REPORT TO THE CONGRESS

Savings From Joint Use Of Spectrometric Oil Analysis Equipment By The Military Departments B-162313(1)

Department of Defense

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

OCT. 27, 1970

715702

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

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B-162313(1)

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

This is our report on savings from the joint use of spectrometric oil analysis equipment by the military departments.

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

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

Comptroller General
of the United States

COMPTROLLER GENERAL'S REPORT TO THE CONGRESS

SAVINGS FROM JOINT USE OF SPECTROMETRIC OIL ANALYSIS EQUIPMENT BY THE MILITARY DEPARTMENTS
Department of Defense B-162313(1)

D I G E S T

WHY THE REVIEW WAS MADE

This review began in response to a congressional request that the General Accounting Office (GAO) examine into the Spectrometric Oil Analysis Program being conducted by the Department of the Air Force in Europe. Subsequently GAO expanded the scope of the review to include consideration of the program, worldwide, in all the military departments.

FINDINGS AND CONCLUSIONS

In spectrometric oil analysis, measurement is made of the worn metal particles in oil taken from engine-lubricating systems. The measurement gives an indication of the amount of wear sustained by engine parts. Data obtained from the analysis, correlated with actual wear in a similar system, provide a means of predicting failures of parts. The technique identifies the parts needing repair or replacement and thus can reduce maintenance time and cost and may prevent the use of an engine that is about to fail.

A triservice agreement to ensure coordination of the program within the Department of Defense (DOD) was reached on March 6, 1967. Despite the agreement, in January 1968 the Army, Navy, and Air Force

--were operating spectrometric oil analysis laboratories independently of each other (see pp. 5 and 6),

--differed substantially in their criteria for the proper frequency of oil analysis (see pp. 5 and 6), and

--planned to acquire separately a total of 357 additional oil analysis laboratories at an estimated cost of $7.1 million for the equipment and $21.4 million annually for operation (see pp. 9 and 10).

In GAO's opinion, the triservice agreement was ineffective because it did not properly assign authority and responsibility for ensuring effective coordination. (See pp. 4, 5, and 12.)

Tear Sheet

OCT. 27, 1970

RECOMMENDATIONS OR SUGGESTIONS

GAO reported its observations to the Secretary of Defense in January 1968 and suggested that, in view of the significant expansion planned by the military departments, his office review the program. (See p. 6.)

AGENCY ACTIONS AND UNRESOLVED ISSUES

The Secretary of Defense had an ad hoc group study the program. The group confirmed the GAO observations and reported that

--there was a serious lack of uniform program management,

--interservice use of oil analysis equipment was almost nonexistent, and

--the justifications by the military departments of their need for more oil analysis equipment were questionable. (See pp. 7 and 8.)

In May 1969 DOD established a new program, called the Equipment Oil Analysis Program, and the Department of the Navy was directed to manage it. (See pp. 8 and 9.)

The new program provides for 110 laboratories for worldwide support of the Army, Navy, and Air Force compared with the total of 428 laboratories that had been envisioned in the three services' plans in January 1968. (See pp. 7 to 10.)

On the basis of January 1970 DOD cost projections for the new program, GAO estimates savings of $5.3 million in planned equipment costs and $18.1 million a year in operating costs will be achieved. (See pp. 9 and 10.)

The problems encountered with this particular program raised the question of whether there may be similar problems in other interservice programs. For this reason GAO believes that it may be appropriate for DOD to review the implementation of other interservice programs. (See p. 12.)

MATTERS FOR CONSIDERATION BY THE CONGRESS

This report is furnished to the Congress because of the significant savings that will be achieved as a result of improvements in the management and operation of the oil analysis program.

Contents

ABBREVIATIONS

DOD	Department of Defense
GAO	General Accounting Office
SOAP	Spectrometric Oil Analysis Program

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CHAPTER 1

INTRODUCTION

The General Accounting Office has reviewed the Spectrometric Oil Analysis Program (SOAP) in the Departments of the Army, Navy, and Air Force. Our review was made in response to a congressional request to examine into certain aspects of the program at Department of the Air Force installations in Europe.

