of aircraft awaiting repair.

In the Navy we looked at the depot-level maintenance program for both the F-4 aircraft and the H-3 helicopters repaired at the Naval Air Rework Facility, North Island. We found approximately the same situation. Aircraft are needed only a short period in advance of the actual start of work, and there is no appreciable backlog of aircraft awaiting repair. Since the scheduling problems of the three services are similar in nature, we believe that the same situation is attainable in the Army.

The Army did not agree that the existence of large quantities of aircraft awaiting repair indicated that quantities due from new procurement were not needed. The Army said that aircraft had not been procured as replacements for unserviceable aircraft awaiting overhaul. The Army said also that by July 1971 the total inventory of aircraft was projected to be short 358 UH-1 and 621 AH-1 helicopters. The Army said further that fiscal years 1970 and 1971 procurements for the UH-1 would not replace projected losses.

During our review we did not examine into the requirements determination for helicopters so we were unable to evaluate the Army's contention that they would not have

sufficient aircraft by the end of fiscal year 1971. If this is correct, however, we believe that it adds emphasis to the need for reducing the number of aircraft which are in an unserviceable condition and awaiting repair. More timely overhaul will make them available to using organizations sooner when, according to the Army, the need for serviceable aircraft greatly exceeds the quantity in the inventory.

## RECOMMENDATION

Although the Army has initiated action which should bring about a decrease in the average quantity of aircraft awaiting repair, we believe that the quantity established as an objective, or a normal situation, is still too high. We therefore recommend that the Secretary of the Army direct the Commander of the Army Aviation Systems Command to consider adopting the procedures used by the Air Force and the Navy in scheduling aircraft for depot-level repair with the objective of reducing the average quantity of aircraft awaiting repair.

## CHAPTER 3

## ENGINE MAINTENANCE PROGRAM

Large quantities of T63 and T53 engines were on hand and awaiting repair at the Army Aeronautical Depot Maintenance Center on January 31, 1970, while new engines were being purchased. If the rate of repair were increased, a larger quantity of serviceable engines could be made available to the Army's aviation supply system and this might permit a reduction in the number of engines required to be bought.

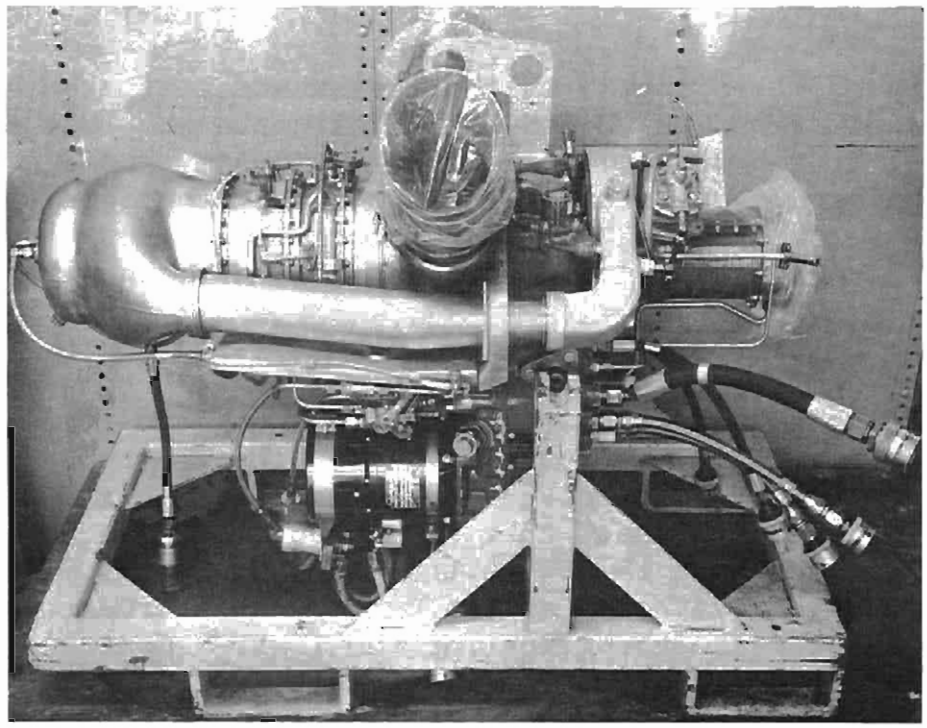
Aircraft engines processed through depot-level maintenance at the Center increased from 4,428 in fiscal year 1968 to 5,875 in fiscal year 1969. On January 31, 1970, the fiscal year 1970 program was 5,625 engines.

