REPORT TO THE CONGRESS

Management Of Aircraft Modification Programs In The Army, Navy, And Air Force

B-157373

Department of Defense

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

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COMPTROLLER GENERAL OF THE UNITED STATES
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4 To the Speaker of the House of Representatives
and the President pro tempore of the Senate

This is our report on the management of aircraft modification programs in the Army, Navy, and Air Force.

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; the Secretary of Defense; and the Secretaries of the Army, Navy, and Air Force.

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ABBREVIATIONS

AFLC	Air Force Logistics Command
AFSC	Air Force Systems Command
AMA	Air Materiel Area (now Air Logistics Center)
AMC	Army Materiel Command
ATC	Air Training Command
AVSCOM	Aviation Systems Command
CCB	Configuration Control Board
DA	Department of the Army
DMM	Directorate of Materiel Management
DOD	Department of Defense
DRD	Directorate for Research and Development

ABBREVIATIONS (continued)

GSU	General Support Unit
MWO	Modification Work Order
NARF	Naval Air Rework Facility
NAVAIR	Naval Air Systems Command
PAR	Progressive Aircraft Rework
SAAMA	San Antonio Air Materiel Area (now San Antonio Air Logistics Center)
TCTO	Time Compliance Technical Order
TD	Technical Directive
TYCOM	Type Commander

COMPTROLLER GENERAL'S REPORT TO THE CONGRESS

MANAGEMENT OF AIRCRAFT MODIFICATION PROGRAMS IN THE ARMY, NAVY, AND AIR FORCE DEPARTMENT OF DEFENSE B-157373

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D I G E S T

WHY THE REVIEW WAS MADE

The Army, Navy, and Air Force had an aircraft modification workload of over 55 million man-hours outstanding in July 1970. The authorization and appropriation committees of the Congress expressed concern about this and the services' ability to manage any additional modification work effectively.

GAO attempted to measure the extent the services had reduced the backlog and to evaluate the services' management of the modification programs.

FINDINGS AND CONCLUSIONS

On June 30, 1973, the Army, Navy, and Air Force had a combined total of 42 million man-hours of modification work approved but still to be done. Using an estimated $15 per man-hour for installing modifications at the depot level, this backlog of man-hours would require about $630 million in labor costs to complete. In addition, services had uninstalled materiel on hand valued at over $300 million. (See pp. 3, 17, and 31.)

However, the Army and Navy have greatly reduced the quantity of modification man-hours outstanding since 1970.

--The Army reduced its outstanding man-hours from 2.7 million in July 1970 to 1.13 million in June 1973. (See p. 3.)

--The Navy reduced its modification man-hours from 20.9 million in July 1970 to 6.6 million in June 1973 (See p. 17.)

--The Air Force's outstanding man-hours increased from 31.7 million man-hours in July 1970 to 34.3 million in June 1973. (See p. 31.)

Considering outstanding man-hours alone can be misleading because this suggests there is materiel on hand, awaiting installation, for all of these hours.

Generally this is not the case. The outstanding hours represent approved modifications to be completed over several years. (See p. 57.)

On hand inventories of modification materiel are a better indicator than outstanding man-hours of the status of modification programs.

Each of the services has attempted to coordinate the acquisition of high-cost materiel with installation programs, to avoid a situation where materiel is purchased and held for a long period before it is installed. (See pp. 3, 17, and 31.)

From 1971 through 1973, the Army, Navy, and Air Force were provided

about $2.7 billion, or an annual average of about $900 million, to buy aircraft modification materiel. The Army received about $124 million, the Navy about $1 billion, and the Air Force about $1.6 billion. (See p. 2.)

On June 30, 1973, the Navy had an inventory of modification materiel worth $173 million. In addition, the Navy had about $22 million worth of kits that had been declared excess. At about the same time the Air Force had an inventory of modification materiel worth $111 million. (See p. 53.)

The Navy's inventory of active kits is large when related to the Navy's annual installation program of about 4 million man-hours and the other services' programs, as shown in the following schedule.

	June 30, 1973		
Service	Approved Modification workload	Modification material on hand	Annual Installation Program
	(millions hours	(millions of dollars)	(millions of hours)
Army	1.1	$ 20	1.3
Navy	6.6	173	4.0
Air Force	34.3	111	13.0
Total	42.0	$304	18.3

(See pp. 3, 17, and 53.)

Many of the Navy kits were purchased with miscellaneous flight safety and operational necessity funds. For several years this was a $20 million annual fund administered by Headquarters, Naval Air Systems Command, to finance modifications which were suddenly needed. (See p. 17.)

To correct this situation the Navy has a multiyear plan to designate additional funds specifically to reduce the backlog of modification kits. It estimates that the backlogged modification work at June 30, 1973, will cost about $121 million to complete.

About $43 million was planned for fiscal year 1974 and $78 million in subsequent years. The Navy projects that by June 1975 the kit backlog will have been reduced to an inventory valued at about $65 million. (See p. 18.)

In the past, the services have not developed detailed budget backup data showing a planned installation schedule and funds required for modifications in support of their annual procurement requests.

The Navy has developed this type of data for its 1975 budget. This data could serve as a standardized format for the other services. It would show both the procurement funds and installation funds needed for a proposed program and, by focusing equal attention on the installation phase, would permit better evaluation. (See p. 56.)

The services continue to be faced with many management problems.

These include (1) not using the below depot modification capability and capacity, (2) unreliable modification management data, (3) inadequate modification testing, (4) installation delays, and (5) inadequate kit accountability and control procedures. (See pp. 3, 18, and 31.)

Although the services are still confronted with these and similar long-standing management problems, the aircraft modification programs of the Army and the Navy are now at more controllable levels because of the backlog reductions. The Air Force considers its program to be at a manageable level. GAO believes that further management improvements are needed by the services. (See p. 56.)

The Navy plans to spend $121 million to install the modification kits outstanding at June 30, 1973. Since many of these are low-priority modifications, the Navy should evaluate them carefully to be sure they are warranted. (See p. 56.)

Most of the modification work outstanding as of June 30, 1973, is planned for application at the depot level and usually will be done during the 2- to 5-year depot maintenance cycle of the aircraft. Accordingly, modification programs will remain open during this time.

Maintenance activities below the depot level are capable of doing more modification work, which would relieve some of the workload at the depot level. (See p. 57.)

RECOMMENDATIONS

In view of the DOD-wide application, GAO recommends that the Secretary of Defense provide the necessary guidance and insure that each service:

--Develops and submits, with the budget request for aircraft modifications, summary data in a standardized format showing a projected installation schedule which considers modification workloads already approved and funded and which forecasts capabilities for installation.

--More fully uses the modification capability and capacity that exists below the depot level. (See p. 58.)

GAO also recommends that the Secretary of the Navy carefully evaluate the Navy's backlog of modification materiel to insure that the modifications are still warranted and that the installation of this materiel is justified. (See p. 29.)

GAO is also making other recommendations to the Secretaries of the Army, Navy, and Air Force. (See pp. 16, 29, and 54.)

AGENCY ACTIONS AND UNRESOLVED ISSUES

DOD said that the military departments agreed generally with GAO's recommendations and were taking steps to implement the recommendations.

The Air Force does not agree that more modification work should be shifted from depot-level to field-level maintenance activities because of the added cost for tools and equipment.

GAO believes that many Air Force field-level maintenance activities have a capacity that is not fully used. Shifting more modification workload to the field activities would increase use of the activities' maintenance capacity and could speed completion of many modification programs.

Tear Sheet

GAO recognizes that each modification decision would have to be carefully analyzed and agrees with the Air Force comment that only those that are cost beneficial and time savers should be so assigned. Obviously the question of capability--availability of equipment--is one of the major factors to be considered in such a decision. (See pp. 16, 30, 55, and 59.)

MATTERS FOR CONSIDERATION BY THE CONGRESS

The cognizant committees may wish to review the information GAO is recommending that DOD develop in connection with the committees' evaluation of future requests for funds for the services' modification programs.

This should show the relationship between materiel acquisition programs and installation programs by identifying when the requested modifications are planned for installation and the amount of operation and maintenance funds needed. Such information would reflect the total cost of modification programs more accurately and would give equal emphasis to the installation phase.

CHAPTER 1

INTRODUCTION

Each of the military services has a similar system and similar procedures for managing aircraft modifications. These are part of a Department of Defense (DOD) system known as configuration management. Configuration management is described in DOD Directive 5010.9, dated July 17, 1968, and guidance for implementing it is in DOD Instruction 5010.21, dated August 6, 1968. Aircraft modification programs represent about 70 percent of the total dollars DOD spent for weapons modification.

Modification means changing an item to make it work better or more safely or to make it able to do something additional. Modifications are planned for installation at (1) the user or organizational level, (2) the intermediate level, or (3) the depot level. Most aircraft modifications are done at the depot level while the aircraft undergo periodic repair or overhaul. Sometimes contractors or special field teams handle the depot-level modifications. The level at which installation is done usually depends on the complexity of the modification in terms of man-hours and equipment needed.

Each service has a configuration status accounting system which identifies the completed and outstanding modifications by modification number and the serial number of the item being modified. Usually there is a separate reporting or accounting system for aircraft, engines, and components.

Modifications are described in published documents: the Army uses a modification work order (MWO), the Navy a technical directive (TD), and the Air Force a time compliance technical order (TCTO). These documents identify the item; the number of man-hours required; the skills, special tools, and materiels needed; and the planned completion date of the installation.

Materiels needed for modifications have been funded primarily by procurement appropriations. In fiscal year 1974 the services requested the following procurement funds for aircraft modifications.

	Procurement request (millions)
Army	$109.1
Navy	295.4
Air Force	527.7
Total	$932.2

In addition, the services requested operation and maintenance funds totaling about $205 million to finance the installation of modifications in fiscal year 1974. Most modifications are installed in the years following purchase of the materiel.

The materiel needed to modify an item is frequently purchased, stocked, accounted for, and issued as a kit. A kit can vary considerably in size, content, and cost; it can be an envelope with a single part or a large container with dozens of different parts.

Because of the high cost of some modification kits and because most modifications apply over a number of years to many aircraft, each of the services has recognized a need to coordinate purchasing modification materiel with the planned installation program. The objective is to have the materiel delivered just before installation.

CHAPTER 2

ARMY MODIFICATION PROGRAM

Since 1970 the Army has reported a large reduction in the number of aircraft modification man-hours outstanding. In July 1970 it reported 2.7 million man-hours outstanding and in June 1973, 1.13 million. During appropriation hearings on the Army's fiscal year 1974 modification funds request, the Army forecasted a further reduction to a normal level of about 540,000 man-hours by June 1974.

Although these figures indicate much progress in reducing modification man-hours, our review showed that:

--The Army's projection of modification man-hours outstanding for June 1974 was understated.

--During the past 15 months many modifications were canceled and the hours were written off rather than accomplished.

--Additional man-hours would be required to accomplish the modifications covered by the 1974 budget request, which had not been recorded.

Certain other areas of the Army's modification program require continued management attention, because:

--Modifications might be completed sooner if more were planned for accomplishment at the field level.

--Responsibility for modification kits is divided between two Army Aviation Systems Command (AVSCOM) organizations, visibility--i.e.; information on quantities, storage locations, etc.--for kits has been poor and modifications have been delayed.

--Kit inventory and issue records are inaccurate.

The Army has not routinely prepared modification installation schedules to back up its annual modification procurement requests. This type of information would be useful in planning modifications and in assessing the status of

modification programs. It could show when modifications are planned to be installed and what installation will cost, thereby providing a clearer indication of the total cost of a modification. The Navy has prepared this type of data for its 1975 modification fund request. It might serve as a standardized format for use by the Army and the Air Force.

