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REPORT TO THE CONGRESS

Project REFLEX (Resource Flexibility) --A Demonstration Of Management Through Use Of Fiscal Controls Without Personnel Ceilings B-165959

Department of Defense

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

JUNE 21, 1974

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

B-165959

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

We have reviewed the Department of Defense's Project REFLEX (Resource Flexibility)--a demonstration of management through use of fiscal controls without personnel ceilings.

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).

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

Elmer B. Staats

Comptroller General
of the United States

Contents

ABBREVIATIONS

AEC	Atomic Energy Commission
AFSC	Air Force Systems Command
AMC	Army Materiel Command
DDR&E	Director of Defense Research and Engineering
DOD	Department of Defense
GAO	General Accounting Office
IBM	International Business Machines
OMB	Office of Management and Budget
OSD	Office of the Secretary of Defense
PPB	planning, programming, and budgeting
R&D	research and development
RDT&E	research, development, test, and evaluation
RIF	reduction in force

COMPTROLLER GENERAL'S REPORT TO THE CONGRESS

PROJECT REFLEX (RESOURCE FLEXIBILITY) --A DEMONSTRATION OF MANAGEMENT THROUGH USE OF FISCAL CONTROLS WITHOUT PERSONNEL CEILINGS Department of Defense B-165959

D I G E S T

WHY THE REVIEW WAS MADE

Project REFLEX (Resource Flexibility) is a Department of Defense (DOD) demonstration project in which several laboratories operate solely under financial controls without manpower ceilings so that management can adjust personnel levels to match workload requirements and available funds. (See p. 6.)

GAO reviewed Project REFLEX to identify and evaluate the benefits management achieved with fiscal controls and without personnel ceilings. (See p. 7.)

FINDINGS AND CONCLUSIONS

The Departments of the Army, Navy, and Air Force began Project REFLEX in 1970. Thereafter the Office of the Secretary of Defense had little involvement, to give the services complete freedom in implementing and monitoring Project REFLEX. Because of differences in laboratory operations, the services needed some flexibility. (See p. 8.)

Although the project was to operate without personnel ceilings, REFLEX laboratory managers were under some constraints during the test period.

--Hiring freezes were imposed, and in some cases ceilings were only partially lifted. (See pp. 13 and 16.)

--Government-wide programs for reducing employment and average grade levels had an impact.

--Civil service and agency regulations limited the ability of laboratories to hire or separate employees. (See p. 42.)

Extensive efforts have been made to develop techniques to measure project success. When GAO's review was completed, the Office of the Secretary of Defense and Army, Navy, and Air Force officials had not developed such a system.

GAO analyzed a substantial amount of statistical data but found it to be of little value in evaluating the project. This is characteristic of the difficulty of measuring performance of research and development activities, whether Federal or private. (See p. 67.)

GAO's evaluation indicated that, even though constraints were not removed entirely, benefits had been realized.

Managing with fiscal controls and without personnel ceilings helped operations.

--Planning for and matching funds, workload, and manpower improved.

--Delegation of responsibility and authority to lower management levels was encouraged.

--Management was provided with more options to use; i.e., direct hire or contracting.

--Management's capability for advancing new technology in-house improved and more effective technical direction was given to contractors.

--High-level management was relieved of costly and time-consuming administration associated with personnel ceilings.

--Management was allowed the flexibility of acquiring employees with appropriate skills and levels of experience and organizing them in balanced working groups to increase efficiency and productivity. (See p. 67.)

All REFLEX laboratory managers agreed the project had been successful because an environment created by encouraging flexibility permitted management to meet rapid change. They conceded, however, that some of the economies and other benefits probably could have been achieved through sound management practices without REFLEX. (See p. 67.)

The Atomic Energy Commission's Government-owned, contractor-operated laboratory and the six laboratories in the private sector which GAO visited conduct their operations with fiscal controls. None operates under personnel ceilings. (See p. 60.)

The concept of holding local management officials accountable for resources made available to them has merit and should be tested further.

Even in the laboratory environment, for which effective productivity measurements have not been devised, the test of entrusting local managers with authority and responsibility for conducting their operations with fiscal controls improved management.

GAO concurs with recommendations of officials concerned with laboratory operations in the Office of the Secretary of Defense and the Army, Navy, and Air Force that the project be continued in the REFLEX laboratories.

This test should be extended to other Federal laboratories and to other DOD and civil agency activities, particularly activities in which productivity measurements have been or can be developed. (See p. 69.)

In the REFLEX test there has been little coordination since initial planning and authorization, and implementation of the project has not been monitored centrally on a continuing basis.

Further testing should be made under common criteria and guidelines to identify and compare actions taken and results experienced by participating activities. (See p. 69.)

Further testing should be encouraged by the Office of Management and Budget (OMB), the focal point of the Government for policy leadership in respect to overall management improvements. In this connection, certain OMB responsibilities, including management procedures and measurement systems, have been transferred to the General Services Administration. (See p. 69.)

RECOMMENDATIONS

OMB, delegating responsibilities to the General Services Administration, as appropriate, should:

--Develop and furnish agencies with common criteria and guidelines for implementing the test of managing through fiscal controls. These might include:

1. Financial operating budgets.

2. Operating plans integrated with operating budgets.

3. Constraints to be removed and constraints to remain in effect.

4. Criteria for allocation of costs.

5. Suggestions for delegation of decisionmaking authority and associated responsibilities.

6. Instruction for documenting actions taken and results experienced.

7. Techniques for evaluating performance against plans.

--Encourage agencies to test the use of fiscal controls to manage operations, particularly agencies in which productivity measurements have been or can be developed.

--Monitor actions taken and results experienced by the agencies.

GAO recommends that the Secretary of Defense specifically authorize continuation of Project REFLEX in Army, Navy, and Air Force laboratories for the purpose of developing and applying criteria and guidelines similar to those suggested above. (See p. 70.)

AGENCY ACTIONS AND UNRESOLVED ISSUES

OMB agreed with the objective of Project REFLEX in DOD but suggested that objective measures of productivity be developed before experimentation is conducted in other agencies.

DOD concurred in GAO's report and endorsed the recommendations.

MATTERS FOR CONSIDERATION BY THE CONGRESS

The Congress should be informed of the benefits of managing Federal activities primarily with fiscal controls and without personnel ceilings.

CHAPTER 1

INTRODUCTION

There have been many studies of the management of Department of Defense (DOD) activities. Among the administrative practices which have been identified as tending to inhibit effective management is rigid manpower ceiling controls.

On December 27, 1967, the Civil Service Commission issued a report on "Problems in the Management of Defense In-House Laboratories." The principal problem cited related to coordinating workload, funds, and manpower. The report said:

> "Workload, funds, and manpower are furnished to laboratories by separate sources that are not coordinated. This reduces the responsiveness of the laboratories and their ability to manage programs subject to dynamic change. Coping with multiple, uncoordinated controls requires an inordinate amount of the time and attention of top level management that should be applied to the technical program."

DOD recommended that:

> "The DOD, working with the Military Departments should improve the coordination of workload, funds, and manpower. The laboratories should be allowed greater flexibility of operation under a less fragmented, better coordinated control system. * * * As an interim measure, significant increases in workload and funds without increases in manpower authorizations should be made only on approval of the Director of Laboratories after review with local laboratory management."

In May 1969 the Deputy Secretary of Defense asked for a review of the planning, programming, and budgeting (PPB) system of DOD laboratories to ascertain whether in fact workload, funds, and manpower were ade-

quately correlated at various management levels. A review was made at the Office of the Secretary of Defense (OSD) level by a task force which represented Systems Analysis, Comptroller, and the Office of the Director of Defense Research and Engineering (DDR&E). The task force concluded that:

> "* * * with but minor exceptions or variations, there is no meaningful correlation of research, development, test and evaluation (RDT&E) workload, [approval of] funds, and [establishment of] manpower [ceilings] within the PPB system at any level of management within the Department of Defense."