Whereas the overhaul program for fiscal year 1970 decreased, the backlog awaiting overhaul substantially increased from 518 at the end of fiscal year 1968 to 1,294 at the end of fiscal year 1969. In January 1970, this backlog totaled 1,431 and represented an investment of about $70 million. (See app. I.) Included in the backlog were T53-L-13 and T63 engines, valued at about $26 million. We concentrated our review on the T53-L-13 and the T63 engines because they were on hand in large numbers and were also being purchased.

Since 1967 the Army has had a special management program in effect for aircraft engines. This program is based on the concept that with intense management attention the time necessary to repair and return a high-cost item like an engine can be reduced so that more efficient utilization will result. Center officials informed us that they planned for a backlog of engines awaiting repair equivalent to about 30 days of output to ensure that a constant supply of engines is available for repair at the Center and at the two contractor locations. They said that a lesser backlog could be tolerated if the rate of return of engines were more stable.

### T63 ENGINES

The T63 engine is the most recent engine added to the Center's overhaul program. (See photo, p. 15.) This engine powers the Army's OH-6A and OH-58A helicopters. On



T63 ENGINE USED IN THE OH-6A AND THE OH-58A HELICOPTERS

January 31, 1970, the Center had a backlog of 317 T63 engines while there were outstanding orders for over 900 new T63 engines at a cost of about $14 million.

There are two models of the T63 involved: the T63-A-5A which represents most of the engine backlog and the T63-A-700 which is the model currently being purchased. (See app. I.) Center representatives told us that after minor changes the T63-A-5A is redesignated the T63-A-700.

The overhaul rate for this engine at the Center during fiscal year 1970 was about 20 a month. The fiscal year 1970 contract overhaul program for the T63 was 900 engines or about 75 a month. The 317 engines on hand on January 31, having a combined overhaul rate of about 95 a month, represented a production quantity in excess of 90 days and had a value of over $4.8 million.

T53-L-13 ENGINE

The T53-L-13 engine is the latest model of the series used to power the UH-1H and AH-1G helicopters. (See photo, p. 17.) At the end of January 1970, the Army had 324 of these on hand and awaiting repair while at the same time there were outstanding orders for more than 1,900 new T53-L-13 engines at a cost of about $130 million. (See app. I.)

The Army told us that the Center repair program for the T53 engine was increased from 2,527 on January 31 to 2,999 on April 30. We found, however, that, although the program was increased to 2,999, the latest report showing actual repairs indicated that only about 2,500 would be repaired through June 1970. Furthermore the actual monthly rate of engine overhauls at the Center has decreased since January. Whereas production for the first 7 months of fiscal year 1970 totaled 1,772, or about 250 engines a month, production during the 4-month period February through May 1970 totaled about 600, or about 150 a month.

The Army also told us that the fiscal year 1970 program for contract overhaul of the T53-L-13 was 1,625, or about 135 a month. Therefore the combined overhaul rate for this engine for the period February through May 1970 was about 285 a month. Under these circumstances the 324 engines on hand on January 31 had a value of over $21.5 million and represented about 35 days of production.

AGENCY COMMENTS AND OUR EVALUATION

We suggested that the Army reduce the backlogs of engines awaiting overhaul at the Center and reevaluate both the need for new engines on order and their delivery schedule.

The Army pointed out that T63 engines are received at the Center and later shipped to the contractor for repair. Therefore they said that the quantity of T63 engines on hand was not excessive if the repair programs of both the Center and the contractor were considered. As we showed earlier, however, when both the Center and contractor programs are considered, the backlog represents a production

T53-L-13 ENGINE USED IN THE UH-1H AND THE AH-1G HELICOPTERS

quantity in excess of 90 days. We believe that this is excessive when related to the 30-day criteria stated by Center representatives.

The Army said that it had recomputed requirements for the T53 engine and had found that about 800 of the 1,900 on order on January 31, 1970, were no longer needed as spares. The reduced requirement was brought about through improvements in the supply pipeline to Vietnam by use of air transportation, intensive management of worldwide inventories, and increased times between overhaul of the engines. As a result the Army redirected the delivery of 821 of the 1,966 engines on order for use in new aircraft and for foreign government assistance programs.

Our review did not include requirements computations for new engines, so we were unable to evaluate the revised computation by the Army. The action taken to divert deliveries of new engines, however, appears to be an effective response to the significant change in the need for T53 engines.

We believe that the quantities of T63 engines in backlog at the Center should be reduced. If these engines were repaired sooner and if the average quantity awaiting repair were held to a lower level, a larger quantity of serviceable engines would be available to the supply system. We believe that this might also have an effect on the total procurement requirements for these engines, since this is a factor essentially similar to the other factors which the Army said it considered when it reduced requirements for the T53-L-13 engine and diverted deliveries under the contract.

## RECOMMENDATION

We recommend that the Secretary of the Army direct the Commander of the Army Aviation Systems Command to continue reducing the backlog of engines awaiting repair. We recommend also that the quantity of engines due from new procurement be reevaluated to determine whether additional reductions can be made by decreasing the quantity of engines awaiting repair.