PROJECTION OF MODIFICATION MAN-HOURS UNDERSTATED AT JUNE 30, 1974

The Army told the House Committee on Armed Services that its aircraft modification backlog would approximate 1.2 million man-hours by the end of fiscal year 1973. Even though the fiscal year 1974 program added another 670,000 man-hours to that total, it planned to accomplish 1.3 million man-hours in 1974, leaving 540,000 hours of unaccomplished modifications at June 30, 1974. The Army considered this backlog a realistic management level consistent with its ability to coordinate installation leadtime, workload, and depot overhaul programs.

According to representatives of AVSCOM's Configuration Management Division, the 1.3 million man-hours to be accomplished in fiscal year 1974 may have been based on AVSCOM's estimate of 1.4 million man-hours to be accomplished during fiscal year 1973. AVSCOM's configuration management records showed a reduction of 1.15 million in its modification backlog in fiscal year 1973. However, only 688,000 man-hours involved installation. The additional 466,000 man-hours were reported as accomplishments but actually were the result of adjustments for aircraft removed from inventory and MWOs which were rescinded before 100-percent accomplishment.

If the Army continued to install kits at the fiscal year 1973 level, it would require approximately 20 months just to complete the MWOs outstanding at the end of that year. This projection assumes no new modifications. This assumption is obviously incorrect because the Army said it planned to add 670,000 man-hours during fiscal year 1974. AVSCOM's configuration status records as of September 30, 1973, showed that 417,855 man-hours were added during the first quarter of fiscal year 1974.

AVSCOM's Configuration Management Division reported to the Army Materiel Command (AMC) on October 18, 1973, the man-hours added and accomplished during the first quarter of fiscal year 1974. This report included an estimate showing that the man-hour backlog at the end of fiscal year 1974 would be about 700,000. We found that this figure had been computed incorrectly. Using the information in the report, we computed 865,000 man-hours, a quantity exceeding the 540,000 man-hour level the Army considered manageable.

MANY MODIFICATIONS CANCELED BEFORE 100-PERCENT ACCOMPLISHMENT

Our comparison of man-hours reported to AMC on September 30, 1973, with the backlog for June 30, 1973, showed that many man-hours were eliminated through adjustments, as shown below.

Backlog on June 30, 1973		1,133,847.6
First quarter fiscal year 1974:		
Man-hours added	417,855.0	
Man-hours accomplished	163,159.8	254,695.2
		1,388,542.8
Backlog on September 30, 1973		1,217,400.5
Man-hours eliminated through adjustments		171,142.3

These adjustments arose through cancellation of MWOs before completion. In many instances modification kits were already on hand. A total of 637,000 man-hours were deleted from the modification records during the 15-month period ended September 30, 1973. This is more than 40 percent of the total accomplished hours reported by the Army. We reviewed two MWOs which had been rescinded before completion. These accounted for about 200,000 of the man-hours involved.

MWO 55-1520-210-30/33. This MWO was published February 9, 1971, was superseded on May 9, 1972, by MWO 55-1520-210-30/37, and was rescinded on February 14, 1973. Due to this rescission, the backlog was reduced by about 107,000 man-hours.

MWO 55-1520-210-30/33 was a Department of the Army-controlled (DA-controlled) modification ("* * * those

controlled by Army because of the expense involved, the critical nature of the modification, or for other reasons.") which called for the installation of provisions for the AN/ARC-134 radio set on UH-1 aircraft. While the MWO was in effect, 205 aircraft were modified. About 1,100 modification kits were procured at a cost of $279,000. About 900 are still on hand. The Army told us that the excess kits would be separated into components and placed in the supply inventory.

This MWO was canceled because the AN/ARC-134 radio set was replaced by the AN/ARC-115 radio set. This change was justified on the basis of a cost analysis which showed that the Army could save $4 million on a 10-year life cycle of 1,500 units. We did not review the cost analysis in detail; however, we noted that most of the savings were based on spare parts costs ($7 million for the -115 versus $11 million for the -134). In addition, the Army determined that the -115 radio was technically superior to the -134. We also noted that the Army, in modernizing the avionics of the U-8D helicopter, planned to use the -134 radio set, the set being discontinued on the UH-1.

The AVSCOM engineer who prepared MWO 55-1520-210-30/37, told us that aircraft modified with the -134 radio were not intended to be remodified with the -115 radio. However, 20 of the 205 aircraft modified with the -134 were identified in the MWO as aircraft that would have the -115 installed. AVSCOM configuration management records indicated that 1 of 20 had already been remodified with the -115 and that -115 kits had been ordered for 2 others.

MWO 55-1510-201-40/17. This MWO was published April 21, 1971, and was rescinded on March 28, 1973. It was a DA-controlled modification which provided for the standard avionics configuration in the U-8D aircraft. The MWO listed 91 aircraft as being affected. AVSCOM configuration management records of September 8, 1973, showed that 47 aircraft had not been modified at the time the MWO was canceled.

Fifty-two kits valued at $520,000 are still available. The Army has not taken any action on the excess kits.

Other modifications canceled

Army headquarters canceled MWO 55-1510-201-40/17 and 16 other DA-controlled modifications at the same time. These MWOs were included in 19 avionics and armaments MWOs that AVSCOM submitted to Army headquarters on December 4, 1972, for review and consideration for rescission. Kits were on hand for 15 of the 17 rescinded modifications.

As a result of Army headquarters cancellations, AMC requested AVSCOM to include the total man-hours applicable to the rescinded MWOs in the data forwarded for reporting modification accomplishment.

On October 18, 1973, AVSCOM submitted a list of an additional 35 DA-controlled MWOs to Army headquarters for review and rescission consideration. However, AVSCOM recommended that 17 MWOs be retained until 100-percent compliance.

MAN-HOURS APPLICABLE TO 1974
MODIFICATION FUNDS NOT RECORDED

Many modification man-hours had been approved and funded but had been excluded from the reported outstanding quantity because of the Army's method of recording man-hours.

Under the Army's procedures, an MWO is not prepared until modification kits are available or until the delivery schedule for the kits is firm. The man-hours are added to the backlog when the MWO is prepared. This can be many months after the product improvement proposal has been initially funded. For example, proposal 1-72-1-024 for the crash-resistant fuel system for the CH-47A, -47B, and -47C aircraft was initially funded in fiscal year 1972. Through fiscal year 1973, over $9 million was funded. The final draft of MWO 55-1500-210-50/4 to install the system on CH-47C aircraft was dated May 4, 1973, and the 254,375 man-hours were added to the backlog at the beginning of fiscal year 1974. By the time the MWO was prepared, AVSCOM had made contractual arrangements for all the modification kits required.

The number of man-hours applicable to approved and funded product improvement proposals is not readily available

at AVSCOM. However, using data developed by AVSCOM and submitted to AMC for the fiscal year 1975 budget request, we estimate that at least 1.3 million man-hours apply to the fiscal year 1974 program. MWOs have not yet been prepared for these modifications, and therefore the hours have not been included in the Army's outstanding hours. Our estimate accounts for only 57 percent of the product improvement proposals in the fiscal year 1974 program because data was not available on the others.

MORE TIMELY MODIFICATION APPLICATION POSSIBLE BY INCREASING USE OF FIELD-LEVEL ACTIVITIES

Army Regulations 750-1 requires that modifications be accomplished not later than 12 months from the beginning of the time compliance period, generally 2 months after an MWO is prepared. However, many of the Army's MWOs have been outstanding for several years, as shown in the following schedule of MWOs outstanding on July 31, 1973.

Year MWO prepared	Number of MWOs	Percent
1965	1	0.5
1966	3	1.5
1967	3	1.5
1968	27	13.3
1969	37	18.2
1970	51	25.1
1971	29	14.3
1972	36	17.7
1973	16	7.9
Total	203	100.0

An important factor contributing to this delay is the level of application of modifications. Almost half of the Army's aircraft modification workload is planned for application at depot level. The outstanding workload for July 31, 1973, by level of application is shown below.

Level	Man-hours (thousands)	Percent
Local users	5.6	0.3
Direct-support maintenance	561.4	38.9
General support maintenance	177.4	12.3
Depot maintenance	699.8	48.5
Total	1,444.2	100.0

Depot-level modifications are planned for application when aircraft are returned for repair. Before fiscal year 1974, Army aircraft were processed through depot maintenance on a cyclic basis as operating hours or years of service accumulated. Depot-level MWOs remained active for as long as 5 years, before all aircraft were cycled.

Starting in fiscal year 1974, aircraft were sent through depot maintenance under a concept called on-condition maintenance. The condition of an aircraft is evaluated by specific indicators which are designed to detect general progressive deterioration at key points of the airframe and to portray the overall condition of the aircraft. The application of selected MWOs is 1 of about 20 evaluation indicators.

Under the on-condition maintenance concept, depot-level MWOs could remain active for even longer periods, and some aircraft may never be processed through depot maintenance. Therefore depot-level MWOs affecting these aircraft would have to be accomplished through Army or contractor field teams.

There were no depot-level MWOs before 1969. The Army has issued only 145 such MWOs, of which about 130 remain outstanding. AVSCOM, recognizing that it is currently impossible to complete depot-level MWOs within the 1-year requirement period, recommended to AMC in November 1972 that these MWOs be exempted from the requirement. An exemption has not been granted.

As indicated previously, there is a low man-hour backlog at the user level. A primary reason is that in July 1972 the Army directed that all future user-level MWOs be eliminated and that MWO kits not be issued below the direct-support level.

A recent Army Audit Agency report pointed out that direct and general support maintenance organizations had the capability and capacity to take on additional modification workloads. We believe that, in view of the long delay in accomplishing depot-level modifications, the Army should review its procedures for designating level of accomplishment since the potential exists for accomplishing a greater number of modifications at the field level.

ORGANIZATIONAL STRUCTURE FOR MANAGING MODIFICATION KITS

A recent Army Audit Agency report pointed out that the organizational structure within AVSCOM did not provide adequate visibility for effective management of modification kits.

The report describes the division of responsibilities between the Directorate of Materiel Management (DMM) and the Directorate for Research and Development (DRD). The item managers within DMM procured and issued kits; whereas, DRD personnel monitored modification kit applications and backlogs of unapplied kits. Records from both areas did not reconcile and, as a result, the status of a modification "became entangled in unknowns." The Army Audit Agency recommended "a consolidation of the requirements determination and issue functions with the monitoring function" to improve knowledge about the program.

According to the report, even DA-controlled kits were not immune to poor kit visibility and loss of control.

As shown in the chart below, the Army Audit Agency found DA-controlled kits stockpiled in depots for long periods.

Modification number	Quantity of kits in depot	Number of days kits in depot
55-1520-210-30/37	764	128
55-1520-210-40/1	18	543
55-1520-210-40/3	562	259

Responsible personnel at Fort Hood, Texas; Fort Riley, Kansas; and Fort Sill, Oklahoma, told the Army Audit Agency that they had the capability to apply the DA-controlled kits. Field activities needed to know which aircraft were to be modified in order to requisition modification kits. But this information was not furnished to them, causing a backlog of unapplied kits.

The Army Audit Agency believes AVSCOM should determine if a general support unit (GSU) has the capability to apply the modification. If it does, AVSCOM should issue kits to GSU. If GSU cannot apply the kits, AVSCOM should contract for the application.

The report recommended consolidating the split responsibilities within AVSCOM to help lessen the modification backlog and to improve visibility of modification kits.