Spectrometric oil analysis is the technique for measuring the concentration of worn metal particles in oil samples taken from enclosed engine-lubricating systems. The data obtained from the samples and analysis are recorded and then correlated with the actual wear experienced in a similar mechanical system to predict failure within the system. Based upon limits of normal wear established for each type of engine, this method of diagnosing the condition of an engine can pinpoint the parts needing replacement or repair and thus reduce maintenance and may prevent the use of an engine that is about to fail.

The Department of the Navy investigated the spectrometric oil analysis technique in 1955 and subsequently verified its potential applicability to all enclosed aircraft mechanical systems which function in an oil lubricating housing or enclosure. The Army and Air Force adopted the technique in 1961 and 1964, respectively. On March 6, 1967, a triservice agreement was made to ensure that SOAP was systematically planned, developed, and managed as a coordinated program within the Department of Defense.

The scope of our review is outlined on page 13 and a listing of the principal officials of the Department of Defense responsible for administration of activities discussed in this report is included as appendix I.

CHAPTER 2

SAVINGS FROM JOINT USE OF SPECTROMETRIC OIL ANALYSIS EQUIPMENT BY THE MILITARY DEPARTMENTS

TRISERVICE AGREEMENT TO ACHIEVE A COORDINATED PROGRAM WAS INEFFECTIVE

In 1967 the Army, Navy, and Air Force entered into a triservice agreement with the objectives of ensuring that SOAP was systematically planned, developed, and managed as a coordinated program within DOD. The objectives were to be achieved by (1) standardizing techniques, terminology, procedures, policies, and equipment, (2) using standardized calibration samples, and (3) establishing oil analysis laboratories in optimum locations to facilitate interservice use wherever practicable.

Under the provisions of the agreement, responsibility for accomplishing its objectives was assigned to an interservice task group composed of representatives of the Army, Navy, and Air Force. These representatives were given authority to make decisions and commitments on behalf of their services on technical matters. Before a commitment could be made on policy matters, however, such matters had to be coordinated within the regular command channels of each service.

In our opinion, the triservice agreement was not accomplishing its objectives because it did not properly assign responsibility and authority for overall surveillance and management of the program. Although the task group was made responsible for carrying out the program, it could not operate timely and effectively because its members had to coordinate policy matters within their service command channels before they could make program commitments for their services.

Program management and authority in the services and in their subordinate commands were diffused, and coordination became a time-consuming process and problem. For example, the DOD ad hoc study group report of July 1968 on SOAP stated that:

> "At the present time there is a serious lack of uniform program management with little authority and control being exercised at the departmental level. In one instance, dual procurement of equipment for delivery to the same site was initiated by two different commands simultaneously without knowledge of the respective program managers. Furthermore, the establishing of programs at lower Command levels can result in programs being established by emotional considerations rather than by technical facts."

Also, members of the committee and subcommittees of the task group worked on SOAP only when time from their other duties permitted.

We found no evidence until after we had raised questions concerning SOAP in January 1968 (see exhibit A), that the task group had attempted to have the military departments hold in abeyance, or to a minimum, further procurements of oil analysis equipment pending formulation of a triservice specification for the equipment and the determination of the coordinated requirements for all the services. By letter dated May 1, 1968, the Assistant Secretary of Defense (Installations and Logistics) indicated that this essential action had been taken when he advised GAO that "Pending completion of the study effort, no additional test equipment will be procured by the military departments." We found no evidence also that the task group had initiated action to ensure that the services would jointly use, wherever practicable, equipment items on hand and those they planned to procure.

Thus, although the triservice agreement of March 1967 was made to ensure that SOAP would be systematically planned, developed, and managed as a coordinated program, in January 1968 we found that, independently of each other,

each service was operating spectrometric oil analysis laboratories; was procuring, or planning to procure, additional oil analysis equipment; and had developed differing concepts on the frequency of making oil analyses.