## CHAPTER 4

## COMPONENT MAINTENANCE PROGRAM

Large quantities of components requiring repair were on hand at the Center while orders for identical new items were outstanding. If the rate of repair of these components could be increased, more of these units could be made available to the supply system sooner and this might enable the Army to reduce the quantities being purchased.

The quantity of aircraft components overhauled at the Center increased from 44,251 in fiscal year 1968 to 55,803 in fiscal year 1969. In January 1970 the fiscal year 1970 overhaul program for components was 47,689, and about 27,107 had already been overhauled by January 31, 1970.

Whereas the overhaul program for fiscal year 1970 decreased, the quantity of components awaiting overhaul at the Center increased from about 9,600 at the end of fiscal year 1968 to 23,258 at the end of fiscal year 1969. In January 1970, this backlog was 23,544 units costing approximately $35 million. Our review specifically concerned 8,400 units included in this backlog, which cost over $18 million. (See app. I.)

Overhaul costs for different types of components vary. The Center's experience indicates that generally a component can be overhauled for about 25 percent of the acquisition cost. Additionally, the overhaul of components requires from 15 to about 120 days. Production leadtime for new components is much longer, requiring about 11 months.

The Center's officials advised us that they had the facilities for substantially larger component overhaul programs provided that manpower spaces were authorized to permit the use of second and third work shifts.

Additional components are overhauled for the Army under contract. For example, the Bell Helicopter Company overhauls UH-1 and AH-1 components. Although the Bell contract quantities were increased, Bell advised the Army as far back as March 1968 that it did not think that component overhaul

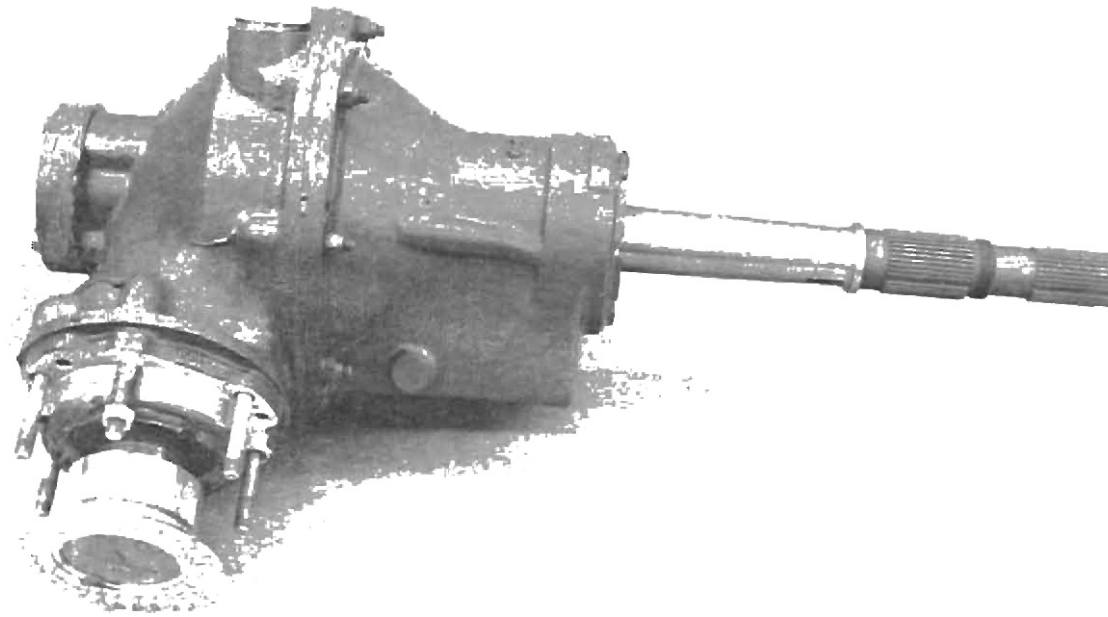
programs were adequate to support the UH-1 fleet and that it could increase its overhaul schedules and activities to satisfy the Army's requirements. Bell also advised us that it was not receiving sufficient quantities of components to fulfill commitments under its contract overhaul schedules.

Officials at the Army Aviation Systems Command told us that component maintenance programs at times were not accomplished as planned because of lack of funds for overhaul and maintenance. Although overhaul program requirements are determined by supply control studies, quantities overhauled, we were told, are based on the funded program and not on stocks available for overhaul.

On the other hand, the Army Aviation Systems Command apparently had funds for new procurement of many of the components for which overhaul funds were not available. For 20 components which we selected for further examination, the Center's records at the end of January 1970 showed 8,448 items which cost about $18 million awaiting overhaul. At the same time, more than 10,000 of these same components costing approximately $22 million were on order. (See app. I.)