The report proposed centralized management to minimize the backlog, citing these reasons:

1. The distribution process would give the exact number of modification kits to a maintenance unit that can apply the kits within a specific time frame.

2. AVSCOM's awareness of exact distribution could simplify monitoring and following up on kit applications.

3. Kit distribution delays would be eliminated.

4. The same activity in AVSCOM would supply, distribute, and monitor the backlog of unapplied kits.

We agree with the Army Audit Agency's conclusions and believe that the recommended corrective action would improve AVSCOM's management of its modification program.

CONFIGURATION MANAGEMENT RECORDS NOT RELIABLE

Configuration management records, which are used to show the status of modifications, are inaccurate and out of date. This could impede modification workload planning, requirements computations, and the effective use of aircraft.

Configuration management records for 32 CH-47 aircraft processed through overhaul during the fourth quarter of fiscal year 1973 showed that 249 MWO applications remained outstanding. The number of MWOs outstanding ranged from 2 to 18 per aircraft. Data from a contractor-prepared report and data from the New Cumberland Army Depot, Pennsylvania, showed that 138 of the 249 outstanding applications had been completed but had not been reported on AVSCOM's configuration management records. We verified the completion of one MWO on seven aircraft.

One depot-level MWO accounted for 14 of the remaining 111 unaccomplished applications. We asked the overhaul facility and the aircraft user whether the MWO had been applied during overhaul but not reported. We found that (1) five applications had been completed during overhaul, (2) five applications had not been completed because kits were not available, (3) two applications had been completed when the aircraft were recycled, (4) one application had been deferred because the aircraft was needed quickly, and (5) no information was provided about one application.

The Army Maintenance Management System procedures require that MWO applications be reported within 3 days to the Army Logistics Data Center, Lexington, Kentucky. AVSCOM officials said that the Center notifies AVSCOM monthly. Below are examples of reporting delays for the MWOs and aircraft previously discussed.

MWO number	Aircraft serial number	Date overhaul completed	Date AVSCOM notified	Elapsed days
55-1500-210-30/41	64-13137	6-29-73	10-01-73	95
	64-13144	6-27-73	"	97
	65-7984	6-30-73	"	94
	65-8011	6-28-73	"	96
	67-18473	5-31-73	"	124
	68-15830	6-24-73	"	100
	68-15833	5-12-73	"	143
	68-16003	5-31-73	"	124
	68-16015	6-30-73	"	94

MWO number	Aircraft serial number	Date overhaul completed	Date AVSCOM notified	Elapsed days
55-1520-227-50/1	67-18473	5-31-73	10-01-73	124
	68-16003	5-31-73	"	124
	68-16015	6-30-73	"	94

In addition to delayed reporting, MWOs were reported as completed on AVSCOM configuration management records, although the overhaul facility reported they had not been completed. For the 32 aircraft overhauled in the fourth quarter of fiscal year 1973, New Cumberland Army Depot identified 13 modifications on 6 aircraft that were unaccomplished. AVSCOM's configuration management records showed that they had already been accomplished. Although some were depot-level modifications, they were not applied when the aircraft underwent overhaul at New Cumberland.

CONTROL OVER MODIFICATION KITS

Item managers use kit inventory and issue records to insure that sufficient kits are available to meet requirements, that valid kit requisitions are submitted, and that kits are issued for the correct aircraft. The Army Audit Agency report stated that kit inventory and issue records were inaccurate and that there were kit shortages in the wholesale supply system. This made it virtually impossible to explain whether the shortages were actual or whether kits had been issued but not yet applied. The report said:

> "Inventory and Issue Records. At 31 May 1973, there were 217 current aircraft modifications. We reviewed 65 modifications that required the application of 72 kits. We compared the number of kits on hand and due in with the number of aircraft that had not yet had the modifications applied. After adjusting for the limited-distribution aspect of some kits, our review showed that 29 (40.3 percent) of the 72 modification kits did

not have sufficient quantities on hand in the wholesale supply system to satisfy requirements. Examples were:

Modification No.	Federal Stock No.	Quantity of Kits Required	Available	Short
55-1500-219-30/01	2945-462-3087	173	12	161
55-1510-209-20/03	2840-169-5818	14	0	14
55-1520-210-30/29	2945-462-3088	391	48	343

"We made a further analysis of issue records to determine if sufficient quantities of kits had been issued to maintenance activities and to confirm or deny the apparent shortages indicated by the inventory records. But records used to control kit issues were not accurate enough to reconcile kit issues with reported applications. We also reviewed the disposition of active modification kits to evaluate the controls exercised over the issue and subsequent use of the kits. As shown in the following schedule, the computerized record used by the AVSCOM item managers as the basic tool for controlling kit distribution did not show many of the issues.

Modification Kit Federal Stock No.	Number of Kits Issued Per Audit	Per AVSCOM Control Record	Difference
1560-168-5493	609	352	257
1560-433-2477	180	99	81
1560-782-9843	159	77	82

The 'Per Audit' kit issues were determined by analyzing financial inventory accounting records.

"In numerous instances aircraft were modified although the control record did not show kits as being issued for those aircraft. We observed instances where kits were issued twice for the same aircraft. In some instances, the aircraft still were not modified even though two kits had been issued for that aircraft. Other instances were noted where issues were shown in the control record even though the requisitions had been cancelled and the kits were not issued."

The Army Audit Agency believed that (1) a force-issue system--when kits are sent to a GSU and it is told on what aircraft to install them--and (2) an accurate record of all kit issues, would help correct this situation.

The Army Audit Agency found excess kits worth about $1.1 million. Its report cited reduction in the Army's inventory of certain types of aircraft due to attrition and turnover of assets to the Republic of Vietnam as the primary cause. Item managers claimed that excess kits were sometimes procured as a safety factor because of high losses on some field-level modifications.

CONCLUSIONS

The Army's outstanding modification workload is now at a more controllable level, because of the backlog reductions. However, there is a continuing need for management attention to the various deficiencies discussed in this report. Many of these are longstanding problems which had been found in numerous past studies of modification management.

The Army has not routinely prepared and submitted modification installation schedules to back up their modification procurement requests. This type of information, showing when modifications will be installed and what their installation will cost, would be useful in evaluating modification planning and would show the combined purchase and installation costs for modifications.

Field-level maintenance activities have the capacity to handle additional modification workload. Having more modifications done at that level would increase the use of the costly equipment and facilities at these activities and could expedite the completion of many modifications.

The Aviation Systems Command needs to eliminate divided responsibility for modifications. Many of the problems and delays in modification accomplishment seem to be due to uncertainty about modification status and lack of total visibility within one organization.

Modification management would improve if configuration management and modification kit inventory records were

accurate and modification managers could rely on them for modification planning. Improved controls are needed to insure more timely and accurate recording of modification data and to insure the accuracy of inventory records.

RECOMMENDATION

We recommend that the Secretary of the Army have the Aviation Systems Command develop controls to insure more timely and accurate recording of modification data.

AGENCY COMMENTS

By letter dated June 13, 1974 (see app. I), the Assistant Secretary of Defense told us that the military departments were in general agreement with our recommendations to improve management and control of their aircraft modification programs and that they were taking steps to implement the recommendations.

CHAPTER 3

NAVY MODIFICATION PROGRAM

The Navy reduced its outstanding modification man-hours from 20.9 million in July 1970 to 6.6 million in June 1973. Most of the reduction was the result of screening the modification records, eliminating those hours pertaining to unneeded modifications, and declaring the related kits excess.

On June 30, 1973, the Navy had an inventory of modification kits on hand valued at $173 million and excess kits valued at about $22 million. The $173 million worth of kits seems inordinately large, in relation to the Navy's fiscal year 1974 installation program estimated at about 3.96 million man-hours and similar data for the other services. The Air Force has an inventory worth $111 million with an annual installation program of about 13 million man-hours, and the Army has an inventory worth about $20 million with a an annual program of about 1.3 million man-hours.

The Navy's inventory contains 546,000 kits. Many were acquired between 1966 and 1972 when a number of modification programs were initiated to support Southeast Asia operations. These kits have not been installed because of funding limitations and restrictions on the time aircraft have been made available for modification and because many of the modifications are routine and therefore have been deferred in favor of higher priority modifications.

Many of the Navy kits were bought with miscellaneous flight safety and operational necessity funds. For several years this was a $20 million annual fund administered by Headquarters, Navy Air Systems Command, to finance modifications which were suddenly needed. Apparently, the materiel was acquired without sufficient planning for later installation. This fund was reduced to $1 million in fiscal year 1974.

This large Navy inventory of modification materiel is undoubtedly the result of procurement practices that did not adequately consider plans and capabilities to have modifications installed. Effective with fiscal year 1974, the Navy has initiated revised procurement procedures that attempt to

relate quantities of modification materiel procured to future installation capabilities. Also, the Navy has prepared its budget request for modification funds in 1975 in a format that shows the relationship between procurement funds and installation schedules and installation fund requirements.

To reduce the quantity of modification kits in backlog, the Navy has formulated a multiyear plan to designate additional funds specifically to install these modification kits. The Navy estimates that the backlogged modification work at June 30, 1973, will cost about $121 million to complete. About $43 million was planned for fiscal year 1974 and $78 million in subsequent years. The Navy projects that by June 1975 the kit backlog will have been reduced to an inventory valued at about $65 million.

Although some progress has been made in improving the Navy's management of aircraft modifications, our review at two Naval Air Rework Facilities (NARF) showed a need for continued management attention. We found that:

--Many modifications had not been installed during depot-level maintenance, called Progressive Aircraft Rework (PAR) in the Navy.

--Fewer aircraft received PAR than were scheduled.

--The Navy was using a special depot-maintenance program that deferred aircraft modifications.

--Many modifications were within the maintenance capability of organizational and intermediate maintenance activities, and the Navy had only recently taken steps to have more modifications installed below depot level.

MANY MODIFICATIONS NOT INSTALLED DURING DEPOT-LEVEL REPAIR

The Navy has a general policy that all outstanding modifications will be installed when an aircraft is sent for PAR. The Navy estimates that having modifications installed during PAR can save about 25 percent of the modification man-hours because frequently the aircraft must be disassembled for depot maintenance. Since PAR intervals are as long as 3

years for some aircraft, a modification missed at this time can mean extensive delay in installation or will necessitate a special project to have the modification installed later.

North Island NARF

At the North Island NARF, many outstanding modifications were not installed when the aircraft underwent PAR. A representative of the Naval Air Systems Command (NAVAIR), told us that, although it was a general policy to install all outstanding airframe changes on each aircraft inducted into PAR, there were limiting factors. For instance:

1. The technical directive which describes how the change is to be incorporated may not be released to NARF in time to allow installation.

2. The controlling custodians of the aircraft, Commander, Naval Air Force, Pacific Fleet and Atlantic Fleet, can override NARF airframe change installation plans to avoid mixed configuration of aircraft with specific missions.

3. Some airframe modification kits are received after aircraft were reassembled and in the testing phase. Installation of the kits at this point would result in excessive costs and delays.

Our review of 666 outstanding modifications on 28 aircraft completed by NARF during the fourth quarter of fiscal year 1973 showed that 72 modifications, or about 11 percent, were not accomplished during PAR. Below is a schedule showing the reasons for unaccomplished modifications. These modifications involved 7,493 man-hours.

Reason	Not accomplished
TD not available	39
Kit or materiel not available	31
Modification not requested	2
Total	72

In two instances modifications, which require 3,000 book man-hours per aircraft, were not installed because they were not requested. NARF personnel said that the Type Commander, Naval Air Force, Pacific Fleet, has instructed them not to incorporate the modification unless requested.