In view of these circumstances, we presented data we had developed on SOAP and the questions which it raised to the Secretary of Defense by letter dated January 16, 1968. (See exhibit A.) Also, since the Air Force was in the process of procuring 130 additional spectrometers and since significant expansion in the number of spectrometers was being planned, on an uncoordinated basis, for use by the Army and Navy, we suggested to the Secretary of Defense that a review of the departmental programs was appropriate.

DOD STUDY OF SOAP AND RESULTING SAVINGS

As of January 1968, the planned programs of the Army, Navy, and Air Force would have increased the number of oil analysis laboratories from 71, then in operation, to 428 by the end of fiscal year 1973. Based upon DOD estimates, the cost of the additional 357 laboratories would be about $7.1 million and the related annual operating costs about $21.4 million. The following table summarizes the planned expansion by military department.

	Army	Navy	Air Force	Total
Number of oil analysis units planned	214	44	170	428
Units on hand as of January 1968	8	2	61[a]	71
Additional units planned to be acquired	206	42	109[a]	357
Estimated cost of additional units	$ 4,120,000	$ 840,000	$2,180,000	$ 7,140,000
Estimated annual operating cost for additional units	$12,360,000	$2,520,000	$6,540,000	$21,420,000

[a]At January 1968, the Air Force was in process of initiating procurement of 130 spectrometers and planned to replace 21 of the 61 units then on hand.

The Assistant Secretary of Defense (Installations and Logistics) replied on May 1, 1968 (see exhibit B), to the GAO letter of January 16, 1968, stating that:

> "*** it is evident that a closer coordinated effort and a more uniform approach to the oil analyses program would prove beneficial. An Ad Hoc Group comprised of representatives from each of the military departments will be established this month under the guidance and control of the Deputy Assistant Secretary of Defense (I&L), Supply and Services. The objectives of this study effort will be to develop uniform policies and criteria to be followed in the conduct of the Spectrometric Oil Analysis Program within the DOD."

The Assistant Secretary further stated that, pending completion of the study, no additional SOAP equipment would be procured by the military departments. The Air Force subsequently withdrew the procurement of 130 spectrometers which it had initiated.

The study group's report, completed in November 1968, confirmed our observations and identified a number of other problem areas inherent in the separate approaches being taken by the military departments, including:

--a serious lack of uniform program management with little authority and control at the departmental level,

--interservice use of spectrometric oil analysis equipment was almost nonexistent, and

--each military department's justification for significant increases in oil analysis equipment was highly questionable.

The study group recommended that DOD either:

"(a) direct the immediate establishment of a DoD Spectrometric Oil Analysis Program under directed DoD management; or (b) direct each Military Department to continue its own independent program with cross-service utilization of laboratories to the greatest extent possible."

The study group recommended also that a single service be designated as the DOD program director. The study group recommended further that, irrespective of the approach adopted, (1) a single service be responsible for the procurement of spectrometers, spare parts, and other items of equipment and (2) the spectrometers be procured in accordance with a specific military specification.

On May 15, 1969, a DOD directive was issued establishing the DOD Equipment Oil Analysis Program and prescribing the policies and responsibilities for the conduct of the program under coordinated management. The Department of the

Navy was assigned management responsibility for this program. These responsibilities included:

--Recommending the location and distribution of oil analysis facilities/activities in a manner which would provide the most effective and efficient use of personnel and equipment.

--Coordinating, consolidating, and procuring all future oil analysis equipment requirements.

--Developing and updating military procurement specifications for all oil analysis equipment to be used in the program.

--Providing the Office of the Assistant Secretary of Defense (Installations and Logistics) with an annual report on the status and progress of the program.

By letter of January 28, 1970, the Assistant Secretary of Defense advised us that considerable progress had been made in the implementation of the DOD directive (see exhibit C). He stated that, as currently proposed, the DOD oil analysis program would have 107[1] laboratories, installed at military installations and on ships, for worldwide support of the three services. He stated also that the estimated equipment and initial logistics support cost for the program, based on the current military specification, would be $6.2[1] million and that the annual estimated operating cost would be about $7.5 million.