As an example, the UH-1 90-degree gear box (see photo, p. 21), an intensively managed item, has had large backlogs at the Center for long periods, notwithstanding that numerous expedite requests were received during fiscal year 1969. The Center overhauled 844 gear boxes during fiscal year 1968 as scheduled; however, the Center's records at the end of fiscal year 1968 showed a backlog of about 900 gear boxes awaiting overhaul compared with a fiscal year 1969 program of 765. In calendar year 1968, Bell Helicopter Company overhauled 401 gear boxes, compared with a contract commitment of about 800.

Although the Center's program in fiscal year 1969 increased and 1,038 gear boxes were overhauled, the large backlog continued into fiscal year 1970. In October 1969, the Center's records showed 1,219 in backlog and 341 in overhaul compared with a fiscal year 1970 program of 1,604 gear boxes. At the end of January 1970, 780 gear boxes were on hand, which was 91 in excess of the quantity needed to complete the fiscal year 1970 program.



UH-1 90-DEGREE GEAR BOX

The Army Aviation Systems Command records in January 1970 indicated a total fiscal year planned overhaul program of 3,193 gear boxes by the Center and under contract, and about that quantity had already been reported available at depots in the U.S. At the same time, the Army Aviation Systems Command's records showed over 600 gear boxes on order as spares.

This component has an acquisition cost of $1,538 and a production leadtime of 11 months. The Center overhaul cost for this component has averaged about $400 and has required about 37 days shop flow time. Center officials advised us that a 30-day backlog of components was adequate to support overhaul schedules.

## AGENCY COMMENTS AND OUR EVALUATION

We suggested that the Army reappraise its depot maintenance program for components and make greater use of both in-house and contractor maintenance capabilities to

reduce the backlog of components awaiting overhaul. In addition, we suggested that the Army undertake a complete review of the supply status of components to reevaluate the need for and delivery schedule of those now on order from contractors.

The Army generally agreed to these suggestions. Specifically, the Army said that, although components were still backlogged at the Center because of fund shortages, action had been taken to help the situation. New repair contracts have been awarded and overhaul quantities are to be increased. Furthermore, reparables of some items are being furnished to contractors for overhaul and use in the production of new aircraft.

We believe that these actions will improve the condition which existed at the time of our review. We would like to be kept advised, however, of the progress made by the Army in reducing the backlog of components awaiting repair.

## CHAPTER 5

## SCOPE OF REVIEW

Our review was directed primarily toward examining into and evaluating the adequacy of the Army's management of its depot-level maintenance program for aircraft, engines, and components.

Our work included a selective review of existing procedures and of files and records pertaining to the depot-level repair and overhaul of aircraft, engines, and components, as well as discussions on these matters with responsible officials at the following locations.

Army Aviation Systems Command
St. Louis, Missouri

Army Aeronautical Depot Maintenance Center
Corpus Christi, Texas

Bell Army Plant Activity, Bell Helicopter Company
Fort Worth, Texas

Bell Helicopter Company
Fort Worth and Amarillo, Texas

We also reviewed the results of internal audits at the Army Aeronautical Depot Maintenance Center. We found that the Army Audit Agency performed an audit at the Center in fiscal year 1967 and again in fiscal year 1969. The reports issued as a result of the audits did not cover the same areas included in our review. The findings in the Army Audit reports concerned such matters as fund accounting, cost reporting, and record accuracy. Recommendations for improvement were generally directed toward stricter adherence to prescribed procedures and toward the establishment of strengthened internal controls; whereas the GAO review was directed toward broader management concepts encompassing the total aircraft maintenance program.