Cherry Point NARF

We also looked into how modifications were applied during PAR at Cherry Point NARF. In fiscal year 1973 NARF inducted 33 F-4 aircraft for PAR and deferred about 94,000 modification installation man-hours. This represents 44 percent of the outstanding man-hours on these aircraft as of August 30, 1973. The table below shows the reasons for deferment.

Reason	Man-hours deferred
Low priority	63,000
TD not released by NARF	29,631
TD not received by NARF	551
Kits not available	273
Aircraft did not require TD	266
TD awaiting installation of prerequisite changes	260
Total	93,981

Low priority

Navy representatives told us that all modifications had not been installed because some were given low priority. Higher priority modifications are selected and funded. The type commander (TYCOM) makes the decision on modification priorities. The decision is based on operational requirements, the funds available for use, and the length of time required to make the modification. We found that modifications with low priorities accounted for most deferred man-hours.

Technical directives not released

Several TDs were not released by NARF. For example, TD 470, part 2, dated June 1972, had not been released because NARF was waiting for the required tooling which was being

manufactured by North Island NARF. NARF was also waiting for the tooling for TD 537, dated October 1972.

Other reasons

Other reasons accounted for deferrals, such as one aircraft did not receive four TDs because kits were not available. In addition, during fiscal year 1973

--five aircraft did not receive TD 421,
--one did not receive TD 450,
--two did not receive TD 487,
--seven did not receive TD 527, and
--six did not receive TD 548

because NARF had not received a copy of the TD when the aircraft went through PAR. We noted several examples of TDs' not being received from 5 to 27 months after issue date.

Effect of deferrals on backlog for specific aircraft

The following table shows for specific aircraft the effects that NARF modification deferment and the addition of new modification requirements during PAR have on the backlog.

F-4 PAR Fourth Quarter FY 1973

Aircraft number	Man-hours outstanding before PAR	NARF deferred		New man-hour requirement	Man-hours outstanding (as of Aug 1973)
		Changes	Man-hours		
155740	9,270	9	6,039	93	6,132
149461	8,456	7	633	2,636	3,269
155735	8,927	11	6,079	93	6,172
155759	8,777	11	6,079	93	6,172
155739	9,073	8	6,039	93	6,132
155766	8,693	10	6,041	29	6,070
155746	5,775	9	3,874	2,660	6,534
155757	5,768	9	3,874	2,660	6,534
157283	3,848	9	3,549	2,646	6,195
157291	3,793	13	3,399	2,640	6,039
Total	72,380	96	[a]45,606	13,643	59,249

[a]TD 506 accounts for 27,000 of these man-hours.

Because few hours were applied and new modifications were approved, some aircraft had more hours outstanding when they left PAR than when they entered. For example:

	Aircraft number	
	157283	157291
Man-hours outstanding before PAR	3,848	3,793
Man-hours installed	299	394
Man-hours deferred	3,549	3,399
New man-hours requirements	2,646	2,640
Man-hours outstanding August 1973	6,195	6,039

OTHER FACTORS AFFECTING MODIFICATION ACCOMPLISHMENT

Although many aircraft did not receive all outstanding modifications when they were inducted for PAR, we found that many others did not receive PAR. Therefore these aircraft did not have the opportunity to have modifications installed. At North Island NARF, less than 80 percent of the aircraft scheduled for depot-level repair during fiscal year 1973 actually arrived at the facility during that period.

The Navy has developed a substitute for depot-level repair called ACE (aircraft condition evaluation) which is currently undergoing evaluation on both Atlantic and Pacific Fleet aircraft.

The Navy's policy is to install all modifications when the aircraft receives PAR. The ACE program was developed as an attempt to get more aircraft through NARF within the same dollar and man-hour limitations. It requires fewer man-hours and more aircraft can be reworked. The ACE program deals with the installation of the structural and safety changes of the aircraft and changes that TYCOM chooses to have installed. Quarterly, TYCOM selects those modifications he wants on specific aircraft.

North Island NARF

In addition to changes not incorporated to aircraft that completed PAR at the North Island NARF during the fourth quarter of fiscal year 1973, 38 other aircraft were not scheduled to receive certain modifications because they were inducted under the ACE program. We reviewed records of 6 of the 38 aircraft. Only 36 of the 184 outstanding modifications were installed. There were 15,403 man-hours applicable to the 148 unaccomplished modifications.

Although NARF officials believe that twice as many aircraft can be processed under ACE compared with PAR, ACE might increase the length of time some modifications remain outstanding unless the Navy arranges to have these modifications done below depot level or through some special program.

An official of the Naval Air Force, Pacific, said ACE would install some modifications at a faster rate because more aircraft could be reworked for the same number of dollars. He said that 1,000 aircraft needed PAR but that only 300 PAR slots were available annually. He also said that ACE was only a "stopgap" measure and that no program had been planned to help alleviate the problem caused by inadequate funds for rework. He said that the total impact of ACE was unknown and could not be evaluated until the program had been in operation for a longer period.

Cherry Point NARF

Under the ACE program at the Cherry Point NARF, the TYCOM defers changes that he considers low priority and NARF defers changes for reasons discussed previously. The table below shows to what extent the TYCOM and NARF deferred changes under the ACE program for the fourth quarter of fiscal year 1973.

Fourth Quarter FY 1973

Aircraft number	TYCOM deferred changes		NARF deferred changes		Total deferred	
	Number	Man-hours	Number	Man-hours	Number	Man-hour
153808	10	5,707	7	519	17	6,226
153850	28	6,102	2	407	30	6,509
157297	21	5,900	1	67	22	5,967
157296	21	5,900	1	67	22	5,967
157282	21	6,325	1	67	22	6,392
153858	26	7,237	4	276	30	7,513
Total	127	37,171	16	1,403	143	38,574

During the first half of fiscal year 1974, an additional 103,000 man-hours were deferred by the TYCOM for 26 aircraft that were in the ACE program at the Cherry Point NARF.

TD 506, which is a modification to update the radar on the F-4, accounts for most of the man-hours being deferred under ACE. TD 506 accounted for 18,000 man-hours (48 percent), 36,000 man-hours (67 percent), and 42,000 man-hours (86 percent) deferred in the fourth quarter of fiscal year 1973 and first and second quarters of fiscal year 1974, respectively.

TD 506 is being deferred because it requires 3,000 man-hours to install. Several concurrent or subsequent airframe changes and avionics changes, requiring additional man-hours, have to be installed with TD 506. The TYCOM decided not to expend allocated NARF man-hours for this change because NARF could not complete all aircraft in time for deployment.

Although TD 506 is being deferred, almost $500,000 worth of modification kits were on hand at Cherry Point to support this modification. This suggests that the modification materiel was acquired without adequately considering installation plans.

NAVY ATTEMPTING TO REDUCE MODIFICATION BACKLOG BY HAVING MORE WORK DONE BELOW DEPOT LEVEL

The Navy policy for applying modifications is specified in Aeronautical Requirements number 22 (AR-22), dated May 23, 1969. This states that "Except for safety considerations, depot level installation shall be prescribed for all changes in airframes and airborne equipment." There is provision for installation below depot level, if the TYCOM so desires.

Because of the extensive backlog of aircraft modifications, the Navy has recently initiated a pilot program to identify modifications for application below depot level. Headquarters, Naval Air Systems Command, message in April 1973 initiated specific action on the project. A memorandum to the Commander, Naval Air Force, U.S. Atlantic Fleet, from the Commander, Naval Air Systems Command, stated that the inventory of modification kits on hand contained 110,150 kits requiring an average of 2 man-hours per kit to install and that there was an additional 33,745 kits requiring an average of less than 12 man-hours per kit to install. Accordingly, it was concluded that many of these kits could be installed using organizational or intermediate level maintenance personnel.

The Commander, Naval Air Force, Atlantic Fleet, published a directive in November 1973 outlining the objectives of the pilot program and establishing program milestones. The following quote from the directive explains why the program was initiated.

> "A large number of airframe change (AFC) kits are currently available within the Navy supply system. Perusal of pertinent NINC (not incorporated change) lists reveal that many are incorporable by organizational maintenance activities. Others may no longer be necessary or desirable. Austere funding of depot rework severely constrains AFC incorporation during PDLM (programed depot level maintenance); and in the interests of aircraft modernization while conserving depot dollars for depot work, it has become necessary to embark on subject program." (Underscoring supplied.)

The directive pointed out that airframe changes requiring 10 man-hours or less would be installed but that higher man-hour changes might also be authorized. It noted that airframe changes "originally coded for depot level may, in some cases actually be within organizational level capability."

The procedures attached to the directive described the use of Aeronautical Technical Directive Requirements lists 2A and 4. List 2A shows the changes that have not yet been incorporated on aircraft, and list 4 shows the changes that have been incorporated. The procedures point out that "lists 2A and 4 cannot be relied upon to give a correct AFC incorporation status * * *." This agrees with our findings during this review, and this matter is discussed in the section that follows.

MODIFICATION MANAGEMENT DATA UNRELIABLE

One of the basic management tools for monitoring the status of aircraft modifications is the configuration status accounting system. Two reports from this system are lists 2A and 4 which show the unincorporated and the incorporated modifications by aircraft model.

These reports are inaccurate and do not provide timely information needed to effectively monitor all modifications. We reviewed updated lists of unincorporated changes obtained on September 25, 1973, for 28 aircraft that completed PAR the last quarter of fiscal year 1973 at North Island NARF. Lists for 13 of the aircraft still showed 178 modifications outstanding even though these had been incorporated during PAR. For the remaining 15 aircraft, lists were either not available or outdated, even though they were supposed to be printed every 6 weeks. The latest incorporated modifications list was 6 months old.

NARF officials told us that the unincorporated modification lists contained inaccuracies because of key punching and processing errors and the failure to report modifications. NARF officials told us that, because of the inaccuracies in the 2A and 4 lists, there was no assurance that a modification had been installed or was still outstanding. Because these reports are unreliable, kits may be positioned incorrectly and therefore may not be available to a NARF when needed or an aircraft may appear as having a modification which has not actually been installed.

At the Cherry Point NARF, we found 6 of the 10 F-4s and 9 CH-46s that completed PAR in the fourth quarter of fiscal year 1973 had incorrect unincorporated change lists. Needed modifications appeared on them, even though they had already been installed. Four F-4 unincorporated change lists were incorrect because they did not include all changes that were still needed. Four CH-46s showed uninstalled modifications in the subsequent not incorporated change list even though these had been accomplished.

SEPARATE KIT INVENTORY AT NORTH ISLAND NARF

As of September 30, 1973, the Naval Air Station, North Island, had available about 3,260 line items of airframe and engine modification kits valued at $57.4 million. In addition, the North Island NARF, at the same facility, had a modification kit inventory. On October 7, 1973, the reported value of kits on hand was $4.9 million. We were advised that the separate NARF inventory was established to simplify kit requisitioning and to insure that kits would be available when aircraft were inducted for PAR.

The Naval Air Station has been able to satisfy the NARF requisition for kits 97 percent of the time within 4 or 5 days. Kits included in the NARF inventory are not accounted for as part of the Navy supply system inventory and, therefore, systemwide visibility for materiel may be lost. This could hamper repositioning kits to another NARF if this need should arise. We believe the Navy should evaluate its needs for this separate NARF inventory.