The DOD oil analysis program will result in considerable savings compared with the separate oil analysis programs planned by the Army, Navy, and Air Force in January 1968. The three services had planned, on an individual basis, to obtain 357 additional oil analysis spectrometers conservatively estimated to cost about $7.1 million, or

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[1]The Navy Materiel Command advised GAO by letter dated May 21, 1970, that the equipment and related costs for installation, technical manuals, and personnel training amounting to $6.2 million were based on acquiring 110 laboratories. The three additional units are to be installed in mobile vans.

$20,000 each. Annual operating costs for the additional 357 units were estimated at $21.4 million. On the basis of the bid prices received and used by the Navy in the award of letter contract N00600-70-C-1090 on May 28, 1970, for the first 40 of the 110 oil analysis spectrometers--including an option for increased quantities at the agreed price--required for the centrally managed oil analysis program established by DOD, we estimate that the new approach will result in savings of about $5.3 million in equipment costs and will reduce the annual operating costs by about $18.1 million, as shown below.

	Programs as of January 1968	Programs as of May 1970	Estimated savings
Investment in equipment:			
Actual cost of 71 spectrometers on hand (note a)	$ 2,369,000	$ -	
Estimated cost of 357 additional spectrometers planned for procurement ($20,000 a unit)	7,140,000	-	
Estimated cost of 110 spectrometers built to military specifications and planned for procurement ($37,900 a unit based on contractor's bid price)	-	4,169,000	
	9,509,000	4,169,000	$ 5,340,000
Operating costs:			
Estimated annual operating costs:			
71 spectrometers on hand	4,260,000	-	
357 spectrometers planned for procurement ($60,000 a unit)	21,420,000	-	
110 spectrometers planned for procurement (about $68,700 a unit)	-	7,556,000	
	25,680,000	7,556,000	18,124,000
Total	$35,189,000	$11,725,000	$23,464,000

[a]These spectrometers do not meet the specification dated January 1969 agreed upon for use by the military departments. The departments plan to replace these spectrometers with spectrometers built to the new specification as the 110 planned for procurement become available.

DOD Directive 4154.14, which established the DOD oil analysis program, states that an objective of the program is the "Application of oil analysis program results, to extend equipment operating intervals between maintenance action(s) and/or to revise maintenance technical criteria ***."

Significant savings are anticipated by DOD, to be derived from the use of the oil analysis data to increase the periods of operation of equipment between maintenance actions, e.g., extend the number of hours of operating time between overhauls of aircraft engines. Previously the data were used only to determine those items of equipment that could fail prior to attaining the life expectancy set by each service. No reasonable estimate can be made at this time of the potential savings that should result from the extended use of oil analysis data in managing maintenance operations.

CHAPTER 3

CONCLUSIONS

We believe that the actions taken by DOD to establish a centrally managed program for spectrometric oil analysis--including the standardization of equipment and the plans to ensure maximum interservice utilization of oil analysis laboratories--will result in significant savings and improvements over the programs the Army, Navy, and Air Force were planning to implement when we referred the matter to the attention of the Secretary of Defense in January 1968.

In our opinion the triservice agreement made in 1967 was ineffective because it did not properly assign responsibility and authority for ensuring timely planning, development, and management of SOAP as a coordinated program. Thus, before the interservice task group could make decisions, time-consuming coordinations through the regular command channels of each service were necessary.

Because of the problems encountered with SOAP, which could have caused substantial additional costs, it appears that there may be areas for improvement in planning, developing, and managing other programs that are common to two or more military departments. Although we did not review other common-type programs of the military departments, we believe that, in view of the experience with SOAP, it may be appropriate for the Secretary of Defense to consider whether similar problems are being experienced in such programs, especially with respect to effective implementation of any related triservice agreements.

CHAPTER 4

SCOPE OF REVIEW

Our review was directed to an examination of SOAP in the Army, Navy, and Air Force. The review was concerned primarily with the future plans of the Department of the Air Force and included a limited examination of the program in the Departments of the Army and Navy.