Therefore, the task force proposed that a demonstration project be established in which a group of laboratories would operate solely under financial controls for 2 or 3 years. This undertaking, to be called Project REFLEX (Resource Flexibility), was to be a test of the management and control of laboratory operations without the constraints of manpower ceilings. It was to provide management with the ability to adjust personnel levels to match workload requirements and available funds. The project, approved by the Deputy Secretary of Defense on December 30, 1969, and implemented on July 1, 1970, has not been terminated.

Ten RDT&E laboratories of the Army, Navy, and Air Force were selected to participate.

Army:

- Electronics Command Laboratories, Fort Monmouth, New Jersey
- Harry Diamond Laboratories, Washington, D.C.
- Mobility Equipment Research and Development Center, Fort Belvoir, Virginia
- Air Mobility Research and Development Laboratory, Moffet Field, California (formerly Aviation Material Laboratories, Fort Eustis, Virginia)

Navy:

Naval Undersea Center, San Diego, California
Naval Underwater Systems Center, Newport, Rhode Island
Naval Weapons Laboratory, Dahlgren, Virginia

Air Force:

Armament Laboratory, Eglin Air Force Base, Florida
Avionics Laboratory, Wright-Patterson Air Force Base, Ohio
Flight Dynamics Laboratory, Wright-Patterson Air Force Base, Ohio

We have made a number of studies (1967, 1969, 1971) of the impact of personnel ceilings on DOD's use of manpower and have proposed testing the use of financial controls as an alternative.

In an April 1971 report on "Impact of Employment Ceilings on Management of Civilian Personnel, Department of Defense" (B-165959), we said that personnel ceilings or hiring limitations, whether imposed by statute or by the executive branch, do not provide the most effective management controls over civilian personnel.

GAO previously proposed that departments and agencies be permitted to accomplish their programs without restrictions on numbers of personnel to be used and be limited only by the available funds.

On December 26, 1970, the Director, Office of Management and Budget (OMB) (successor to the Bureau of the Budget), agreed to eliminate DOD administrative ceilings on civilian employment for a trial period of 1 year. However, in January 1972 the Secretary of Defense reinstated civilian employment ceilings because of budget decisions. In August 1972 the Assistant Secretary of Defense (Comptroller) rescinded ceilings for the military departments and Defense agencies.

Our objective of this review was to identify and evaluate the benefits in managing the laboratories with fiscal controls and without personnel ceilings.

CHAPTER 2

THE REFLEX PLAN AND ITS IMPLEMENTATION

On December 30, 1969, the Deputy Secretary of Defense advised the service Secretaries that he had approved the proposal to establish a demonstration project on reconciling workload, funds, and manpower. Project planning was to begin immediately; the project was to be fully implemented by July 1, 1970. The proposal was supported by a preliminary work plan for the Project REFLEX experiment following extensive study by representatives of DDR&E and the services.

The project's purpose was to test the concept of using fiscal controls instead of the combined fiscal and manpower controls then used to manage in-house RDT&E organizations. The intent was to increase the management flexibility and responsibility of the laboratory directors and see how they responded.

On May 18, 1970, DDR&E issued instructions for implementing Project REFLEX to the service Secretaries. The instructions provided, in part, that:

--OSD participation would be only that necessary to insure cross-service applicability, make necessary manpower adjustments, and participate in the final analysis and evaluation.

--The laboratories were expected to maintain a reasonable balance of in-house to out-of-house work. This did not mean that each laboratory must always have a precise ratio.

--Certain quantitative data was to be collected at June 30, 1970, and annually thereafter until the project was completed, for evaluation purposes.

--It was imperative that meaningful fiscal controls be employed. The project required use of an operating budget and related reports of actual performance to provide good visibility of workload and all the

resources (including manpower and sources of financing) available to the activity.

--No additional accounting should be required since instructions already provided for uniform accounting procedures in terms of obligation authority and accrued expenditures.

--Fiscal limitations and other legal requirements continued to apply.

--For the REFLEX demonstration project, OSD would not apply manpower ceilings to the participating laboratories. Therefore, it was important that careful planning be exercised in preparing operating budgets and that quarterly (later changed to semiannual) reports be accurate and on time.

DDR&E officials told us that OSD had little involvement in Project REFLEX after the test began as OSD wanted the services to have complete freedom in implementing and monitoring the project. Because of differences in the way the laboratories operated, the services needed some flexibility in implementing the project. OSD did not establish a formal plan when REFLEX began, which would serve as a basis for measuring its benefits.

Each service implemented Project REFLEX in its own way, as discussed below.

ARMY

The Army research and development (R&D) laboratories account for annual expenditures of about $1.2 billion and employ about 22,000 civilian and military personnel. Most are under the direct jurisdiction of Army Materiel Command (AMC) or one of its nine major subordinate commands. Most of these laboratories report to AMC through commodity commands and the remaining laboratories report directly to AMC.

The four laboratories selected for Project REFLEX (see p. 6.) included organizations with unique characteristics to determine whether managing with fiscal controls would be

effective in various circumstances. Air Mobility Research and Development Laboratory was newly organized and scheduled for major expansion in terms of program and manpower. Electronics Command Laboratories is a complex of laboratories and is the largest in terms of dollar expenditure, manpower, and complexity of organization. Harry Diamond Laboratories is an industrially funded laboratory operating its own installation. Mobility Equipment Research and Development Center is a laboratory within a major commodity command and is at a major Army post.

On February 26, 1970, the AMC Deputy for Laboratories notified commanders that Project REFLEX would be implemented at the four laboratories on July 1, 1970. During the test period manpower ceilings and manpower surveys would be suspended at these laboratories. Certain data would be required, and an attempt would be made to identify meaningful quantitative criteria to evaluate the project. A steering committee was established at AMC headquarters.

AMC forwarded to the participating laboratories the May 18, 1970, instructions for implementing Project REFLEX issued by DDR&E. (See p. 8.) Some modifications were made to existing Army reports and procedures. Most of the modifications, summarized below, were in the manpower management area.

--Manpower vouchers for AMC were reduced by the allocated civilian spaces of the test laboratories as of June 30, 1970.

--All manpower surveys for the laboratories were suspended during the test period.

--Budget material and recurring reports relating to manpower and personnel requirements continued to be submitted with manpower data, and funds related to the test were to be identified separately in recurring reports.

--The Manpower Utilization and Requirements Report continued with separate identification of the test laboratories' manpower and fund data.

--The Personnel Subject to Manpower Voucher Report continued with the omission of civilian allocations. Data for the test laboratories was to be submitted as a separate section.

--Table of Distribution and Allowances submissions continued but were modified to exclude civilian authorizations. The requirements column showed actual strength under normal circumstances and was used for evaluation and approval purposes.

--There was no change in the requirements for managing and reporting military manpower spaces, except that those allocated to the test laboratories were not subject to manpower survey.

In exercising control over the REFLEX laboratories, AMC reviewed the semiannual budgets and the monthly actual total manpower strength and full-time permanent personnel. Laboratory directors were required to explain any sizable personnel increase. AMC exercised control over laboratory missions and in this way continued to exercise control over laboratory programs.

Civilian positions previously authorized, totaling approximately 6,000, were withdrawn from the REFLEX laboratories and carried in a pool by Headquarters, Army. Since the project began, manpower ceilings have not been imposed on the REFLEX laboratories. However, they were subject to the brief Government-wide employment freeze ordered in December 1972.

Statistics on funding and personnel at the REFLEX laboratories for fiscal years 1970 through 1973 are summarized below to show trends in activity levels. These statistics are not appropriate for evaluating the impact of the project on the laboratories or for relating funding levels to personnel levels.

	Fiscal year			
	1970	1971	1972	1973 (note a)
	(000,000 omitted)			
Funding levels and/or operating revenues:				
Electronics Command Laboratories	$ 223	$ 190	$ 206	$ 214
Harry Diamond Laboratories	59	64	73	75
Mobility Equipment R&D Center	109	67	103	111
Air Mobility R&D Laboratory (note b)	-	37	43	38
Average personnel levels (civilian and military):				
Electronics Command Laboratories	3,947	3,726	3,560	3,569
Harry Diamond Laboratories	1,355	1,316	1,458	1,465
Mobility Equipment R&D Center	1,071	1,071	1,157	1,192
Air Mobility R&D Laboratory (note a)	-	623	608	579

[a]Estimated.