# APPENDIXES

SELECTED REPARABLE ASSETS ON HAND AT THE

ARMY AERONAUTICAL DEPOT MAINTENANCE CENTER ON JANUARY 31, 1970

| | Reparables on hand | | Due in from new procurement (note a) | |
|---|---|---|---|---|
| | Quantity | Cost | Quantity | Cost |
| AIRCRAFT: | | | | |
| Helicopter--UH-1B | 24 | $ 5,874,240 | - | $ - |
| " UH-1C | 20 | 4,488,300 | - | - |
| " UH-1D | 34 | 8,075,136 | - | - |
| " UH-1H | 133 | 32,497,885 | 1,389 | 246,915,585 |
| " AH-1G | 27 | 12,180,807 | 178 | 68,451,858 |
| Subtotal | 238 | 63,116,368 | 1,567 | 315,367,443 |
| ENGINES: | | | | |
| Engine--T53-L-1A | 63 | 3,654,000 | - | - |
| " T53-L-7 | 108 | 4,833,000 | - | - |
| " T53-L-7A | 3 | 134,250 | - | - |
| " T53-L-11 | 453 | 24,084,198 | - | - |
| " T53-L-13 | 324 | 21,571,920 | 1,966 | 130,896,280 |
| " T53-L-15 | 28 | 1,781,640 | - | - |
| " T55-L-7 | 128 | 8,909,568 | - | - |
| " T55-L-11 | 7 | 749,623 | 195 | 20,882,355 |
| " T63-A-5A | 315 | 4,831,155 | - | - |
| " T63-A-700 | 2 | 30,674 | 936 | 14,355,432 |
| Subtotal | 1,431 | 70,580,028 | 3,097 | 166,134,067 |
| COMPONENTS: | | | | |
| Scissors and sleeve | 241 | 303,178 | 104 | 124,176 |
| Gear Box, T/R | 780 | 1,199,640 | 678 | 1,042,764 |
| Quill assy | 422 | 292,446 | 100 | 69,300 |
| Do. | 347 | 476,431 | 305 | 281,820 |
| Mast assy | 690 | 658,260 | 1,289 | 1,229,706 |
| Generator | 1,332 | 599,400 | 563 | 217,318 |
| Hub, M/R | 540 | 1,747,980 | 549 | 1,981,341 |
| Quill assy | 491 | 630,444 | 405 | 520,020 |
| Rotor hd fwd | 41 | 739,230 | 16 | 288,480 |
| Trans aft | 61 | 1,919,731 | 35 | 1,508,535 |
| " comb | 21 | 381,759 | 133 | 2,711,604 |
| " mech | 41 | 278,841 | 62 | 571,640 |
| " fwd | 123 | 3,681,882 | 75 | 2,984,925 |
| Rotor hd aft | 28 | 498,456 | 16 | 284,832 |
| Power steering | 77 | 334,334 | 39 | 169,338 |
| Cyl actuating | 601 | 818,562 | 808 | 1,064,944 |
| Nozzle turbine | 853 | 1,315,326 | 959 | 1,472,065 |
| Do. | 795 | 870,525 | 1,142 | 1,159,130 |
| Do. | 546 | 835,380 | 2,530 | 3,870,900 |
| Housing assy | 418 | 480,700 | 382 | 526,014 |
| Subtotal | 8,448 | 18,062,505 | 10,190 | 22,078,852 |
| Total | | $151,758,901 | | $503,580,362 |

[a]As shown on the Army Aviation Systems Command's Master Data Records from February 3 to 18, 1970.

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, D.C. 20310

1 JUN 1970

Mr. C. M. Bailey
Director, Defense Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Bailey:

This is in response to your letter of 1 April 1970, to the Secretary of Defense requesting comments on your draft report titled: "Need for More Responsive Aviation Maintenance Program." (OSD Case #3107).

The inclosed statement provides the Department of the Army position on your report. This reply is made on behalf of the Secretary of Defense.

Sincerely yours,

Joseph C. Zengerle, Jr.
Deputy for Supply, Maintenance and Transportation

1 Incl
Army Position Statement

DEPARTMENT OF THE ARMY POSITION
ON
GAO DRAFT REPORT TO CONGRESS, APRIL 1970
"NEED FOR MORE RESPONSIVE AVIATION MAINTENANCE PROGRAM"

OSD CASE #3107

## I. POSITION SUMMARIES

### A. GAO Position Summary

1. The Army's backlog of aviation items requiring repair has increased due to increased requirements and insufficient use of maintenance capabilities. Aircraft, engines, and components are accumulating at ARADMAC awaiting repair, while orders for similar or identical items are outstanding. Increased helicopter availability could be obtained by increasing the maintenance program and reducing or stretching out the procurement program.

2. The GAO recommended that the Army reappraise its depot maintenance program in order to reduce backlogs of aviation items awaiting overhaul; and that the Army re-evaluate the need and delivery dates of new items.

### B. Army Position Summary

The Army concurs with the desirability of reducing the backlog of aviation items awaiting overhaul. Aircraft overhaul programs have been increased and procurement requirements for new items have been reduced for FY 1970 and 1971. However, fund limitations still preclude overhaul of all unserviceable items. The Army non-concurs with some of the findings in the report.

## II. ARMY POSITION ON GAO FINDINGS AND CONCLUSIONS

### A. Airframes.

1. The Army was aware in mid-1969 that unserviceable aircraft would be backlogged due to an increase in requirements and a shortage of overhaul funds. This was further complicated by the fact that we were completing a contract with Lockheed Aircraft Services and were in the process of bringing more UH-1 overhaul in-house. It was estimated at that time that there would be 598 first-line aircraft backlogged in CONUS by June 1970. The average number of pre-induction aircraft required to be on hand where more than one overhaul site is used was 195. Therefore, 403 first-line aircraft would be excess to the constant pre-induction requirement.