CONCLUSIONS

Since 1970 the Navy has made a large reduction in the number of modification man-hours outstanding. However, the Navy's inventory on June 30, 1973, was still disproportionately large when compared with Air Force and Army inventories. The Navy has developed new procedures that require the preparation of installation plans which are reviewed before modification materiel is approved for purchase. This revised planning is reflected in the Navy's 1975 budget submittal. These measures will help reduce the quantity of modification kits awaiting installation. If properly implemented, these control procedures should prevent this situation from developing again.

The Navy estimates that the modification backlog at June 30, 1973, will cost about $121 million to install. About $43 million is planned for fiscal year 1974 and $78 million in subsequent years. In view of this large installation cost, the Navy should carefully evaluate its backlog of modification materiel and determine whether this additional expenditure is fully justified. These kits have been on hand for several years. Many have not been installed because they are low priority. The Navy should be certain that these modifications are important enough to warrant the additional installation expense that it plans to incur over the next few years.

The Navy recently implemented a special program to have many of its outstanding modifications installed by maintenance activities below the depot level. Many of these modifications were originally designated for depot-level application although they required few man-hours per installation and apparently were within the maintenance capability of lower level activities. This indicates a need for the Navy to reexamine its system for designating level of application for modifications. The Navy should try to have as many modifications designated for lower level application as is consistent with the maintenance capabilities of those activities.

The Navy's modification management data is not reliable. Without records and reports that accurately show modifications outstanding or those that have been installed, the program cannot be managed effectively. The Navy needs to improve its control over this data to insure that data is accurately recorded and maintained so that it provides a valid basis for modification management.

RECOMMENDATIONS

We recommend that the Secretary of the Navy have the Naval Air Systems Command

--effectively implement and monitor the revised control procedures that require review and verification of installation schedules before modification procurements are authorized,

--evaluate the validity of the modifications contained in the outstanding backlog to determine whether these are still important enough to warrant the high installation cost planned,

--establish effective controls to insure that modification management data is reliable, and

--reevaluate the need for the separate inventory of modification materiel stocked at North Island NARF.

AGENCY COMMENTS

By letter dated June 13, 1974 (see app. I), the Assistant Secretary of Defense told us that the military departments were in general agreement with our recommendations to improve management and control of their aircraft modification programs and that they were taking steps to implement the recommendations.

CHAPTER 4

AIR FORCE MODIFICATION PROGRAM

Although aircraft modification man-hours increased in the Air Force from 31.7 million man-hours in June 1970 to 34.3 million man-hours in June 1973, the Air Force believes that the hours are manageable. Air Force representatives said that at June 30, 1973, only 21.8 million man-hours involved modifications in which materiel delivery had begun. Acquisition of modification materiel has been phased with installation. They said that this had avoided premature acquisition of materiel and that, therefore, the August 1973 materiel inventory valued at $111 million was equal to about 4 months' requirements.

Although these statistics indicate that the Air Force modification program is at an acceptable management level, our review at the San Antonio and Sacramento Air Materiel Areas showed that:

--More than 96 percent of the Air Force modification workload was planned to be done at the depot level. This could delay modifications, since installations were dependent on the depot maintenance cycle for aircraft and the capacity of depot maintenance facilities.

--Some modifications had not been installed when aircraft received depot maintenance.

--Modification management data was not reliable.

--Better planning could have avoided delays in the C-5 update program.

--Modifications had been delayed because of a lack of workable kits.

--The procedures for managing modification kits needed improvement.

--Inventory accountability controls for modification kits and materiel were inadequate.

The Air Force has not routinely developed backup data that relates the annual budget request for modification funds to modification installation schedules and that shows what the installation will cost. This type of information would assist in evaluating the impact of proposed modification work on the capacity of maintenance activities and how this workload interfaces with other maintenance workloads. It would also permit analysis of how effectively installation had been planned and would give a more accurate indication of total modification cost.

MODIFICATIONS PLANNED TO BE DONE AT DEPOT LEVEL

Air Force Regulation 57-4 specifies the criteria for selecting the level where modifications will be done. Except for safety and urgent modifications, a modification requiring more than 8 hours' elapsed time or more than 25 man-hours is done at the depot level. For equipment used by the Military Airlift Command, a modification requiring 16 hours' elapsed time or 48 man-hours is done at the depot level. Of the 34.3 million approved modification man-hours, 33 million, or over 96 percent, are planned for application at the depot level.

When modifications are designated for the depot level, they are usually phased so that aircraft are modified when they are sent to the depot for periodic maintenance. But depot-level maintenance for some weapons systems is approaching the capacity of depot facilities. Having the field level do more modifications could help alleviate this. Since the depot-maintenance cycle for some major aircraft is as long as 4 years, using the field level more could also speed up modifications and prevent materiel from being on hand for prolonged periods. Some field-level activities have said they have the capability to do more modifications.

Modification workload exceeding planned capability

The Air Force Logistics Command's (AFLC's) detailed review disclosed that six major weapon systems accounted for over 90 percent of the total outstanding aircraft TCTO man-hours. These systems are the F-4, F-111, C-5, C-130, C-135,

and B-52. After analyzing the six systems, AFLC officials concluded that workloads for the F-4 would exceed planned capability for fiscal years 1975 and 1976. Other aircraft systems appear to be within manageable limits, but this could change with the approval of new modifications or workloads.

AFLC has recommended to Air Force headquarters that a moratorium be placed on all new F-4 modifications not essential for safety or national defense. In addition, AFLC recommended that modifications on the remaining five systems be minimized for the next 2 years, or until the current situation improves.

Because depot-level modifications are planned to be done when aircraft receive periodic maintenance, the time from approval to modification depends on the total depot-maintenance cycle. For some aircraft this cycle can span several years. (The cycle for the F-4 is 4 years.)

Procurement of modification kits

AFLC policy requires that kits be phase-procured for modifications scheduled to be done at the depot level over more than 1 year. This policy is intended to relate fiscal year kit-funding requirements to kit installation schedules. Instructions received by the San Antonio Air Materiel Area (SAAMA) in August 1972 limit initial kit procurements to the quantities that can be installed in a fiscal year. Later kit procurements are limited to increments that can be installed in a single fiscal year.

According to SAAMA officials, classes IV and V modification kits scheduled for depot installation over more than a year are now phase-procured unless a single procurement can be justified. Class IV modifications are intended to correct service-revealed deficiencies which affect safety, performance, or maintainability. Class V modifications are intended to provide new or improved operational capability. The decision to use phase procurement or single procurement is made for each modification.

SAAMA personnel consider phased procurement to have the following advantages and disadvantages.

Advantages:

1. Funding requirements are spread over a period of years, so investments in inventory are lower.

2. The purchase of excess kits is less likely because later procurement quantities can be adjusted when aircraft are retired or attrited.

3. Less storage space is required.

Disadvantages:

1. Inflation of labor and materiel costs may increase the cost of later procurements.

2. The setup cost for multiple-production runs may increase the unit cost of kits.

We examined 30 modification proposals at SAAMA between June 13 and September 26, 1973, and found that phased procurement was planned for 3 modifications. Phased procurement was not planned for the remaining 27 because of:

1. Short installation period. Twenty-four modifications were scheduled for installation within 1 year, and most of these were field-level modifications.

2. Low program cost. Estimated kit costs for one engine modification and one aircraft modification were $8,334 and $3,795, respectively.

SAAMA justified single procurement for one depot-level engine modification scheduled for installation over 5 years. On the basis of past cost escalation experience, SAAMA estimated the modification would cost $12.2 million if procured over 5 years, while a single procurement under a firm fixed-price contract would cost $9.8 million, a savings of $2.4 million.

Installation below depot level

It appears that more modifications could be installed below the depot level. Increasing the quantity of modifications installed at this level would speed up modifications and would make increased use of the capacities and capabilities of many maintenance activities below the depot level.

An official of the 60th Military Airlift Wing at Travis Air Force Base told us that Travis had enough space and facilities for increased modification work but would need additional manpower.

The California Air National Guard is studying the feasibility of having the field level do most maintenance and modification work on the F-102. Currently the depot work is being done at AMA, at contractors' plants under contract with AMA, or at the base by a depot or contract field team. Guard officials explained to us that the Guard could save substantially by having as much work as possible done at the base by depot field teams, as follows:

--Generally, when modifications and maintenance are done at a contractor's plant, each aircraft must be inspected when the work is completed and after the aircraft is returned to the base. If the base discovers work deficiencies, extensive paperwork is generated and the aircraft may have to be returned to the plant. If the work were done at the base, only one inspection would be required and deficiencies could be readily corrected.

--It takes at least 5 days to process an aircraft coming into AMA and at least 5 days to process an aircraft out. Often, finished aircraft are not ready for return to the base when new aircraft are brought in. As a result, the Government incurs per diem and commercial travel costs for the pilots. If the work were done at the base, the processing time would be minimized and travel costs for pilots could be reduced.

MODIFICATIONS NOT MADE WHEN AIRCRAFT RECEIVED DEPOT MAINTENANCE

It is Air Force procedure to make outstanding depot-level modifications when aircraft arrive for depot maintenance. However, the Sacramento Air Materiel Area (SMAMA) did not make all such modifications.

Of the 190,850 depot TCTO man-hours outstanding on F-100, F-105, and F-111 aircraft at SMAMA for depot maintenance during the fourth quarter of 1973, about 15,590 man-hours, or 8 percent, were not applied. According to SMAMA's records, the modifications were not made primarily because:

--Published TCTOs or technical data was not available.

--Parts or kits were not available from Air Force stock.

An analysis of the depot TCTO workload on the F-100, F-105, and F-111 during the fourth quarter showed:

Depot-level TCTO Accomplishment

Aircraft system	Tail numbers examined	TCTOs outstanding (note a)		Percent not accomplished
		On arrival	On departure	
F-100	73	287	11	4
F-105	17	191	39	20
F-111	80	[b]2,568	[b]207	8
Total	170	3,046	257	8

[a]The total TCTOs required for each tail number examined.

[b]Excludes TCTOs not scheduled because they were not part of the depot-maintenance project.

Accomplishment of Depot-level TCTO Man-hours

Aircraft system	TCTO man-hours outstanding On arrival	TCTO man-hours outstanding On departure	Percent not accomplished
F-100	38,210	1,817	5
F-105	38,058	3,653	10
F-111	[a]116,582	[a]10,117	9
Total	192,850	15,587	8

[a]Excludes TCTOs not scheduled because they were not part of the depot-maintenance project.

Sacramento maintenance records showed the reasons for failing to complete depot TCTOs, as follows:

	Aircraft				
	F-100	F-105	F-111	Total	Percent
TCTO or technical data not available	-	-	108	108	42.0
Parts or kits not available	-	7	92	99	38.5
Not in project directive	8	16	-	24	9.3
Other reasons (note a)	3	16	7	26	10.2
Total	11	39	207	257	100.0

[a]Includes modification requirements dependent on aircraft inspection revealing deficiency and one modification assigned to a depot field team.

An examination of F-105 records revealed that kits were available for three of the seven TCTOs annotated as not completed due to a lack of kits. Of the remaining four TCTOs, two involved cases in which SMAMA had not yet received the kits and two did not require the installation of kits to complete the modifications.

The F-105 kit monitor could not explain why the kits were not installed when, according to his records, they were available.

INACCURATE MODIFICATION MANAGEMENT DATA

Modifications to Air Force equipment are reported in the configuration management system. Properly maintained, the system could, in our opinion, be an effective tool for monitoring modifications. Due to inaccuracies in the system, however, its effectiveness is limited. In two tests of the system's data on C-5 aircraft at SAAMA, we found TCTOs for which the reported status was unreliable. The errors found were usually the result of incorrect initial entries or incorrect reporting of TCTO compliance.