[b]Established in fiscal year 1971.

NAVY

The Navy laboratories account for annual expenditures of about $1.1 billion and employ about 32,000 civilian and military personnel. Ten of the 11 major Navy RDT&E field

activities of the Naval Material Command are under the command of the Chief of Naval Material. The Director of Laboratory Programs directs these industrially funded activities.

Three of these laboratories were selected to participate in REFLEX. Both the Naval Undersea Center and the Naval Underwater Systems Center, which work in similar R&D areas, were included to eliminate from the test the influence of possible bias from their selection by customers. The Naval Weapons Laboratory was selected because other unique and innovative techniques had been implemented there.

On June 17, 1970, the Chief of Naval Material sent to the laboratories the instructions issued by DDR&E in May 1970 for implementing the project. (See p. 8.) Additional guidance was limited to clarification of the instructions for reporting quantitative data. The Resources, Plans, and Program Branch, Office of Laboratory Management, Naval Material Command, is responsible for monitoring REFLEX.

The Navy did not relieve the REFLEX laboratories of all manpower constraints. The Director of Laboratory Programs was assigned a personnel ceiling for his organizations and he, in turn, assigned ceilings to each of the seven non-REFLEX laboratories under his jurisdiction and retained a pool of civilian positions for the REFLEX laboratories. He could exceed his total ceiling only to the extent that the REFLEX laboratories exceeded their estimated yearend strengths; the non-REFLEX laboratories could not exceed their ceilings.

Limitations were placed on the REFLEX laboratories that were not envisioned when the experiment began. A total personnel ceiling of 7,729 was reserved in the pool for the REFLEX laboratories for fiscal year 1972. This included 422 positions above the total the Navy requested to allow the REFLEX laboratories to operate as though they were in a nonceiling environment.

Because of a sizable reduction in the Navy's total fiscal year 1972 authorized civilian end strength, the June 30, 1972, ceiling for the Director of Laboratory Programs

was reduced by 477. The Director applied 442 of this reduction to the REFLEX laboratories. He told us that this action was necessary to avoid a reduction in force (RIF) at the non-REFLEX laboratories.

Statistics on funding and personnel at the REFLEX laboratories for fiscal years 1970 through 1973 are summarized below to show trends in activity levels. These statistics are not appropriate for evaluating the impact of the project on the laboratories or for relating funding levels to personnel levels.

	Fiscal year			
	1970	1971	1972	1973 (note a)
	(000,000 omitted)			
Funding levels and/or operating revenues:				
Naval Undersea Center	$ 58	$ 71	$ 88	$ 76
Naval Underwater Systems Center	74	86	94	114
Naval Weapons Laboratory	53	61	83	95
Average personnel levels (civilian and military):				
Naval Undersea Center	1,900	1,839	1,985	1,966
Naval Underwater Systems Center	2,919	3,188	3,421	3,475
Naval Weapons Laboratory	2,613	2,745	2,804	2,938

[a]Estimated.

AIR FORCE

The Air Force laboratories spent about $788 million and employed about 8,000 civilian and military personnel in fiscal year 1973 in managing RDT&E programs. Generally each

laboratory is responsible for a specific functional area, such as armament, medicine, avionics, or aeropropulsion. All Air Force laboratories are under the command and control of Headquarters, Air Force Systems Command (AFSC).

Three Air Force laboratories were selected to participate in Project REFLEX--the Armament Laboratory at Eglin Air Force Base and the Avionics Laboratory and the Flight Dynamics Laboratory at Wright-Patterson Air Force Base.

In June 1970 the AFSC Director of Laboratories issued a plan to implement the project at the three laboratories which identified procedures for reporting progress, techniques for evaluating the project, and requirements for supplemental data to assist in the evaluation. The plan provided that:

--The laboratory commander control civilian and military manpower requirements on the basis of available funds. His authority was to include modifying, adding, or deleting positions.

--The laboratories were to be exempt from the AFSC Manpower Determination Program (i.e., manpower surveys).

--Decisions to increase personnel were to be effected immediately with review by higher headquarters on an after-the-fact basis.

--Hiring restrictions and similar limitations were to be eliminated to insure the test's validity.

--Once an objective or a task was defined, the laboratory commander could decide to accomplish it in-house or by contract.

--Planning, programming, budgeting, and accounting procedures were to remain unchanged during the test. However, special reporting requirements and procedures were to be added to the management information system so as to follow the progress and evaluate the results of the test at each laboratory.

--The laboratories were to be exempt from manpower and personnel reductions levied on AFSC by Headquarters, Air Force. However, they were not to be exempt from budget cuts, nor were additional funds to be provided because of the test.

The AFSC plan was not expanded further by either DDR&E or Headquarters, Air Force. It was expected that the laboratories would be free to operate within the plan.

Project REFLEX started July 1, 1970, at the three selected Air Force laboratories in accordance with the implementation plan. Laboratory commanders told us that a cautious attitude was adopted during the first few months of the demonstration; only planning and reorganization were accomplished. During the second year, hiring restrictions were applied within AFSC, including the REFLEX laboratories. The following summary shows how the restrictions were applied to the Flight Dynamics Laboratory.

--The AFSC Director of Laboratories directed a hiring freeze on September 13, 1971. He said that it would be prudent to cease hiring additional personnel under REFLEX until his staff could "sort things out." There was an apparent conflict between proposed personnel reductions within AFSC and Laboratory plans to add over 300 personnel by the end of the fiscal year.

--In October 1971 Headquarters, AFSC, imposed hiring limitations on all AFSC units, including the REFLEX laboratories, to minimize the impact of an anticipated RIF. Although the restrictions were lifted on January 28, 1972, effective continuation of the test was interrupted for about 7 months as personnel displaced in other units exercised their retention rights and displaced personnel in the laboratories.

--An additional hiring freeze imposed by the President on executive agencies from December 1972 to February 1973 included the REFLEX laboratories.

Statistics on funding and personnel at the REFLEX laboratories for fiscal years 1970-73 are summarized below to show trends in activity levels. These statistics are not

appropriate for evaluating the project's impact on the laboratories or for relating funding levels to personnel levels.

	Fiscal year			
	1970	1971	1972	1973 (note a)
	(000,000 omitted)			
Funding levels and/or operating revenues:				
Armament Laboratory	$ 41	61	60	$ 59
Avionics Laboratory	94	91	105	99
Flight Dynamics Laboratory	53	62	69	47
Average personnel levels (civilian and military):				
Armament Laboratory	[b]599	678	763	817
Avionics Laboratory	565	611	766	947
Flight Dynamics Laboratory	753	825	997	1,073

[a]Estimated.

[b]Adjusted for transfer of engineering development activities and associated manpower spaces from the Armament Development Test Center.

CHAPTER 3

BENEFITS FROM INCREASED MANAGEMENT FLEXIBILITY

Under Project REFLEX some of the constraints associated with personnel ceilings have been removed at the laboratories. Laboratory managers have had more flexibility in selecting and using manpower.

In the R&D environment, it is extremely difficult to measure performance improvements because there are no generally acceptable performance measurements of effectiveness or productivity. The lack of performance measurements made it impracticable to identify and quantify advantages or disadvantages of managing without personnel ceilings.

Lacking quantitative measurements, we evaluated REFLEX primarily (1) through discussions with top management officials at REFLEX and non-REFLEX laboratories in DOD; a Government-owned, contractor-operated laboratory; and private laboratories, (2) by analyzing the benefits cited by management officials, and (3) by contrasting management practices in the REFLEX and non-REFLEX laboratories. Although we could not assess the full impact of REFLEX, we did identify several benefits. These fall into three broad areas: improved correlation of workload, funds, and manpower; more manpower options; and improved management performance capability.