2. It was determined that if action could be taken to begin induction of the 403 excess aircraft in FY 1970, sufficient depot maintenance capacity would be available in FY 1971 between Army in-house, the Naval Air Rework Facility (which is now being used as a DOD in-house overhaul site for UH-1's), and contractors to accomplish the required FY 1971 workload. Accordingly, in February 1970, funds were reprogramed within the Army to allow induction of 220 of the 403 previously unfunded aircraft during FY 1970. This is the maximum number of aircraft which can be inducted into overhaul facilities during FY 1970. If unserviceable UH-1 and AH-1 helicopters generate as anticipated, there will be 158 unfinanced UH-1's and one unfinanced AH-1 by 30 June 1970.

3. Funding is not sufficient to meet the total FY 1971 aviation overhaul requirement. Overhaul will have to be delayed on engines and components. However, the backlog of first-line aircraft should be reduced to a normal 30-day operating level by November 1970. Based on current aircraft deployment plans and flying hour programs, additional funds will be required in FY 1971 to support aircraft in the field with serviceable engines and components and to preclude again exceeding the normal backlog of unserviceable first-line aircraft after November 1970.

4. Aircraft have not been procured as replacements for unserviceable aircraft awaiting overhaul. Procurements are made to fulfill force requirements. By the end of FY 1971, the total inventory is projected to be short 358 UH-1 and 621 AH-1 helicopters. Also, FY 1970 and 1971 procurements for the UH-1 will not replace projected losses.

5. Even though helicopter projected inventories are below force requirements, procurement has been reduced in FY 1971. The following number of UH-1's and AH-1's are programed for procurement:

| | Funded Delivery Period FY 1970 | Funded Delivery Period FY 1971 |
|---|---|---|
| UH-1 | 160 | 120 |
| AH-1 | 170 | 70 |

6.

[See GAO note, p. 34.]

[See GAO note, p. 34.]

1. Engine supply studies have shown a shortage of engines between March 1968 and November 1969. A November 1969 supply control study reflected a long supply of 804 T53-L13 engines. This long supply resulted from a reduction in the RVN pipeline which was made possible by the use of dedicated airlift, intensive management of worldwide inventories, and increased times between overhauls.

2. Long stocks of spare engines are being utilized in the following manner:

a. 160 each diverted to FY 70 UH-1H airframe buy.

b. 170 each diverted to FY 70 AH-1G airframe buy.

c. 37 each sold to MAP/MAS requirements.

d. 454 each sold to the U.S. Air Force for helicopters in support of VNAF.

Total 821 engines

3. The audit makes the conclusion that engines are accumulating at ARADMAC and not being promptly programed and scheduled for overhaul. This is summarized in Appendix I of the audit report. However, a detailed analysis of engine assets at ARADMAC shows that this is not the case. Since ARADMAC is the prime engine depot for T53 and T55 engines, many of these engines located at ARADMAC are awaiting disposition. This can be substantiated by a review of those T53/T55 engines which the GAO indicated were in excess to ARADMAC requirements.

a. T53-L1A: The GAO report indicated 49 engines located at ARADMAC over the quantity required to complete the FY 70 overhaul program. This is correct. The engines were previously installed in UH-1A helicopters which were utilized in RVN. Redeployment of the UH-1A to CONUS resulted in shortened pipelines thereby resulting in overages. This engine presently supports UH-1A aircraft located only at Ft Rucker. This engine is out of production and due to age is becoming increasingly difficult to support. Assets are being held pending a definitive aircraft retirement determination and for possible reclamation for spare parts or interservice transfer to U.S. Air Force for support of HH-43 helicopters. An inquiry has been received from the Air Force on 12 February 1970 as to availability of 30 each T53-L1A's. The engines have been offered on a non-reimbursable basis.

b. T53-L7/7A: The GAO reported 30 engines on hand at ARADMAC over the quantity required for completion of the FY 70 overhaul program. This is correct. Twenty-seven each of these engines are being held for sale to the Swiss government. Eventually, reclamation of T53-L7/7A engines for repair parts will be initiated.

c. T53-L13: The GAO report indicated a program for 2,257 engines at ARADMAC on 31 Jan 70 with 203 engines on hand over the quantity required for FY 70 overhaul program. However, AVSCOM records reflect the program to be 2,527 as of 31 Jan 70. These figures may have been transposed in the GAO report. The correct figure would show insufficient assets on hand to complete FY 70 program. Current ARADMAC overhaul program for FY 70 is 2,999 plus 1,625 for commercial overhaul. Based on the current program, 564 additional T53-L13 engines must be made available for induction to FY 70 program; on hand engines awaiting induction to overhaul on 19 Mar 70 was 88 engines. This is only seven days of reparable backlog based on current overhaul output rates.

d. T53-L15: The GAO report indicated four engines on hand over FY 70 overhaul requirements. This amount of overage can be caused by fluctuations in receipts.