In the first test, we reviewed 16 C-5 TCTOs for which there was an obvious discrepancy between reported TCTO status and the number of kits in the inventory. The TCTO status of seven TCTOs which should have been reported in the management system could not be determined from the system's reports. Two TCTOs had reached their original recision dates and had been dropped from the system; one TCTO was never entered in the system; and initial data entries on four TCTOs were erroneous.

In the second test, we reviewed 10 rescinded C-5 TCTOs which, according to management system reports, had not been completed. The true status of these TCTOs, according to SAAMA personnel, could not be determined from the reports. SAAMA was making physical inspections of C-5 aircraft to determine the status of 10 rescinded TCTOs as well as 29 active TCTOs.

All 39 TCTOs included in the inspection involved modification of landing gear. A total of 137,989 man-hours were required for the TCTOs; of this total, 45,700 man-hours were

reported as completed and 92,289 man-hours as outstanding. SAAMA personnel did not consider this data reliable and provided several explanations why, as follows:

--TCTO compliance for serially controlled equipment is reported in the system by serial number, but some landing gear serial number plates were lost in flight.

--Some serial numbers may have been duplicated.

--The installing activity may have failed to report TCTO compliance.

Our analysis of the 45,700 man-hours completed showed that 17,082 man-hours (37 percent) had not been reported by the installing activity. Completion of the modifications represented by these man-hours had been discovered by physical inspection and had been reported later in the management system.

Physical inspection to determine TCTO status requires expenditure of man-hours which would not be necessary if the management system was reliable. In some cases TCTO compliance can be verified only by disassembling the equipment. In the past, SAAMA modification managers attempted to validate reported modification status by asking Air Force bases for reports of TCTO status. In June 1972, however, this practice was discontinued at AFLC's direction. It was discontinued because it required the bases to expend man-hours that could not be justified and because it created the impression that the AFLC-mechanized management system must be supported by other information.

Deficiencies in the system were also found in a recent Air Force Inspector General review. In a June 1973 report, the Inspector General concluded that the system was not providing managers with timely and accurate data on TCTO status. The report indicated it was questionable whether the configuration status of any specific C-5 aircraft could be determined.

DELAYED C-5 UPDATE PROGRAM

C-5 aircraft are scheduled into SAAMA's depot maintenance activity for periodic maintenance and installation of updating changes. Aircraft completed during August and September 1973 under the maintenance and update program required about 57,000 man-hours per aircraft at a cost of over $930,000. Approximately 40 percent of the man-hours were for maintenance work and 60 percent for installation of updates.

SAAMA's C-5 maintenance-update program is running behind schedule. Large increases in the update workload, coupled with problems encountered during the work, have delayed aircraft completions and increased program costs. The 1973-74 maintenance-update program included 18 C-5 aircraft, of which 14 were originally scheduled for completion by September 6, 1973. By September 15, 1973, only 10 aircraft had been completed. The most recent C-5 aircraft processed were at SAAMA over 2 months longer than originally anticipated. The eight uncompleted aircraft are also running over 2 months behind schedule. Problems which have contributed to the delay include (1) shortages of skilled personnel, (2) new and unfamiliar work procedures, and (3) shortages of kits and special tooling.

A group of structural modifications, called the "five pack," illustrates all the above problems. The five pack was added to SAAMA's C-5 work package in March 1973 and became effective with the eighth fiscal year 1973 aircraft. Its installation was estimated to require approximately 9,000 man-hours per aircraft and a high degree of skill in sheet metal work, including a new metal-bonding procedure. After the five pack work was started, SAAMA found that it needed more highly skilled and experienced sheet metal workers than anticipated. Materials, parts, and tools were also in short supply. Other factors, such as the lack of satisfactory bonding adhesive and a shortage of special fasteners, contributed to the installation delays.

The C-5 maintenance-update program has received high-level attention at SAAMA in recent months. The Commander of SAAMA initiated weekly meetings to keep him informed of

modification problems and to delegate responsibility for finding solutions. Some corrective actions already taken were to:

1. Employ additional sheet metal workers.

2. Initiate a formal training program.

3. Simplify work procedures.

4. Expedite the shipment of kits and materiels to SAAMA.

MODIFICATIONS DELAYED DUE TO LACK OF WORKABLE KITS

Procurement of deficient kits causes increased materiel and labor costs. Materiel costs increase because the kits must be either corrected or replaced, and labor costs increase when deficient kits are installed and must later be removed and replaced.

Our review of delayed modification programs at SAAMA disclosed that kits procured for six modification programs either did not correct the deficiencies or adversely affected performance of the equipment in other areas. As a result, deficiencies went uncorrected for prolonged periods.

Kit deficiencies for two of the six modifications have been corrected, and these programs are now progressing. Satisfactory kits have not been obtained for the remaining four modifications, which involve pilot safety and which affect a total of 3,340 F-105, O-2, T-37, T-38, and T-33 aircraft. Approximately $4,170,000 has been spent on the four uncompleted modifications, one of which has now been abandoned. The Air Force now estimates that over $3.4 million additional will be spent to correct these kit deficiencies and to complete the three modifications. Although the kits were tested, the test kits had not been installed in all equipment configurations and/or had not been evaluated under operational conditions. Therefore, the tests either disclosed no deficiencies or did not reveal the full extent of the deficiencies. A summary of the four modifications follows.

F-105 ejection initiation system

This modification was approved by the SAAMA Configuration Control Board (CCB) in January 1969 to eliminate one of two separate motions required for the pilot to activate the F-105 ejection seat. The modification was to result in faster ejection initiation and thereby increase the crewmembers' chances for survival during low-level ejections when time is critical. The program was originally estimated to cost $322,600.

In July 1969 a contract was awarded for engineering and testing. Testing was completed using an F-105 mockup. The kit production contract was awarded in August 1970. In December 1971 kit proofing was successfully done on one aircraft model. SAAMA approved delivery of the remaining kits to begin in April 1972 and end in July 1972.

In June 1972, following a 4-day test, a using command reported the system was "totally unacceptable." The primary objections were: difficulty in initiating the ejection sequence and lack of clearance between the handgrip and the console. These problems did not occur during kit proofing. TCTO for the modification was subsequently canceled after about $430,650 had been spent.

A new F-105 single-motion ejection initiation system, estimated to cost $333,685, was developed in-house by SAAMA and was approved by CCB in August 1973. Delivery of the new kits was forecast for June 1974.

The Air Force, we believe, could have avoided accepting the unsatisfactory kits by having the using commands make operational tests.

Armored seat for O-2A aircraft

Pacific Air Force requested this modification to reduce injuries to O-2A pilots from small-arms ground fire, and Air Force headquarters approved it in November 1969. At the time of approval, the estimated program cost was $481,200.

The Air Force Systems Command (AFSC) was responsible for engineering and testing. Armored-seat evaluations,

which identified some deficiencies, consisted of on-the-ground inspections and a flight test in February 1970.

In March 1970 the production contract was amended to insure correction of the deficiencies. One amendment required that the armored seat not restrict exit by a pilot wearing a parachute and other survival gear. We found no evidence that a prototype seat had been evaluated under operational conditions before full-scale kit production.

During 1970, 233 seats were procured at a cost of over $2,000 each. Installation of the armored seats began in October 1970. By December 1970 the using activities had submitted numerous Operational Hazard Reports and Emergency Unsatisfactory Material Reports concerning these seats. These deficiencies included

--impaired pilot exit;

--seat discomfort during long missions;

--difficulty for either pilot to reach, unlock, and remove the fire extinguisher and canopy-breaking tool; and

--inability to fully tighten lapbelt.

Subsequently, the using command requested a complete reevaluation of the armored seats, and the modification was placed in abeyance in January 1971. An interim safety TCTO was issued in March 1971 directing the removal of armored seats and reinstallation of the original seats. Armored seats had already been installed on approximately 82 aircraft.

A reevaluation of the armored seats was made. SAAMA proposed in September 1972 a modification to correct armored-seat deficiencies; but the using commands rejected the proposal, stating that armored seats were no longer required. Thus, the modification was terminated and action was initiated to dispose of all 0-2A armored seats.

Unusable armored seats costing approximately $496,000 were obtained and discarded. We believe this procurement might have been prevented if the using command had evaluated the seats before full-scale production.

Bird-resistant windshield for T-37 aircraft

Plans to install a bird-resistant windshield on T-37 aircraft began in January 1968 after Reese Air Force Base submitted an emergency unsatisfactory report citing the death of a pilot when a large bird struck and penetrated the windshield of his aircraft. Two other such fatalities had occurred on T-37s since that time, one in 1969 and one in 1970.

Following report of the initial fatality, tests were made to identify suitable material for the new windshield. In November 1969, the AFSC Aeronautical Systems Division (ASD) approved the development of a new windshield made from polycarbonate. Test programs had revealed that, although polycarbonate had the necessary impact resistance, it had poor abrasion resistance and poor optical quality.

Because polycarbonate was soft and subject to abrasion, plans were made in January 1970 to apply two types of protective coatings to a total of 20 polycarbonate windshields and to service test those windshields on Air Training Command (ATC) aircraft. The quantity of windshields to be service tested was reduced to 10, which ATC received in August 1970. A number of the windshields were rejected due to poor optical quality. Ultimately only three windshields were installed and tested. One of the test windshields had a protective coating and two were bare polycarbonate. Service testing showed that the bare polycarbonate windshields were susceptible to abrasion and scratches during normal maintenance operations.

Although the poor abrasion resistance of polycarbonate was recognized, the Air Force commands involved agreed that the primary objective of the modification was to provide bird resistance. For this reason, the Air Force plans to procure and install bare polycarbonate windshields and to concurrently make further tests of protective coatings. Over 900 bare polycarbonate windshields and the necessary technical data and tooling were obtained at a cost of $1,980,012.

Windshield kit delivery began in March 1971, and installation began the following month. In July 1971 the using command reported one modified aircraft had experienced windshield "fogging" from the sandblast effect of ice crystals, sand, and dirt. In August 1971, following seven more reports of fogging, the modification program was halted after polycarbonate windshields had been installed on 89 aircraft.

Since August 1971 ASD has been attempting to develop a satisfactory protective coating for the windshields. Protective coatings tested have either lessened the windshield's bird resistance or caused distortion or cracks in the windshield. Another protective coating ASD developed was approved by SAAMA for service testing on 89 aircraft in November 1973. Even if the latest protective coating proves successful, installation on the remaining aircraft is not expected to begin before March 1975, and the Air Force estimates an additional $3,105,246 will be required to complete this program.

As of September 1973, over $2.6 million had been spent for developing, procuring, and installing the bird-resistant windshields even though most of the T-37 aircraft still had the original windshield. The bare polycarbonate windshields, we concluded, were procured before adequate service testing.

Replacement of aircraft safety lapbelts

The SAAMA CCB approved this modification in October 1968 to provide a safer lapbelt. The new belt ASD developed was intended to prevent inadvertent latch opening which negated operation of the automatic parachute deployment system.

Over 17,000 belts were purchased in 1969 at a cost of approximately $1.8 million. SAAMA originally planned to complete installation of over 14,000 belts in 20 different aircraft systems by July 1972; however, only 4,772 belts, involving 10 aircraft systems, had been installed by August 1973.

Of the uninstalled belts, over 5,400, valued at $632,270, were procured for installation in T-33, T-37, and T-38

aircraft. Belts obtained for these systems either had been installed and removed or had never been installed. The following lapbelt problems were found on these aircraft.