IMPROVED CORRELATION OF WORKLOAD, FUNDS, AND MANPOWER

Project REFLEX has brought about more effective matching of workload, funds, and manpower at the organizational level ultimately responsible for the resources, the laboratory. Management has been better able to fit manpower into the overall laboratory goals and to give more attention to such long-term implications as continued workload, growth potential, and relative value of short- and long-term requirements.

Improved management under Project REFLEX has been demonstrated by more effective planning, increased

delegation of authority, and a greater sense of responsibility and cost consciousness.

More effective planning

A major criticism of operating under personnel ceilings is the lack of correlation of workload, funds, and manpower. Workload and funds are controlled by one source, and the number of employees authorized is controlled by another source with little or no correlation between the two. Under the REFLEX concept, laboratory managers have authority to determine requirements and acquire, to the extent funds are available and without prior approval of headquarters, the quantities and types of manpower needed.

When managers were given increased authority, they assumed greater responsibilities for effective use of available funds. Project instructions required an operating budget and reports to provide managers with good visibility of their workload and resources. (See p. 8.) This established a need for more realistic program planning and measurement of performance against plans.

Army

The flexibility provided by Project REFLEX led to a broadened management philosophy which included more intensive planning and more intensive review of programs and projects. For example, at Electronics Command Laboratories:

--Project REFLEX required more intensive R&D planning, periodic review of resources, and additional information on program execution. In a project evaluation, the Director said that the first dramatic effect was demonstrated in formulating the Electronics System Plan, a budget-oriented plan described as the strategy of the R&D spending program. There had been previous attempts at R&D planning but they were not as effective as the current plan.

--Before Project REFLEX, when manpower ceilings were allocated, certain organizational elements believed

that top management was responsible for providing programs and funds to sustain them. Under Project REFLEX the ground rules changed, and it is recognized that the order of events is to obtain program approval; then funds; and, from these, manpower requirements are determined. It became essential to obtain broad participation of operating personnel in developing a realistic plan and to be sure that programs were relevant, necessary, and in phase, since an activity's existence depended on its program fitting into the overall plan.

--Because Project REFLEX pointed up a need for better resources management information, a more comprehensive resources review was initiated during fiscal year 1973. This consists of a structured, in-depth review of workload, funds, and manpower to assist the Director of Laboratories in planning the Laboratories' future operation. Previously, resources were reviewed but not in great detail because the Director did not have full control over his manpower resources.

--During a resources review the Director, his staff, and Laboratory personnel match the programs and needed resources. They emphasize the best way of performing the program--in-house or by contract--the rationale for decisions, the division of the budget by element of expense, and the way a division supports the programs and work force.

Navy

Before Project REFLEX began in Naval Material Command laboratories, the command assigned less than 10 percent of the laboratories' workload but controlled their entire manpower authorization. It was not uncommon for a laboratory to receive significant increases in workload and funds without any increase in manpower authorization.

More attention to matching workload, funds, and manpower was evident at the three Navy REFLEX laboratories. Each laboratory established new internal management proce-

dures for systematically considering matching manpower with changes in workload and funding.

--Naval Undersea Center established a Resources Management Board for planning and implementing management actions. Its functions included reviewing, revising, and/or establishing policies and procedures relating to Center personnel, finances, and facilities. Department heads were to inform Board members about program requirements, commitment of funds, need for facilities, and other circumstances affecting use of resources by their organizations.

--Naval Underwater Systems Center established a Staffing Plan Review Board which meets quarterly to review the status of the Center's personnel, establish policy guidelines, and consider matters which affect organizational growth or decline.

--Naval Weapons Laboratory instituted a quarterly review of programs, budgets, and manpower requirements. During these quarterly reviews the commander, technical director, and department heads examine goals and total Laboratory resources--people, dollars, and space.

Laboratory officials said that, before Project REFLEX, there was no real planning of manpower requirements because of the frustrations and time involved in obtaining staff increases. The incentive was for management to fight to keep its staff without taking a real hard look at its needs. Under Project REFLEX this attitude has changed because the Laboratory now is responsible for insuring the proper matching of people and funds. It can no longer blame higher authority for an improper balance.

Air Force

Headquarters, AFSC, delegated to laboratory directors complete authority to modify, add, or delete positions without prior approval by headquarters. The directors were made responsible for developing and implementing fiscal

controls to provide the necessary cost data and visibility essential to laboratory management.

--Avionics Laboratory revised its planning to include manpower costs to aid in determining whether projects should be performed in-house or by contract. Since all cost elements are considered in making expenditure decisions, the need arose for more reliable information at various management levels.

--Flight Dynamics Laboratory has included, in its entire PPB cycle, cost considerations at each level down to the individual effort level. The Director said that, to aid in providing fiscal control under the project, he had found the following to be helpful:

1. Requiring make-or-buy analyses on new effort areas or areas slated to receive increased resources.

2. Using a system for continuous tracking of actual project expenditures against those budgeted.

3. Insuring that savings are documented.

The Director said:

"REFLEX has imparted a new realism to our manpower planning efforts as opposed to the feeling of futility attached to preparing 26-1 Manpower Validation packages which rarely produced results under fixed manpower ceilings. The plans are now prepared a year in advance with periodic updates to keep them current and in consonance with program guidance and emphasis. Furthermore, under REFLEX a vastly increased awareness of the importance of the quality and cost of personnel has been imparted to supervisors at all levels of the Laboratory."

Increased delegation of authority

Another facet of management effectiveness is the amount of authority and responsibility delegated to lower level managers. Increased authority can reinforce lower level

management and create incentives for greater efficiency. Also it frees top management for high-level policy issues and decisionmaking. The increased delegation of authority under REFLEX has acted as a catalyst to lower management levels in improving planning, morale, and enthusiasm for getting the job done.

Army

REFLEX laboratory directors said REFLEX had improved various management levels' sense of responsibility, cost consciousness, perspective, morale, enthusiasm, and performance. Changes in attitude resulted in improved communications, increased cost consciousness, a concerted sense of financial responsibility, and improved morale and performance.

--At Electronics Command Laboratories the Director said that all positions, including those of project engineers, had taken on a management flavor as contrasted with merely administering programs. He said also that, as middle and lower management personnel had continued to examine individual programs and organizations for effectiveness and efficiency, actions had been initiated which would have been unacceptable and fought if forced down from above because of controls on manpower.

Electronics Command Laboratories officials told us that the Electronics System Plan (see p. 19) started with the bench-level engineer along with his supervisor and technical area chief, since their existence depends on fitting their programs into the overall scheme. In the past, plans were developed by staff personnel, not by those actually doing the work. Now the personnel doing the work are involved in planning the work.

--Electronics Command Laboratories' Night Vision Laboratory eliminated a technical area and more closely coupled its personnel and programs to the needs of the overall organization. A laser group was transferred from the Electronics Technology and Devices Laboratory to the Combat Surveillance and Target Acquisition Laboratory and joined with its

electro-optics technical group to obtain better coupling of personnel and stronger functional groups. Similar realignments of organizational elements and functions have been and are being made to obtain more effective and efficient operations. These changes have resulted in delegation of day-to-day management of these programs to lower levels so that upper management can concentrate on other essential matters.

--The directors at both Army non-REFLEX laboratories visited--Ballistic Research Laboratories and Natick Laboratories--said that middle management now was responsible for managing the technical programs. Removal of manpower ceilings, according to one director, probably would not cause delegation of more authority to lower level management, but greater flexibility would be allowed to the extent manpower ceilings influenced decisions. The other director said that resource management would be increased at middle management levels; e.g., on decisions as to whether to accomplish a task in-house or by contract.

Navy

Navy REFLEX laboratory officials said that the REFLEX environment had facilitated increased delegation of authority. In the past, department heads and project leaders could not always accept additional work from sponsors, even though the work was adequately funded, because they might not have the necessary manpower. Under Project REFLEX these managers were in a better position to commit the laboratory to additional important R&D within their technical areas of responsibility.