e. T55-L11: The GAO report indicated seven engines on hand with none programed for overhaul at ARADMAC for FY 70. This is correct. All of these engines returning from RVN are offloaded at ARADMAC for subsequent transfer to Lycoming for overhaul. Action has been taken to move these engines.

f. T63-A5A: The GAO report indicated 315 engines on hand at ARADMAC, while only 100 were required to complete the FY 70 program at ARADMAC. All engines returning from RVN are offloaded at ARADMAC. Part of the T63 engines are transferred to Allison Division of General Motors Corporation, Indianapolis, Indiana. Contractor overhaul FY 70 program requirements total 900. The 215 reported as excess on 31 Jan 70 were therefore not excess to the total overhaul Army program, as they were awaiting induction for the third quarter overhaul program at Allison. The GAO may not have considered the entire program.

g. T63-A700: The GAO report indicated two engines on hand with none scheduled for the ARADMAC FY 70 program. This is correct. These are to be utilized for prototypes. The outstanding orders for 936 new engines of this type are to be utilized for new production aircraft on contract, plus spares required in support of the OH-58A.

4. It should be noted that due to the rapid increase in engine support requirements for RVN plus the high rate of new airframe production, combined output from overhaul and new procurement sources could barely

meet total monthly engine requirements. This can be substantiated by the total number of serviceable turbine engines on hand in RVN during the periods shown below:

| Date | Monthly Replacement Rqmts | Serviceable On Hand in RVN | Days Supply |
|---|---|---|---|
| Aug 68 | 204 | 56 | 8 |
| Oct 68 | 214 | 130 | 18 |
| Jan 69 | 253 | 131 | 15 |
| Apr 69 | 295 | 155 | 16 |
| Jun 69 | 332 | 332 | 30 |
| Aug 69 | 349 | 312 | 27 |
| Nov 69 | 351 | 304 | 26 |
| Mar 70 | 336 | 364 | 33 |

As evidenced by the above, a 30-day on-hand posture was not achieved in RVN until June 1969, which coincides with the first reduction in pipelines.

5. In summary, procurement was not made to offset delays in overhaul; reparables are not being accumulated due to delays in overhaul programing and scheduling; and vigorous action has been taken to economize and utilize engines to the best possible advantage.

c. Components.

1. Unserviceable components are still backlogged at ARADMAC due to a shortage of funds. Every effort is being made to reduce this backlog by reprograming workloads. For example, new contracts have been awarded for overhaul of 90 degree and 42 degree gear boxes at a lower cost than was previously paid to the prime manufacturer. UH-1 main transmission overhaul will be increased beginning in June 1970.

2. Total inventory of components is being reduced by furnishing long supply components as government furnished parts (GFP) for new end item procurement in lieu of procuring new components. The following number of components will be furnished as GFP for FY 70 procurements:

| Aircraft | Lines | Dollar Value |
|---|---|---|
| CH-47 | 80 | $1.424M |
| UH-1H | 36 | $6.555M |
| AH-1G | 67 | $3.552M |

3. Procurement of aviation spare components have been progressively reduced from $132.0 million in FY 69 to $61.2 million in FY 70, and to $30.7 million in FY 71.

4. Using the number of components counted at ARADMAC as a requirement for overhaul programing may be misleading in that ARADMAC has a stock and distribution mission for the NICP. AVSCOM moves these assets as required to support maintenance programs at other locations. Therefore, some of the backlog at ARADMAC is actually normal pre-induction backlog for other maintenance activities. These total overhaul programs were not taken into account.

III. ARMY POSITION ON GAO RECOMMENDATIONS

A. GAO recommends that the Army reappraise its depot maintenance program for aviation and make greater use of both in-house and contractor maintenance capabilities in order to reduce the backlogs of aircraft, engines and components awaiting overhaul to that minimum level required to sustain an efficient maintenance program. The Army concurs with this recommendation. Additional funds have been made available to increase the FY 1970 overhaul program. By November 1970 the backlog of first-line aircraft should be reduced to a normal 30-day level. Engine and component inventories are also being reduced and maximum use of overhaul facilities is being made within fund limitations.

B. GAO recommends that the Army undertake a complete review of the supply status of all aircraft, engines, and major components with the objective of re-evaluating the need and delivery schedule of those now on order from contractors. The Army concurs with this recommendation. Procurement of new items has been reduced for FY 1970 and 1971.

GAO note: The agency comments relating to draft report material omitted from our final report have been deleted.