1. Pilot ejection from T-33 aircraft was impaired by belt interference with armrest movement and prevented or delayed ejection.

2. The belt buckle interfered with control-stick movement on the T-38 aircraft.

3. Pressure exerted on the belt during manual release hindered the belt from opening in T-37 and T-38 aircraft.

The lapbelts were originally tested during a 60-day operational test and evaluation made by four using commands. As a result of the testing, ASD recommended several design changes and planned to do additional operational testing after it received the redesigned belts from the contractor.

The T-38 aircraft, in which the belt buckle interfered with the control stick, was not included in the original test, but the T-33 and T-37 were. Although we were unable to determine why belt deficiencies in these aircraft were not detected and corrected before they were procured, we did find that pressure was exerted to obtain the new lapbelts as quickly as possible. For this reason SAAMA proposed, and AFLC approved, placing production quantities on contract concurrently with ASD's contract for additional belts.

PROCEDURES FOR MANAGING MODIFICATION KITS NEED IMPROVEMENT

We looked into the SMAMA's procedures to insure that kits are available when needed. We found that, once kits for depot-level modifications had been delivered, they were installed on aircraft as the aircraft were scheduled for depot maintenance. Kits for outstanding depot-level modifications are requisitioned about 30 days before an aircraft's scheduled arrival date. The item manager controls the availability of kits to requisitioners by releasing kits only for valid aircraft serial numbers and only for those

aircraft which have not yet received the kits. These procedures, although generally workable, do have the following shortcomings.

Delays due to incomplete requisitions

When a requisition is sent from maintenance to the item manager through base supply and two computerized systems, the aircraft serial number is omitted. Therefore the item manager must contact the requisitioner to obtain this necessary information. Kit management personnel for the F-105 told us that the process of gathering this important data could cause up to a 2-week delay in processing the requisition.

Problems in recovering issued but uninstalled kits

Fewer kits than procured and delivered may be available for installation because of the item manager's loss of total kit accountability. The item manager provides issuance responsibility for kits, supplies depot and contract field teams which do depot-level modifications in the field, and attempts to maintain control of kits by issuing them only for valid aircraft serial numbers.

The problem arises when a kit is released to a base for installation. If the kit is not installed due to change of aircraft location, the modification is still programed upon arrival at SMAMA for depot maintenance. At this time the item manager must issue another kit for the aircraft.

He also attempts to retrieve the first kit. Modification managers for the C-121, F-100, and F-105 told us that some attempts to retrieve these kits had failed.

For example, kits for TCTO 1F-105-1036 were issued to the field for installation. However, before the team could do the modification, the aircraft arrived at SMAMA for depot maintenance. The kit had not been installed and was not with the aircraft on arrival. The item manager released a second kit for the aircraft so that the modification could be done during depot maintenance. We found, however, that the aircraft again had not been modified. The alleged cause

was kit nonavailability, but the item manager's records indicated that kits were available. As of early November 1973, the item manager was attempting to recover the kits.

The C-121, F-100, and F-105 modification managers also told us that in a number of instances, especially in war zone situations, kits could not be accounted for or had been cannibalized for parts. Because the item manager's records were incomplete, we could not verify this contention. However, we did note that for the TCTO modifications involved in the above sample, four kits warehoused at SMAMA were condition-coded "Incomplete."

The ultimate effect of poor kit accountability is that modifications cannot be done on all aircraft programed for modification, even though sufficient kits may have been procured initially. Our examination of the depot-level TCTOs for the F-105 aircraft system in fiscal year 1973 disclosed three TCTOs that could no longer be completed because kits were not available despite the fact that enough kits had been bought to modify all F-105s in inventory and aircraft remain to have the modification accomplished. The August 31, 1973, standard configuration management system report shows that:

TCTO	Aircraft not modified	Total man-hours backlogged	Total kit cost
1F-105-1036	3	1,068	$ 7,956
1F-105-1045	6	954	43,200
1F-105-1049	11	7,623	77,616
Total	20	9,645	$128,772

Should SMAMA be unable to locate the required kits, more kits will have to be obtained or these aircraft will have to be removed from project requirements.

Field-level TCTOs

We also inquired into how SMAMA insures that field-level maintenance activities receive the necessary modification kits.

SMAMA automatically distributes all TCTOs to all users, including field-level maintenance activities. By this procedure, field activities are made aware of the kits necessary to make the TCTO modification and can requisition such kits from SMAMA's item manager. We found that field activities sometimes do not requisition their total kit require - ments after they receive a TCTO, but we did not evaluate the extent of this problem.

Kit accountability controls inadequate

At SMAMA, we found that frequently the number of modification kits installed on aircraft plus the number of kits disposed of exceeded the number of kits received. The question arises "were the kits actually installed on the aircraft as shown in the configuration management system?" If they were not, the so-called excess kits are possibly being disposed of. If this occurs, more kits will have to be procured to satisfy the original modification requirement or the aircraft will have to fly without the modification.

To evaluate the inventory accountability controls for modification kits and materiel, several TCTOs were selected for detailed review from all active class IV, class V, and update TCTOs outstanding at SMAMA. TCTOs were selected from each weapon system as shown below.

	TCTOs reviewed		
Weapons system	Class IV	Class V	Update
F-100	6	-	-
F-105	5	-	-
F-111	1	2	20
T-33	7	1	-
T-39	10	5	-

The F-111 is the only aircraft at SMAMA undergoing update modifications. No F-100 and F-105 class V TCTOs appeared to warrant detailed review.

The class IV TCTOs were selected from the quarterly Status of Approved Class IV Modifications Report (AFLC Form 934) which SMAMA had prepared for each weapon system. This report shows the projected kit delivery and installation dates as well as the actual dates.

Management of the kit inventory was examined for each TCTO from delivery of kits through installation or disposal. The number of kits installed or disposed of, plus the number on hand, were compared with the number of kits delivered. This analysis showed discrepancies in the F-100, F-105, F-111, and T-33 systems. These discrepancies were summarized and presented to appropriate SMAMA officials for explanation. In each of the following cases, they could not explain the discrepancies.

TCTO number	Kits					Kit costs	
	Received	Installed	On hand	For disposal	Discrepancy (note a)	Per unit	Total for discrepancy
F-100:							
1F-100-1035	613	536	50	-	- 27	$13,616	$367,644
1F-100-1040	869	676	133	-	- 60	868	52,080
F-105:							
1F-105-0678	489	282	-	207[b]	[b]-207	[c]72	14,904
1F-105-1080	280	242	31	-	- 7	551	3,857
F-111:							
1F-111-507C	51	51	-	13	+ 13	105	1,365
1F-111-718	12	2	9	3	+ 2	186	372
1F-111-731	296	235	-	81	+ 20	422	8,440
1F-111A-1303	88	88	-	11	+ 11	3,043	33,473
T-33:							
1T-33-558	228	202	117	-	+ 91	43	3,913
Total cost of kit discrepancy							$486,048

[a]Kit discrepancy: Kits received, less kits installed, on hand, and sent for disposal.

[b]Shown as a discrepancy because the disposing activity had no record of receiving the kits which were not on hand.

[c]Cost under the original contract. The aircraft manufacturer eventually donated the kits to rectify a design deficiency.

F-100 deficiencies

Of the six F-100 TCTOs reviewed, there were two cases where the kit monitor was unable to account for his assets. The total value of these kits exceeded $400,000.

In one case the kit monitor could not account for 27 kits, valued at about $367,644, for TCTO 1F-100-1035. In the second case, the kit monitor failed to account for 60 kits, valued at approximately $52,000, for TCTO 1F-100-1040.

We visually inspected warehoused kits for TCTO 1F-100-1035, which is a modification of the wing outer panel structure assembly. Each kit was contained in two large packing crates and would not be easily lost. However, the kits for TCTO 1F-100-1040, which provided for the installation of an anticollision light, would probably be more susceptible to loss.

F-105 deficiencies

Of five F-105 TCTOs reviewed, there were two instances where the kit monitor could not account for kits delivered. In one case, seven kits, costing about $4,000, were not accounted for. In another case the kit manager was able to account for all of his assets but had accumulated 207 excess kits when TCTO was rescinded. Air Force records indicated that the difference was due to attrition of aircraft during the Southeast Asia conflict.

The kit manager's records showed that the 207 kits were still on hand, but we could not locate them. A responsible base supply official told us that the kits had been sent to disposal (redistribution and marketing). We contacted the disposal facility to ascertain whether kits were there. A redistribution and marketing official said that the facility had never received the kits. As of December 1973 the kits had not been accounted for.

F-111 deficiencies

During the review of the 20 selected F-111 update TCTOs, the Air Force was unable to account for the modification kits it had received for 4 TCTOs.

In these cases the number of kits installed plus the number on hand or disposed of exceeds the number of kits received. Assuming that the number of kits acquired is accurate, either the number of aircraft reported as being modified is overstated or the number of kits sent to disposal is overstated. If the number of aircraft modified is overstated, aircraft could be flying in unsafe conditions or contractors could have been paid for modification work which was never done.

T-33 deficiencies

In the T-33 modification management system, one TCTO was found in which 228 kits were received, 202 kits were reported as installed, and 117 kits were on hand. Again the failure of the modification kit inventory records to adequately account for kits indicates that either the number of modified aircraft is overstated or the number of kits on hand at the depot and field activities is overstated. We were unable to reconcile this discrepancy from existing inventory records.

CONCLUSIONS

Unlike the other services, Air Force modification man-hours have increased since 1970. At June 30, 1973, there were 34.3 million man-hours outstanding. Although this is a large workload, most of these hours are planned for application over several years.

Most significantly, however, modification materiel is on hand for only part of this workload. On August 24, 1973, the Air Force inventory of modification materiel was valued at $111 million. Since the Air Force has been provided procurement funds for modification materiel averaging $500 million each year, for the past 3 years, this balance does not seem unusually large. The Air Force considers its program to be at a manageble level. Still the Air Force is not without problems in managing its modification program, and there are opportunities for improvement.

The Air Force has not routinely developed backup data that relates the annual budget request for modification funds to modification installation schedules and shows installation cost and how modification workloads relate to other maintenance workload requirements. This type of information would assist in evaluating the impact of proposed modification work on the capacity of maintenance activities and showing how this interfaces with other maintenance workloads and whether the timing of the modification was appropriate. It would permit analysis of how effectively installations had been planned and would give a more accurate indication of the total modification cost.

Modifications might be applied sooner and the existing maintenance capability below depot level could be used more effectively, if more Air Force modifications were designated for accomplishment by field-level maintenance activities.

Although most modifications are applied when aircraft are at the depot for maintenance, there are many that are not applied because of poor planning. Frequently this is caused by unreliable modification management data which hinders accurate forecasting of modifications to be applied or by poor modification kit accountability procedures which have not made kits available for installation. In some cases, kits were acquired before testing had been completed. This delayed the solution of the problem and led to the disposal of modification materiel and the need to buy new materiel. The delays experienced by the C-5 update program can also be traced to inadequate planning. Although the corrective measures recently initiated seem to be solving these problems, these matters will require continued management attention.

RECOMMENDATIONS

We recommend that the Secretary of the Air Force have the Air Force Logistics Command

--reevaluate its criteria and procedures for designating the level of application for modifications with the objective of promoting increased use of the maintenance capability that exists below depot level,

--implement improved control procedures to insure the accuracy and reliability of modification management data,

--require that modification kits undergo complete operational testing before procurement is initiated, and

--effect the necessary change to improve modification kit management procedures.