At Naval Undersea Center the authority of department managers was increased as follows:

	Prior authority	New authority
Authority to propose or make new commitments	$100,000 or 6 months	$200,000 or 1 year
Authority to request procurements	$15,000	$25,000

The purpose of this change was to allow processing of more administrative actions at the departmental level, reserving top-management review and approval for large-scale, novel, or complex situations. A Center official said that, when top management made the decision to increase the department managers' authority, REFLEX was considered a "safety valve." If department heads overcommitted themselves, Project REFLEX provided the Center with the flexibility to hire the necessary personnel to accomplish the work.

Officials at two Navy non-REFLEX laboratories--Naval Electronics Laboratory Center and Naval Ship Research and Development Center--said that the commander and technical director had retained the authority to commit resources and to accept or reject proposed programs. If manpower ceilings were removed, some authority for recruiting and assigning personnel would be delegated to department heads.

Air Force

Increased authority and responsibility were delegated to middle management at the Air Force REFLEX laboratories. This gave the lower-level managers a different perspective of their role in the laboratories, improved morale, and increased enthusiasm.

Flight Dynamics Laboratory top management delegated to middle management a major portion of the authority and responsibility for analyzing the need for new or different personnel and for reevaluating funded programs as potential sources of funds to support them. The Director said that he felt this would aid considerably in developing management skills since recommendations were reviewed by higher management levels and the results of approved actions would be evaluated.

We discussed delegation of authority with officials of three Air Force non-REFLEX laboratories.

--At Aero Propulsion Laboratory the fiscal program is planned through a system of participative management, which involves several management echelons. Once the plan has been developed, the divisions execute it.

Manpower resources are greatly restrained because of ceilings, and allocations and distribution are not delegated below the Laboratory Director level. If manpower ceilings were removed, delegation of authority on manpower to lower levels should be done within well-defined guidelines over a period of time.

--At Cambridge Research Laboratories top management determines broad areas of program responsibility and sets technical objectives. The director of each laboratory determines what work is to be undertaken. The branch chiefs determine the approaches and their implementation. Officials said that, without manpower ceilings, more authority would be delegated to laboratory directors to exercise manpower options.

--At Rome Air Development Center the extent to which authority is delegated within the managerial structure of the laboratories is limited by the requirement to adhere to overall ceilings, which requires control at the commander or staff level. Removal of ceilings would allow considerable decentralization; dollar responsibility would be the primary control which could be exercised at branches or sections within divisions.

Greater sense of responsibility and cost consciousness

Project REFLEX forces a realistic management approach in that the costs of resources previously considered "free" become project costs and the availability of funds becomes an important consideration. Also managers have become more concerned about the reasonableness of overhead charges to projects.

Army

Fiscal controls have brought about increased attention to financial management responsibility and cost sensitivity at Army REFLEX laboratories. At Electronics Command Laboratories certain charges, previously hidden from program managers because they were collected as part of the bulk

overhead charge, have now been separated from overhead and are being charged directly to the project, task, or work unit. These charges showed a significant reduction in use of services which engineers and scientists previously used without considering cost.

--Charges for use of aircraft were reduced from $1.4 million in fiscal year 1970 to $1 million in 1971 and to $0.8 million in 1972. Costs of visual display materials, which were charged directly to projects for the first time in fiscal year 1973, were reduced to about 60 percent of fiscal year 1972 charges, from about $900,000 to $526,000. Computer usage, also charged directly to the project for the first time in fiscal year 1973, was reduced by about 50 percent, from about $1.3 million to $650,000.

--Charges for miscellaneous purchases decreased from about $3.6 million in fiscal year 1970 to $1.4 million in 1973. Project REFLEX motivated personnel to review each purchase to determine need and benefit of the purchase.

--The Research and Development Technical Support Activity is responsible for calibration work for Electronics Command Laboratories. Much of this work was done by assigned military personnel--"free resources." When cutbacks caused the activity to lose its 86 military personnel, the Laboratories had to meet the needs with available funds, and special-purpose equipment funds were diverted from other uses to purchase a computer system for instrument calibration.

  Officials said that in all likelihood this decision would not have been made had it not been for the cost sensitivity caused by Project REFLEX--the need to get the job done in the most effective and economical way.

In his Management Analysis Memorandum 71-1, dated October 26, 1971, the Director of Electronics Command Laboratories wrote about cost sensitivity:

"* * * Project REFLEX imbued the entire laboratory management with a new perspective by focusing attention on costs in a way that allowed them an opportunity to make meaningful management decisions regarding program accomplishment.

"What effect did this emphasis on funding have on our technical program? Laboratory directors became aware that they had been subsidizing programs in the past that had failed to pay their own way. Because the idea was instilled in them that every program had to pay its own way, marginal programs were eliminated. More significantly, laboratory managers brought these unfunded requirements to the attention of our project managers and other customers, and indicated that these programs would have to be discontinued unless funds were made available to provide the needed support. Project REFLEX furnished the necessary leverage to pry loose the required funding in support of these programs."

We discussed cost sensitivity with officials at two Army non-REFLEX laboratories.

--At Ballistic Research Laboratories the Director said that managers at all levels were deeply sensitive to cost but that the removal of manpower ceilings could, in some cases, influence the method of performing work. This, in turn, could affect the cost. He could not foresee any significant changes in operations which would result in cost savings due to removal of manpower ceilings but felt that REFLEX would provide more options for managerial decisions on expenditures.

--At Natick Laboratories the Director said that the removal of manpower ceilings would make managers at all levels more cost sensitive. They would no longer be "fenced in" by the manpower limits and grade structure of the Table of Distribution and Allowances. Resources could be used to get the job done with a properly

balanced staff rather than by people hired at certain grades to protect authorized spaces. Removal of manpower ceilings would result in organizational changes and cost savings.

Navy

Reliable status and forecasting of funding at all levels were required when REFLEX began. Department heads placed more responsibility on project engineers to provide good forecasts. This interest has resulted in closer monitoring of fiscal charges and increased emphasis on collection of valid cost data.

--At Naval Underwater Systems Center, increased interest in financial management--partly because of the Navy industrial fund also--led to establishment of an Overhead Review Board in September 1972 to provide management with a more systematic and searching view of general and administrative overhead. The Board meets quarterly to review overhead costs incurred by the various directorates and to recommend actions for reducing costs in operating areas.

--At Naval Weapons Laboratory, before the project began, the operating technical managers were assigned projects to work on but had very little influence in obtaining the necessary manpower since a different Navy office assigned personnel ceilings. Branch heads and project managers monitor costs very closely under Project REFLEX. They are responsible for employing a work force sufficient to accomplish technical objectives, they must make accurate cost estimates, and they must live within those estimates.

Officials at two Navy non-REFLEX laboratories--Naval Electronics Laboratory Center and Naval Ship Research and Development Center--said that removal of manpower ceilings would not affect the managers' cost sensitivity. The Navy industrial fund already requires a high degree of cost sensitivity at all management levels.

Air Force

Before REFLEX, civilian manpower was considered a "free" resource since personnel costs were not budgeted and accounted for in the cost of projects. When manpower ceilings were eliminated, civilian personnel came under financial controls and were included in project costs.

--At all three Air Force REFLEX laboratories, officials told us that the project had brought about more focus on financial management responsibilities at all management levels. Project managers, who rarely considered civilian manpower as contributing to project costs, now are concerned with numbers and grade levels of employees on their projects. Civilian personnel costs are considered in determining whether to perform a project in-house or by contract. Military personnel still are a "free" resource.

Officials at four Air Force non-REFLEX laboratories commented on cost sensitivity.

--At Aero Propulsion Laboratory an official said that removal of manpower ceilings probably would not greatly affect managers' cost sensitivity in the early stages of implementation but there should be an impact later.

--At Cambridge Research Laboratories, Materials Laboratory, and Rome Air Development Center, officials said that removal of manpower ceilings would increase cost sensitivity at all management levels. According to one official, manpower costs now tend to be viewed as a fixed charge. If the project leader, Laboratory Director, Commander, and then staffs had meaningful manpower alternatives at any given time, they would all be more sensitive to relative costs.