We examined pertinent regulations and operating procedures of each of the services. We reviewed the 1967 tri-service agreement concerning SOAP and the extent to which the services were complying with the agreement. Also we examined, in detail, documents and records relating to the establishment and planned expansion of the Air Force program and interviewed responsible management officials.

Our review included visits to Headquarters, U.S. Air Force, Washington, D.C.; Headquarters, U.S. Air Forces in Europe; Headquarters, Air Force Logistics Command, Wright-Patterson Air Force Base, Ohio; San Antonio Air Materiel Area, Kelly Air Force Base, Texas; Naval Air Systems Command, Washington, D.C.; and the Office of Assistant Secretary of Defense (Installations and Logistics), Directorate of Maintenance Policy, Washington, D.C.

EXHIBITS

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

DEFENSE DIVISION

JAN 16 1968

The Honorable
The Secretary of Defense

Attention: Assistant Secretary of Defense
(Comptroller)

Dear Mr. Secretary:

As a result of a recent congressional request, we have obtained information concerning the Spectrometric Oil Analysis Program (SOAP) in the Departments of the Army, Navy, and Air Force. Our review, which was primarily concerned with the Department of the Air Force, disclosed that the current Air Force program may not achieve timely materiel readiness or optimum cost effectiveness. A detailed discussion of the questions raised by our review is given in the attachment to this letter.

Spectrometric oil analysis is the technique for measuring the concentration of contaminants in enclosed lubrication systems. The data obtained from each analysis is recorded and then correlated with the actual wear in the mechanical system to predict failure in the system. The Army, Navy, and Air Force regularly conduct spectrometric analyses of the lubricating oil of aeronautical equipment with primary emphasis on aircraft engines. There are plans to extend SOAP to other equipment such as heavy motor vehicles. The Air Force has spent over $2 million for SOAP equipment and currently has a planned requirement for additional equipment estimated to cost about $4 million.

The questions set forth in the attachment concern the (1) need for equipment at 170 Air Force installations, (2) type and cost of equipment, (3) method of procurement, (4) equipment delivery time, and (5) interservice utilization of equipment.

Since the Air Force is currently in the process of initiating procurement for 130 analyzers, we believe it would be appropriate for your office to review this program. We shall be pleased to discuss with you or your representatives any questions you may have relating to information included in the attachment to this letter, or other data that we have obtained during our review of the spectrometric oil analysis programs. Arrangements may be made through Mr. Hassell B. Bell, Associate Director (Code 129, Extension 5577).

We would appreciate receiving, for use in any report to the Congress that may result from our work on SOAP, your comments concerning the questions raised and any additional remarks you may wish to make within 60 days from the date of this letter.

Sincerely yours,

WILLIAM A. NEWMAN, JR.

Director

ATTACHMENT

SPECTROMETRIC OIL ANALYSIS PROGRAM

BACKGROUND

[See GAO note.]

QUESTIONS

[See GAO note.]

5. IS MAXIMUM INTERSERVICE UTILIZATION OF SOAP EQUIPMENT BEING ACHIEVED?

In keeping with the spirit and intent of DOD Instruction 4000.19, Basic Principles for Interservice Support, the Army, Navy, and Air Force established a tri-service agreement for SOAP. The stated objectives of this agreement dated March 6, 1967, are to assure that the development of the SOAP is systematically planned, developed, and managed as a coordinated program within the various departments to insure maximum material readiness and optimum cost effectiveness by:

a. Standardization of techniques, terminology, procedures and policies.

b. Standardization of equipment.

c. Use of standard calibration samples.

d. Interservice utilization of oil analysis laboratories.

e. Optimized laboratory locations.

In view of the extensive spectrometric oil analysis program planned by the Air Force, the significant expansion being planned in the Army program, the increase--relatively small--contemplated by the Navy's program, we believe a review should be made by the Secretary of the Defense to determine if the objectives of the interservice agreements are being achieved, especially interservice utilization of oil analyzers and related equipment.

GAO note: Portions of this attachment have been deleted because they are no longer relevant to the matters discussed in this report.