AGENCY COMMENTS

By letter dated June 13, 1974 (see app. I), the Assistant Secretary of Defense told us that the Air Force agreed with four of our five recommendations. The Air Force disagreed with the recommendation to shift a greater part of the modification work load to the field from the depot level. (See p. 59.)

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The aircraft modification programs of the Army and Navy are now at more controllable levels because of the backlog reductions. The Air Force consider its program to be at a manageable level. We believe that further management improvements are needed by the services.

Navy modification inventory

Although the Navy inventory of modification materiel is large when related to the inventories of the other services, the Navy has recently initiated a multiyear program to reduce this backlog. The Navy projects it will spend $43 million in fiscal year 1974 and $78 million in subsequent years to install the modification kits on hand at June 30, 1973. The Navy should carefully evaluate this entire backlog of modification materiel and determine whether this additional expenditure is fully justified. These kits have been on hand for several years. Many have not been installed because they are low priority. Therefore the Navy needs to be sure that these modifications are important enough to warrant the additional installation expense it plans to incur over the next few years.

Modification planning

In the past, the services had not developed and submitted detailed backup data that related their annual modification procurements to planned installation programs and that showed the estimated cost of installation. Such data would permit better evaluation of modification fund requests, because the requests could be considered in conjunction with the modifications already approved and planned to be applied and the other maintenance work that is scheduled to be accomplished at the same time. It seems evident that this type of planning might have prevented the accumulation of the extensive

quantities of modification materiel in the Navy's inventory at June 30, 1973. This materiel was acquired apparently without adequate consideration of how it would be installed.

Level of modification application

The outstanding modification man-hours indicate that the services have a large volume of approved modification work; but these hours represent planned work for future periods. Generally funds have not yet been provided for all the hours, and all needed materiel is not yet on hand. Most of this modification work is planned for application at the depot level and is planned to be done while the aircraft are undergoing depot maintenance.

The depot maintenance cycles for aircraft in the services range from 2 to 5 years and accordingly modification programs remain open during this time. Maintenance activities below the depot level are capable of doing more modification work. These activities have large investments in equipment and trained personnel that are capable of doing complex maintenance functions. This could relieve some of the workload at the depot level and could expedite the application of modifications. The services have not been consistent in designating levels of application for modification work. The Air Force designates very little work below depot level. The Navy has been following a similar criterion but has recently recognized the benefits that can arise from increasing the work done below depot level. Although the Army has more than half of its modification work already designated for application below depot level, there are indications that those activities could handle additional work.

The services have resisted greater use of the capacity below depot level, asserting that (1) it is difficult to account for kits after they have been issued to field activities and (2) they have no real way to insure the completion of the modification because they cannot control the field activities. However, these are matters that can be monitored with improved reporting and scheduling procedures that are directed from the modification control point at AVSCOM, at Headquarters, Naval Air Systems Command, or at a designated AMA. Furthermore, during depot repair, the

status of the modification can be verified and, if necessary, the modification can be installed at this time.

Modification management data

Each service has modification management data systems which show modifications outstanding and completed and which account for quantities and locations of modification materiels. These systems are used for planning modification workloads, computing materiel requirements, and ascertaining materiel support status. The services have frequently been unable to rely on the accuracy of the installation data and instead have determined the specific modifications required by physical inspection of the aircraft. This hinders effective planning of modification workloads and distorts the information showing how aircraft are equipped. Inaccurate modification materiel records have led to delays in modification programs, additional cost for materiel redistribution, unneeded procurements of additional kits, and improper disposal of required kits. Because these systems are unreliable, they have not been fully effective for controlling and managing modification programs.

RECOMMENDATIONS

In view of the DOD-wide application, we recommend that the Secretary of Defense provide the necessary guidance and insure that each service:

--Develops and submits, with the budget request for aircraft modifications, backup data in a standardized format showing a projected installation schedule that is reasonably attainable, which considers modification workloads already approved and funded and which forcasts capabilities for installation.

--More fully uses the modification capability and capacity that exists below the depot level when identifying the level of application for modifications.

AGENCY ACTIONS AND UNRESOLVED ISSUES

DOD said that the military departments generally agreed with our recommendations to improve management and control of aircraft modification programs and were taking steps to implement the recommendations.

The Air Force does not agree that more modification work should be shifted from depot-level to field-level maintenance activities because of the added cost for tools and equipment. We believe that many Air Force field-level maintenance activities have a capacity that is not fully used. Shifting more modification workload to the field activities would increase use of the activities' maintenance capacity and could speed completion of many modification programs.

We recognize that each modification decision would have to be carefully analyzed and agree with the Air Force comment that only those that are cost beneficial and time savers should be so assigned. Obviously the question of capability--availability of equipment--is one of the major factors to be considered in such a decision.

CHAPTER 6

SCOPE OF REVIEW

We reviewed the status of the modification programs in the Army, Navy, and Air Force on June 30, 1973, and the execution of aircraft modification programs during fiscal year 1973 and the first quarter of fiscal year 1974. We reviewed various regulations, directives, and similar publications and discussed the policies and procedures for management of aircraft modification programs with key management officials within each of the military services and within the Office of the Assistant Secretary of Defense, Installations and Logistics.

We made this review within the Army primarily at the Army Deputy Chief of Staff, Installations and Logistics; Director of Aviation Logistics, Headquarters, Department of the Army; and the Army Aviation Systems Command in St. Louis. The Army Audit Agency had recently issued a report on the management of Army aircraft modification programs; therefore, we limited the review to avoid duplication.

In the Navy we made our review in the office of the Chief of Naval Operations; the headquarters of the Naval Air Systems Command; the headquarters of the Atlantic and Pacific Fleets; the Office of the Naval Air Systems Command representatives for the Atlantic and Pacific Fleets; and the Naval Air Rework Facilities, Cherry Point, North Carolina, and North Island, California.

The review in the Air Force was carried out within the Directorate of Systems and Logistics, Headquarters, U.S. Air Force; Headquarters Air Force Logistics Command; and the San Antonio and Sacramento Air Materiel Areas.

ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

APPENDIX I

INSTALLATIONS AND LOGISTICS

13 JUN 1974

Mr. F. J. Shafer
Director, Logistics and Communications Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Shafer:

This is in response to your letter of April 15, 1974 to the Secretary of Defense, which forwarded your draft report entitled "Management of Aircraft Modification Programs in the Army, Navy, and Air Force" (OSD Case No. 3819).

The Military Departments are in general agreement with the recommendations of your report to improve management and control of their aircraft modification programs. Steps are being taken by the Military Departments to implement your management recommendations, with one partial exception. While concurring fully with four of your five Air Force recommendations, the Air Force is in disagreement with the recommendation to shift a greater part of the total modification workload to the field from the depot level. The Air Force's current policy already permits field-level modifications which require less than twenty-five man-hours, or less than eight clock hours. The Air Force is reluctant, however, to materially increase the volume of field-level modifications for several reasons, e.g., unnecessary added costs for duplication of special tools and test equipment at each installation base.

The Office of the Secretary of Defense, as you may be aware, is in the process of conducting an audit of selected modification programs. Since it is anticipated that our audit will be completed within a month or two, it seems prudent to review our audit findings thoroughly before establishing the need, if any, for further OSD policy in this general area. We will consider your findings in the light of our audit studies.

We wish to thank you for your continued interest and assistance in the modification management area.

Sincerely,

A. I. Mendolia

ARTHUR I. MENDOLIA
Assistant Secretary of Defense
(Installations & Logistics)

APPENDIX II

PRINCIPAL OFFICIALS RESPONSIBLE

FOR ACTIVITIES DISCUSSED IN THIS REPORT

	Tenure of office			
	From		To	
DEPARTMENT OF DEFENSE				
SECRETARY OF DEFENSE:				
James R. Schlesinger	July	1973	Present	
Vacant	May	1973	July	1973
Elliot L. Richardson	Jan.	1973	May	1973
Melvin R. Laird	Jan.	1969	Jan.	1973
DEPUTY SECRETARY OF DEFENSE:				
William P. Clements, Jr.	Jan.	1973	Present	
Kenneth Rush	Feb.	1972	Jan.	1973
Vacant	Jan.	1972	Feb.	1972
David Packard	Jan.	1969	Dec.	1971
ASSISTANT SECRETARY OF DEFENSE (INSTALLATIONS AND LOGISTICS):				
Arthur I. Mendolia	June	1973	Present	
Hugh McCullough (acting)	Jan.	1973	June	1973
Barry J. Shillito	Jan.	1969	Jan.	1973
DEPARTMENT OF THE ARMY				
SECRETARY OF THE ARMY:				
Howard Callaway	May	1973	Present	
Robert F. Froehlke	July	1971	May	1973
Stanley R. Resor	July	1965	June	1971
UNDER SECRETARY OF THE ARMY:				
Herman R. Staudt	Oct.	1973	Present	
Vacant	June	1973	Oct.	1973
Kenneth E. Belieu	Aug.	1971	June	1973
Thaddeus R. Beal	Mar.	1969	July	1971

APPENDIX II

	Tenure of office			
	From		To	

DEPARTMENT OF THE ARMY

ASSISTANT SECRETARY OF THE ARMY (INSTALLATIONS AND LOGISTICS):				
Vacant	July	1974	Present	
Eugene E. Berg	Nov.	1973	July	1974
Vincent P. Huggard (acting)	Apr.	1973	Nov.	1973
Dudley C. Mecum	Oct.	1971	Apr.	1973
J. Ronald Fox	June	1969	Sept.	1971
COMMANDING GENERAL, AMC:				
Gen. H. A. Miley, Jr.	July	1969	Present	

DEPARTMENT OF THE NAVY

SECRETARY OF THE NAVY:				
J. William Middendorf, II	June	1974	Present	
Vacant	April	1974	June	1974
John W. Warner	April	1972	April	1974
John W. Chafee	Ja.	1969	April	1972
UNDER SECRETARY OF THE NAVY:				
Vacant	June	1974	Present	
J. William Middendorf, II	Aug.	1973	June	1974
Frank Sanders	Apr.	1972	Aug.	1973
John W. Warner	Feb.	1969	April	1972
ASSISTANT SECRETARY OF THE NAVY (INSTALLATIONS AND LOGISTICS):				
Jack L. Bowers	June	1973	Present	
Charles L. Ill	July	1971	May	1973
Frank Sanders	Feb.	1969	July	1971
CHIEF OF NAVAL OPERATIONS:				
Adm. James L. Holloway	June	1974	Present	
Adm. Elmo R. Zumwalt, Jr.	July	1970	June	1974
Adm. Thomas H. Moorer	Aug.	1967	June	1970

APPENDIX II

DEPARTMENT OF THE AIR FORCE

	Tenure of office			
	From		To	
SECRETARY OF THE AIR FORCE:				
John L. McLucas	July	1973	Present	
Dr. Robert C. Seamans, Jr.	Feb.	1969	May	1973
UNDER SECRETARY OF THE AIR FORCE:				
James Plummer	Dec.	1973	Present	
Vacant	June	1973	Dec.	1973
John L. McLucas	Mar.	1969	June	1973
ASSISTANT SECRETARY OF THE AIR FORCE (INSTALLATIONS AND LOGISTICS):				
Frank A. Shrontz	Oct.	1973	Present	
Richard J. Keegan (acting)	Aug.	1973	Oct.	1973
Lewis E. Turner (acting)	Oct.	1972	Aug.	1973
Phillip N. Whittaker	May	1969	Sept.	1972
COMMANDER, AIR FORCE LOGISTICS COMMAND:				
Gen. Jack J. Catton	Sept.	1972	Present	
Gen. Jack G. Merrell	Mar.	1968	Sept.	1972

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