MORE MANPOWER OPTIONS

When employment levels are controlled by personnel ceilings, the manager does not always have the

flexibility of choosing the most efficient and effective method of accomplishing assigned work. This is particularly true when deciding whether work should be performed in-house or be contracted. When a laboratory is assigned additional work and provided the funds to accomplish it but not allowed to hire the needed personnel, manpower options are limited.

Under Project REFLEX, laboratory managers have more flexibility in determining whether to do work in-house or by contract. Previously, because of manpower ceilings, some research had to be contracted even though it could have been done more economically or more effectively in-house. By having both options and authority to obtain the necessary manpower in the best way, laboratory managers have instituted more sophisticated make-or-buy analysis techniques for determining whether to do projects in-house or by contract.

Project REFLEX has provided laboratory management with more manpower options to respond to changes in programs and customer needs. Through the ability to adjust manpower levels and make organizational changes as needed, laboratory officials have transferred personnel between work groups or projects, hired additional personnel without prior approval to meet changing workload, and implemented new programs as needed without undue impact on existing projects.

Project REFLEX has permitted the laboratories to balance their mix of technical skills. Also it has facilitated organizational changes; e.g., combining or realigning divisions or work groups, by eliminating the need for expensive and time-consuming manpower surveys which often are associated with major organizational changes. It has eliminated the fear of losing manpower positions, causing the various levels of laboratory management to more readily accept changes. Reorganizations have progressed more smoothly and without decreasing emphasis on important programs for which funds were available.

Laboratories periodically have experienced reductions in manpower levels. Before Project REFLEX, invariably the reductions were made in administrative and other support areas. The work force became unbalanced; the numbers of administrative and other support personnel were insufficient to assist the professional work force. Because of this imbalance professional personnel spent some of their time on administrative or support duties that were not commensurate with professional skills.

Where personnel ceilings were removed under Project REFLEX, the laboratories were able to improve the composition of the work force by consolidating, adding, downgrading, or eliminating positions in accordance with their needs. The ability to hire additional lower grade administrative and support personnel has improved the ratio of professional to support personnel.

Army

--Electronics Command Laboratories officials told us that, before Project REFLEX, once a position was authorized on a laboratory's Table of Distribution and Allowances, efforts were made to keep it filled. Positions were not transferred or eliminated. Laboratory prestige was based on the number of people in the laboratory. The attitude that prevailed was "I've got to hire." Now the attitude has changed to "Can I afford to keep the position?" Manpower has been tied to needs and funds.

--At Air Mobility Research and Development Laboratory, the Director said that, before Project REFLEX, filling vacancies to protect space and grade structure was necessary to survive. In many instances, because of fear of loss of spaces, even high-grade positions were filled with less qualified personnel than could have been obtained through additional search. He said that the advantage of acquiring people as needed with the appropriate skills and ex-

perience must not be underestimated. It is a more effective way of upgrading the capability of Government laboratories.

--At Mobility Equipment Research and Development Center, the added flexibility provided by Project REFLEX enabled the Center to effectively respond to increased emphasis in the countermine program area. A management decision was made, and quickly implemented, to consolidate three organizational elements and to build on the foundation of an existing organization. As the program expanded, the staff of the new organization was expanded.

--At Harry Diamond Laboratories officials told us that sponsors were no longer afraid that the Laboratories would not be able to complete work because of manpower constraints. For example, before Project REFLEX the Air Force feared its projects might be displaced by Army projects; now it knows the laboratories will be able to staff Air Force projects.

At two Army non-REFLEX laboratories--Ballistic Research Laboratories and Natick Laboratories--the Directors said that they had the flexibility to shift personnel within the Laboratories but not without some administrative difficulty. One director felt that Project REFLEX would permit him more flexibility in shifting the work force. The other director could not visualize Project REFLEX affecting his flexibility in this area.

The Director at Natick Laboratories said there was a tendency to hire to fill vacancies so as not to lose the spaces. On the other hand, the Director at Ballistic Research Laboratories said that the Laboratories did not hire merely to fill vacancies; every recruitment action was fully justified before processing.

The Director at the Ballistic Research Laboratories felt REFLEX would help the Laboratories

change the mix of personnel since it would permit an increase in the number of technical aides and technicians in some areas and thereby free professionals to perform broader and more sophisticated work. The Natick Laboratories Director also visualized a change in the mix of his personnel to attain better performance. He said that REFLEX would permit the hiring of support personnel and would improve the ratio of professional to support personnel.

Officials at both non-REFLEX laboratories said they could not always support customer needs to the extent they would like. They felt elimination of manpower ceilings would permit the hiring of additional people when necessary and this would allow more efficient accomplishment of tasks.

Navy

--Project REFLEX permitted the Naval Undersea Center to respond quickly to a new Light Airborne Multipurpose System (helicopter) program. This program required the Center to provide system integration, engineering, and program management support for a multiplatform (air and surface) system. The Center had adequate expertise in the surface technologies involved but needed additional capability in aircraft and antisubmarine warfare systems. Eight people with the required talents were hired, which eliminated the need for any in-house training. The Center began basic work on the project immediately by reassigning experienced personnel from other duties and hiring replacements to continue work on existing programs.

--Naval Weapons Laboratory increased its fleet ballistic missile staff by 21 professionals to respond to assigned responsibilities and increasing complexity of the Poseidon missile system. Although the Polaris program was phasing down at this Laboratory, the decrease in Polaris requirements was not timely enough to release talent from that program to work on the

Poseidon system. Laboratory officials said that REFLEX permitted them to respond promptly to new and added responsibilities for the Poseidon system.

--Navy laboratory officials said that the long-range effectiveness of a laboratory demanded the recruitment of new professional talent when needed and when available. Rigid personnel ceilings hinder effective recruiting programs. Before Project REFLEX, the Naval Undersea Center had to suspend all active college recruiting programs. After the project started, the Laboratory reactivated its recruiting programs and 77 new professionals were hired compared with only 7 during the 2 preceding years. Although officials could not estimate the impact of these hires on Laboratory operations, they were convinced that overall Laboratory effectiveness had improved.

Officials at two Navy non-REFLEX laboratories commented on this matter.

--Naval Electronics Laboratory Center officials said that options would remain the same but would be exercised with more flexibility. With ceilings there is a tendency to hire at possibly higher than ideal grade levels to have maximum productivity with minimum personnel. Without ceilings, more lower grades would be employed in professional, subprofessional, and support areas. This would provide better balance and permit the professional to devote his time to professional tasks.

Removal of ceilings would permit selection of options to perform work in-house or by contract on the basis of merit, including cost. Response to new and emerging projects should improve if proper numbers and types of personnel are available.

--Naval Ship Research and Development Center officials said that, without ceilings, the Center could be more responsive to new projects. Taking on new work in the present situation usually requires slowing down schedules on existing projects to make manpower available. Even so, it is often very difficult to provide sufficient manpower to proceed with a new project at the rate the sponsor desires.

Air Force

Before Project REFLEX, Air Force laboratories found that, when they wanted to implement a new program, it was extremely difficult and time consuming to acquire additional needed personnel and other means of obtaining manpower had to be used. Some laboratory officials said that they had to staff new high-priority projects by "robbing" manpower assigned to lower priority projects even though funds were available to finance the increased manpower.

The REFLEX laboratories have been able to reassign personnel from existing projects to new, higher priority projects. Also they have been able to hire additional personnel to work on new projects or to replace those reassigned from existing projects to new projects. By removing the need for higher authority approval, the time required to recruit and hire new personnel has been reduced by about 6 months. In addition, preparing a manpower package for submission to higher authority took about three to five times as many man-hours for the same number of positions as the present method of reporting action after it has been taken.

The management flexibility provided under Project REFLEX has made it possible for the laboratories to achieve a better balanced work force. They have accomplished this by obtaining new skills in key areas, improving the ratio of professional to support personnel, balancing the mix of technical skills, making desired organizational changes more readily, and establishing a more balanced grade structure.