EXHIBIT B
Page 1

ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

1 MAY 1968

INSTALLATIONS AND LOGISTICS

Mr. William A. Newman, Jr.
Director, Defense Division
U.S. General Accounting Office
Washington, D.C.

Dear Mr. Newman:

This is in reply to your letter report of January 16, 1968 concerning the Spectrometric Oil Analysis Program (SOAP) in the Departments of the Army, Navy and Air Force, (OSD Case # 2712).

After reviewing your report, the comments of the military departments incident to your report and further discussions with representatives of the military departments, it is evident that a closer coordinated effort and a more uniform approach to the oil analyses program would prove beneficial. An Ad Hoc Group comprised of representatives from each of the military departments will be established this month under the guidance and control of the Deputy Assistant Secretary of Defense (I&L) Supply and Services. The objective of this study effort will be to develop uniform policies and criteria to be followed in the conduct of the Spectrometric Oil Analysis Program within the DoD. The effort will encompass testing of oil samples, analysis of tests, equipment for conduct of the tests, response times for testing, and criteria dealing with the authorization and use of the equipment. A forecast will be developed for expansion or further application of the oil analysis program over the FY 69 thru the FY 73 time period.

Results of the study effort and decisions reached will be incorporated in a DoD Instruction covering uniform policies, criteria and responsibilities for the conduct of the Spectrometric Oil Analysis Program within the DoD. The target date established for completion of the project effort is July 17, 1968.

Copies of the DoD Instruction resulting from our task effort will be forwarded your office when published. Pending completion of the study effort, no additional test equipment will be procured by the military departments.

Sincerely yours,

Thomas D. Morris

THOMAS D. MORRIS
Assistant Secretary of Defense
(Installations and Logistics)

EXHIBIT C
Page 1

ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

INSTALLATIONS AND LOGISTICS

28 JAN 1970

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

Dear Mr. Bailey:

Reference your letter of November 20, 1969, which requested information on the status of the DoD Equipment Oil Analysis Program. (OSD Case #2712)

In general, considerable progress has been made in implementation of DoD Directive 4151.14. There is considerable additional work that must be done, however, to effect full implementation of the program envisioned in the Directive. With regard to specific information requested in your letter, the following information is furnished:

Number of Oil Analysis Equipment to be Procured

Based on actions currently in progress and funds which have been made available to date, it is expected that approximately 55 oil analysis spectrometers will be acquired. Contractual negotiations are forecast to be completed in February of this year.

Location of DoD Equipment Oil Analysis Facilities

Attached is a draft proposal to be published as Addendum 1 to DoD Directive 4151.14. The proposed list includes a listing of 107 oil analysis facilities, the location of each, and the customers to be served by each facility. This proposal is currently undergoing final coordination within the DoD and is forecast to be published during February of this year. [See GAO note.]

Funds Required to Finance the Program as Presently Envisaged

Based on a program comprising the oil analysis facilities previously identified and assuming each to be ultimately equipped with equipments conforming to the current Military Specification (83129) the following investment and annual operating costs are furnished:

GAO note: The attachment is not included in this report.

Cost Summary

Investment expense	$ 6,205,000	[See GAO note.]
Operating costs	7,555,694	
TOTAL	$13,760,694	

These projected costs assume a single shift operating program for the facility, a 24 hour response time for routine samples and a 10 hour aircraft engine sampling interval. Workloads which will be accommodated are projected to amount to 2.537 million samples during FY 73 and are based on the program being fully implemented during this fiscal year.

Projected Time Period for Full Implementation of the DoD Equipment Oil Analysis Program

The principal phases of the program as currently envisioned will be implemented over the next two years. It must be recognized, however, that full implementation to include the use of the system to produce maximum benefits from the program will not be realized for another year or so.

Sincerely,

BARRY J. SHILLITO
Assistant Secretary of Defense
(Installations and Logistics)

Attachment

GAO note: This amount covers the oil analysis equipment, installation costs, and costs for technical manuals and training of personnel. The contractor's bid price of $37,900 a unit for oil analysis spectrometers has been used for the tabulation on p. 10 of the report.