# PRINCIPAL OFFICIALS OF THE DEPARTMENT OF DEFENSE AND THE DEPARTMENT OF THE ARMY RESPONSIBLE FOR THE ADMINISTRATION OF ACTIVITIES DISCUSSED IN THIS REPORT

| | Tenure of office | |
|---|---|---|
| | From | To |
| **DEPARTMENT OF DEFENSE** | | |
| SECRETARY OF DEFENSE: | | |
| Melvin R. Laird | Jan. 1969 | Present |
| Clark M. Clifford | Mar. 1968 | Jan. 1969 |
| Robert S. McNamara | Jan. 1961 | Feb. 1968 |
| DEPUTY SECRETARY OF DEFENSE: | | |
| David Packard | Jan. 1969 | Present |
| Paul H. Nitze | July 1967 | Jan. 1969 |
| Cyrus R. Vance | Jan. 1964 | June 1967 |
| Roswell L. Gilpatric | Jan. 1961 | Jan. 1964 |
| ASSISTANT SECRETARY OF DEFENSE (INSTALLATIONS AND LOGISTICS): | | |
| Barry J. Shillito | Feb. 1969 | Present |
| Thomas D. Morris | Sept. 1967 | Jan. 1969 |
| Paul R. Ignatius | Dec. 1964 | Aug. 1967 |
| Thomas D. Morris | Jan. 1961 | Dec. 1964 |
| **DEPARTMENT OF THE ARMY** | | |
| SECRETARY OF THE ARMY: | | |
| Stanley R. Resor | July 1965 | Present |
| Stephen Ailes | Jan. 1964 | July 1965 |
| Cyrus R. Vance | July 1962 | Jan. 1964 |
| ASSISTANT SECRETARY OF THE ARMY (INSTALLATIONS AND LOGISTICS): | | |
| J. Ronald Fox | June 1969 | Present |
| Vincent P. Huggard (acting) | Mar. 1969 | June 1969 |
| Dr. Robert A. Brooks | Oct. 1965 | Feb. 1969 |

PRINCIPAL OFFICIALS OF THE DEPARTMENT OF DEFENSE

AND THE DEPARTMENT OF THE ARMY

RESPONSIBLE FOR THE ADMINISTRATION OF ACTIVITIES

DISCUSSED IN THIS REPORT (continued)

| | Tenure of office | |
|---|---|---|
| | From | To |
| **DEPARTMENT OF THE ARMY (continued)** | | |
| ASSISTANT SECRETARY OF THE ARMY (INSTALLATIONS AND LOGISTICS): (continued): | | |
| Daniel M. Luevano | July 1964 | Oct. 1965 |
| A. Tyler Port (acting) | Mar. 1964 | June 1964 |
| Paul R. Ignatius | May 1961 | Feb. 1964 |
| UNDER SECRETARY OF THE ARMY: | | |
| Thaddeus R. Beal | Mar. 1969 | Present |
| David E. McGiffert | July 1965 | Feb. 1969 |
| Stanley R. Resor | Mar. 1965 | July 1965 |
| Vacant | Dec. 1964 | Mar. 1965 |
| Paul R. Ignatius | Mar. 1964 | Dec. 1964 |
| U.S. ARMY MATERIEL COMMAND COMMANDING GENERAL: | | |
| Lt. Gen. Henry A. Miley | Nov. 1970 | Present |
| Gen. Ferdinand J. Chesarek | Mar. 1969 | Oct. 1970 |
| Gen. Frank S. Besson, Jr. | July 1962 | Mar. 1969 |
| U.S. ARMY AVIATION SYSTEMS COMMAND COMMANDING GENERAL: | | |
| Maj. Gen. J. L. Klingenhagen | Nov. 1969 | Present |
| Maj. Gen. John Norton | June 1967 | Nov. 1969 |
| Col. Delbert L. Bristol (acting) | May 1967 | June 1967 |
| Brig. Gen. Howard F. Schlitz | Apr. 1964 | May 1967 |
| Col. E. H. Hauschultz | Jan. 1964 | Apr. 1964 |
| Brig. Gen. David B. Parker | Aug. 1962 | Jan. 1964 |

PRINCIPAL OFFICIALS OF THE DEPARTMENT OF DEFENSE

AND THE DEPARTMENT OF THE ARMY

RESPONSIBLE FOR THE ADMINISTRATION OF ACTIVITIES

DISCUSSED IN THIS REPORT (continued)

| | Tenure of office | |
|---|---|---|
| | From | To |
| **DEPARTMENT OF THE ARMY (continued)** | | |
| U.S. ARMY AERONAUTICAL DEPOT MAINTENANCE CENTER | | |
| COMMANDING OFFICER: | | |
| Col. Luther G. Jones, Jr. | Jan. 1968 | Present |
| Col. Floyd H. Buch | July 1964 | Dec. 1967 |
| Col. Vancel R. Beck | Feb. 1963 | June 1964 |
| Vacant | Dec. 1962 | Jan. 1963 |
| Col. C. C. Albaugh | Dec. 1961 | Nov. 1962 |
| Brig. Gen. Melvin D. Losey | Apr. 1961 | Dec. 1961 |

U.S. GAO Wash., D.C.