Officials at all four Air Force non-REFLEX laboratories visited said more manpower options would be available without ceilings. At Cambridge Research Laboratories, an official said that there would be greater flexibility in determining which work is to be done in-house or under contract. The work force mix could be adjusted to reflect changing needs for certain types of expertise and certain levels of competence. At Aero Propulsion Laboratory an official said that manpower needs that exceed inherent organizational flexibility could be promptly satisfied under Project REFLEX, circumventing normally lengthy current manpower validation methods.

IMPROVED MANAGEMENT PERFORMANCE CAPABILITY

Within the limit of available funds, Project REFLEX has given the laboratories the option of obtaining the skills necessary to build up their management performance capabilities as new programs develop. This increased expertise not only has provided the laboratories with the capability of performing in-house types of research which could not have been undertaken previously but also has enabled them to provide more effective technical direction of work contracted. Cases follow.

Army

--Harry Diamond Laboratories undertook to apply its capabilities in fluidics to improve carburetion of internal combustion engines because attention had been directed to pollution control and energy conservation. Although the Laboratories had a highly qualified staff, senior investigators were fully occupied. Project REFLEX enabled the Laboratories to hire an engineer who had written his thesis in applying fluidics to automotive problems. This added capability significantly enhanced the Laboratories' ability to implement projects.

--The Mobility Equipment Research and Development Center was able to respond to a decision to

develop its computer capability as an AMC resource and to participate in a nationwide computer network. Project REFLEX greatly facilitated the establishment of a new computer facility. A new organizational structure was established in May 1971 to accommodate the new computer in June 1971. In addition, Project REFLEX permitted the timely hiring of a consultant who made a comprehensive survey of current and planned RDT&E programs to determine areas where significant benefits would result from increased use of computers. The survey results were considered in shaping and staffing the new organization.

At the Army non-REFLEX Ballistic Research Laboratories, officials said that manpower ceilings did inhibit the Laboratories from gaining in-house capabilities to better serve customer needs. At times they are forced to contract effort which might be done better, more efficiently, and at less cost in-house.

Navy

--Project REFLEX enhanced the Naval Weapons Laboratory's ability to hire and promptly develop the staff necessary to centralize the Naval Ordnance Systems Command's fire control software responsibilities for surface warfare missile and gun systems. The staff had to be expanded from approximately 24 professionals to approximately 82 in 3 years.

Before centralizing these responsibilities, the command had many different contractors developing software programs for surface digital fire control systems but no organization to run quality assurance checks on the software programs to insure that they performed adequately before it was taken aboard ship for checkout trials. It would have been costly and would have required a duplication of Laboratory equipment to provide each contractor with the

digital computers and associated equipment necessary to perform the proper quality assurance checks.

Centralization in this Laboratory provided an opportunity for optimum use of fire control computers, especially where they were common to more than one fire control system. It also provided for Laboratory quality assurance checks on the software before it was tried aboard ship. This in turn gave the Navy a better product and avoided costly delays since the software is now checked out in a laboratory where shipboard environment can be simulated.

At the non-REFLEX Naval Electronics Laboratory Center, officials said that the Center had been unable to acquire in-house capabilities in electronic warfare and radar surveillance because of manpower ceilings even though it is responsible for developing these areas. Naval Ship Research and Development Center officials said that the Center had not been able to respond rapidly or to the technical depth desired in two ongoing programs--shipboard pollution and reduced ship manning--because of a shortage of skilled in-house manpower.

Air Force

Air Force REFLEX laboratories have increased their in-house competence and capabilities by hiring the necessary numbers and types of personnel to better keep abreast of the technology of their programs. Consequently, the laboratories no longer have to depend on contractors to the extent they did before REFLEX.

In addition, laboratories have been better able to describe to contractors the work to be done, evaluate contractor proposals, judge contractor performance, and evaluate contractor products. Contractors realized that they were being evaluated on a technical basis rather than on their report-writing skills. These improvements not only benefitted the laboratories but also were considered to be advantageous to industry

because improved project definition permitted industry to do a better job in less time and often at less cost.

--Armament Laboratory established a complete in-house capability for making laser-guided bomb simulations and analysis--a capability acknowledged to be needed in this new field--and for laser-ranging development after its contractor went out of business. The Armament Laboratory also reported significant state-of-the-art advancements in propellants.

Armament Laboratory built up an in-house analysis capability which enabled it to evaluate contractor efforts on warhead effects. Since the analysis formerly was part of contract requirements, the contractor had, in effect, been evaluating its own efforts. This capability also enabled the Laboratory to redirect contractor efforts on incendiary bomblet case material and plastic bonded explosives. The increased emphasis resulted in a change in bomblet design and a savings of about $7.1 million in production costs. Laboratory officials said that this would not have been possible without the flexibility allowed under Project REFLEX.

--Avionics Laboratory employed analytical groups which could assess technical risks and reasonableness of goals before major investments in hardware were made. The Laboratory claimed that it had saved about $727,000 by replacing onsite contractor personnel with Government employees.

--Flight Dynamics Laboratory decided to perform an aeroacoustics project in-house, rather than contract the work, after developing a make-or-buy analysis which showed estimated in-house costs of $162,300 and contract costs of $422,400. About $260,000 could be saved, and the project could be completed in-house 6 months earlier. Project REFLEX enabled the Laboratory

to employ needed aeroacoustical and sonic fatigue engineers.

Flight Dynamics Laboratory increased its responsiveness to the need for evaluation of a new Air Force close-air-support fighter plane. Two contractors were competing for the production contract for the aircraft, and evaluation of the results of tests of certain flight dynamics characteristics of the two prototypes was urgently needed.

Flight Dynamics Laboratory was tasked with independently evaluating contractor test results and performing independent tests on certain components. This Laboratory obtained the necessary manpower to conduct the tests and evaluations, provided the results within the specified time, and did not delay the Air Force analysis of the merits of the competing aircraft. Under manpower ceilings the Laboratory could not have accomplished this goal because obtaining the necessary manpower approvals by higher authority would have taken too long.

Officials at all four Air Force non-REFLEX laboratories said that without manpower ceilings they could gain additional in-house capabilities.

CHAPTER 4

CONSTRAINTS ON RESOURCE FLEXIBILITY

Despite the increased management flexibility provided under Project REFLEX, some constraints continued to affect the ability of laboratory managers to match workload, funds, and manpower.

In chapter 2 we discussed applying hiring constraints in implementing Project REFLEX. Other constraints limited to some extent the ability of the REFLEX laboratories to manage operations solely with fiscal controls. These constraints included:

--Policies and procedures for acquiring or removing employees.

--Guidelines for reducing average grade levels.

--Procedures for acquiring capital improvements.

ACQUIRING EMPLOYEES

Although REFLEX laboratory officials have had authority to determine without prior approval from higher authority that positions need to be filled, generally employees to fill the positions have been acquired through the personnel office that serves the laboratory. Compliance with agency practices and civil service policies and procedures has considerably delayed the hiring of full-time permanent employees.

--An Army Electronics Command Laboratories study showed that it took about 166 working days--approximately 7-1/2 months--to fill a vacancy.

--At the Army Mobility Equipment Research and Development Center, positions required for the greatly expanded major thrust areas of countermine and countersurveillance were authorized shortly after the requirements were known. Necessary organizational, position management, and classification actions extended the total

time for establishing and filling professional positions through the Army's Career Referral System by 8 to 10 months.

--At the Naval Weapons Laboratory, civil service restriction of authority for appointing engineers at only the GS-5 and GS-7 levels limited the Laboratory's ability to recruit and make timely job offers.

--At the Air Force Avionics Laboratory, the commander said that delays of over a year between approval of a manpower position request and the appearance of an employee on the job had occurred. A large part of the delays were related to the selection process.

REMOVING EMPLOYEES

Although Project REFLEX facilitates hiring and internal realignment to match changing workload and funding, civil service regulations do not permit timely removal of unneeded employees.

Observations by agency officials, directed at the RIF system governed by civil service regulations, follow.

--The system reduces the efficiency of the civil service. Technical and professional erosion of staff results from separation of bright young people of low retention standing.