APPENDIX

PRINCIPAL OFFICIALS OF THE DEPARTMENT OF DEFENSE

RESPONSIBLE FOR ADMINISTRATION OF ACTIVITIES

DISCUSSED IN THIS REPORT

	Tenure of office	
	From	To
DEPARTMENT OF DEFENSE		
SECRETARY OF DEFENSE:		
Melvin R. Laird	Jan. 1969	Present
Clark M. Clifford	Mar. 1968	Jan. 1969
Robert S. McNamara	Jan. 1961	Feb. 1968
DEPUTY SECRETARY OF DEFENSE:		
David Packard	Jan. 1969	Present
Paul H. Nitze	July 1967	Jan. 1969
Cyrus R. Vance	Jan. 1964	June 1967
ASSISTANT SECRETARY OF DEFENSE (INSTALLATIONS AND LOGISTICS):		
Barry J. Shillito	Jan. 1969	Present
Thomas D. Morris	Sept. 1967	Jan. 1969
Paul R. Ignatius	Dec. 1964	Aug. 1967
DEPARTMENT OF THE ARMY		
SECRETARY OF THE ARMY:		
Stanley R. Resor	July 1965	Present
UNDER SECRETARY OF THE ARMY:		
Thaddeus R. Beal	Mar. 1969	Present
David E. McGiffert	July 1965	Feb. 1969
ASSISTANT SECRETARY OF THE ARMY (INSTALLATIONS AND LOGISTICS):		
J. Ronald Fox	June 1969	Present
Vacant	Mar. 1969	June 1969
Dr. Robert A. Brooks	Oct. 1965	Feb. 1969

PRINCIPAL OFFICIALS OF THE DEPARTMENT OF DEFENSE

RESPONSIBLE FOR ADMINISTRATION OF ACTIVITIES

DISCUSSED IN THIS REPORT (continued)

	Tenure of office	
	From	To
DEPARTMENT OF THE NAVY		
SECRETARY OF THE NAVY:		
John H. Chafee	Jan. 1969	Present
Paul R. Ignatius	Sept. 1967	Jan. 1969
Charles F. Baird (acting)	Aug. 1967	Sept. 1967
Robert H. B. Baldwin (acting)	July 1967	Aug. 1967
Paul H. Nitze	Nov. 1963	June 1967
UNDER SECRETARY OF THE NAVY:		
John W. Warner	Feb. 1969	Present
Charles F. Baird	Aug. 1967	Jan. 1969
Robert H. B. Baldwin	July 1965	July 1967
ASSISTANT SECRETARY OF THE NAVY (INSTALLATIONS AND LOGISTICS):		
Frank Sanders	Feb. 1969	Present
Barry J. Shillito	Apr. 1968	Jan. 1969
Vacant	Feb. 1968	Apr. 1968
Graeme C. Bannerman	Feb. 1965	Feb. 1968
DEPARTMENT OF THE AIR FORCE		
SECRETARY OF THE AIR FORCE:		
Dr. Robert C. Seamans, Jr.	Jan. 1969	Present
Dr. Harold Brown	Oct. 1965	Jan. 1969
UNDER SECRETARY OF THE AIR FORCE:		
John L. McLucas	Mar. 1969	Present
Townsend Hoopes	Oct. 1967	Feb. 1969
Norman S. Paul	Oct. 1965	Oct. 1967

PRINCIPAL OFFICIALS OF THE DEPARTMENT OF DEFENSE

RESPONSIBLE FOR ADMINISTRATION OF ACTIVITIES

DISCUSSED IN THIS REPORT (continued)

	Tenure of office	
	From	To
DEPARTMENT OF THE AIR FORCE (continued)		
ASSISTANT SECRETARY OF THE AIR FORCE (INSTALLATIONS AND LOGISTICS):		
Phillip N. Wittaker	Apr. 1969	Present
Robert H. Charles	Nov. 1963	Apr. 1969

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