--The system is too inflexible, provides management too few options, and involves too much indiscriminate "bumping" and too little recognition of job performance and mission requirements in selecting employees to be retained.

--Current DOD procedures require prior approval for a RIF exceeding 50 people.

--Under DOD instructions implementing the Civil Service regulations governing RIFs, affected employees must receive a minimum of 60 days' advance notice before separation. The applicable civil service regulation, 5 CFR 351.801, prescribes a minimum notice period of 30 days.

In the Air Force, although the REFLEX laboratories were exempt from RIFs, they were not exempt from the bumping that resulted from RIFs at other Air Force organizations in the same competitive area.

--Employees displaced from positions at the Aeronautical Systems Division and other organizations, where RIFs occurred within the AFSC community at Wright-Patterson Air Force Base, bumped employees at the Avionics Laboratory and the Flight Dynamics Laboratory. These Laboratories thus acquired employees they had not selected. (See p. 16.)

REDUCING AVERAGE GRADE LEVELS

In August 1971 DOD and the services instituted an OMB-directed program of grade deescalation of General Schedule employees. Officials at the Army and Navy REFLEX laboratories generally agreed that this had limited to some extent the management flexibility intended under Project REFLEX.

--Army Mobility Equipment Research and Development Center officials said that higher authority had directed the Center to reduce its average grade levels for fiscal years 1973 and 1974. The R&D managers could not restructure to spread out duties and reduce high grades within the deadlines, and in many cases this was not desirable because the mission had not changed significantly. They said that managers had to reduce occupied positions to meet average grade targets.

--Naval Underwater Systems Center officials said that average grade constraints had affected management's capability to employ some personnel of outstanding ability to meet the skill requirements of high-priority programs.

The need for highly-skilled professionals in an R&D activity tends to increase the activity's average grade level; average grade constraints create a difficult problem.

At all three Air Force REFLEX laboratories, average grade levels decreased. The ability to hire lower grade level technicians and indirect support personnel resulted in better use and support of scientific and engineering professional personnel.

ACQUIRING CAPITAL IMPROVEMENTS

A decision whether to do something in-house or by contract sometimes requires consideration of expenditures for capital improvements. The lead time often required for capital improvements adversely affects the increased management flexibility concept of Project REFLEX. Approval of military construction, including congressional approval, may take a year or more and, if approved, construction may take an additional year or more. By this time the urgency which generated the initial requirement may have dissipated. Leasing sometimes is an alternative, but this also requires considerable time for analysis and approval.

--The Army Electronics Command Laboratories' Night Vision Laboratory has requested approval in its military construction program to construct a three-story building adjacent to its current facility. In the interim the Laboratory has received approval to lease facilities several miles from its present location. Electronics Laboratories officials said that work on the night vision projects had not stopped but that the work could be conducted more efficiently at adjacent facilities.

--The Air Force has not requested any unusual investment in capital equipment at its REFLEX laboratories. The uncertainty of the future of Project REFLEX raises a serious question as to whether laboratories would be able to hire

people to operate the new equipment if personnel ceilings were reinstated.

--Under Project REFLEX the Flight Dynamics Laboratory hired employees to operate Air Force-owned equipment purchased before the project started. The Laboratory reported estimated savings totaling $600,000 in fiscal year 1972 by using Government employees instead of contractor employees.

CHAPTER 5

AGENCY EVALUATION OF PROJECT REFLEX AND FUTURE PLANS

Instructions for implementing Project REFLEX issued by DDR&E to the service Secretaries required a project appraisal that would involve:

--An appraisal of the reactions of the customers (project managers, systems commands, etc.) of the laboratories involved.

--An appraisal by a visiting committee of competent scientists, engineers, and technical managers.

--An appraisal by each laboratory director involved. Each would be expected to assess progress and independently evaluate the impact of the increased flexibility and responsibility.

--Supervisory appraisals. This would include an appraisal through the normal chain of command measured against goals and objectives.

A DOD REFLEX evaluation committee considered methods of evaluating laboratory effectiveness and, in particular, ways to measure changes in effectiveness attributable to REFLEX. The committee recognized that it would be difficult to develop a system or technique which would quantitatively and qualitatively measure project success.

In May 1973 the Committee on Federal Laboratories, Federal Council for Science and Technology, reported on "Performance Measures for Research and Development." The Committee concluded, in part, that:

> "An extensive survey of current attempts to evaluate performance of R&D and of the published literature has not revealed any procedure applicable to the wide variety of Federal R&D efforts."

* * * * *

"The generally recognized best procedure for evaluating research and development is one in which peer and other technical experts including management jointly judge the progress toward goals of ever increasing definition and mutual acceptablity."

The Deputy Director of Defense Research and Engineering told us that OSD had had little involvement since OSD wanted to give the services complete freedom in implementing and monitoring the project. He said that OSD had not evaluated the project's benefits. In November 1973 he told us that his office had analyzed reports prepared by the Army, Navy, and Air Force cited below but had not prepared a formal report on the total project.

ARMY

In December 1972 Headquarters, AMC, requested the directors of the four REFLEX laboratories to submit their personal assessment of the project as it had affected the operation of their laboratories, especially during the last year.

In evaluating operations under REFLEX, Electronics Command officials commented on the difficulty of measuring its impact on laboratory performance:

"It is not possible to isolate Project REFLEX from other on-going management actions at any point in time so as to determine with any degree of exactitude the impact of REFLEX on laboratories' performance. Laboratories differ, programs and missions differ, and the circumstances surrounding their operation change from year to year. REFLEX does not operate in a vacuum. There are too many variables which affect laboratory performance to pinpoint responsibility for changes in performance; and the evaluation process itself is far from precise. There must be consideration as to whether the laboratories meet the goals

expected of it; the extent to which its performance went beyond normal expectations, and whether it made reasonable progress in view of the obstacles and difficulties encountered in the R&D situation. These are judgments which are difficult to make over the relatively short period of time that REFLEX has been in effect. To the extent, however, that such judgments can be made, and can be considered meaningful, the individuals most qualified to evaluate the impact of Project REFLEX on laboratory performance are the Directors of the four REFLEX Laboratories."

In May 1973 AMC reported on an evaluation of the project at the four Army REFLEX laboratories. The report summarized assessment by the directors of project effectiveness and impact after 2 years of experience.

"The Director, Air Mobility Research and Development Laboratory (AMRDL) stated that 'the most important aspect of Project REFLEX...is the sense of responsibility which it places on all levels of management from the Director to the lowest level.'

"The Director of ECOM [Electronics Command] laboratories concludes his evaluation of the Demonstration Project with the statement that 'It has created a new philosophy of operation with emphasis on economy, efficiency, and return on investment for both short term and long term goals.'

"The Director, Harry Diamond Laboratories (HDL) considers that 'The major change throughout the organization has been to unite solidly manpower and fiscal planning.' He further states that 'All managers appeared to have greatly increased their view of the total operation, recognizing clearly that their success is directly related to how well they manage both dollars and manpower.'

"The Director, Mobility Equipment Research and Development Center (MERDC) agrees: 'Project REFLEX

has caused managers to be very conscious of the relation of output and expenses and has motivated an improved sense of management responsibility.'"

AMC observed that there had been concerns about what would happen under REFLEX:

"During the time REFLEX was being established, concern was expressed that several undesirable situations might occur:

"Escalation of in-house strength and related payroll costs without corresponding increase in workload.

"Increase in in-house staffing at the expense of contracts, i.e., a radical shift in the in-house/out-of-house ratio.

"Build-up thru the use of military personnel (who are not charged to project funds).

"None of these fears has materialized."

The report concluded:

"The Directors of the REFLEX Laboratories, without exception regard the Demonstration Project as an 'unqualified success.'

"REFLEX has encouraged the laboratories, through improved program planning and better integration of workload, funding, and manpower to respond more effectively to Army requirements.

"-REFLEX has made it possible for Laboratory Managers to respond more readily to changes or shifts in program emphasis through adjustments in the size and composition of the workforce.

"-REFLEX has resulted in increased cost-consciousness and cost savings.

"REFLEX has removed limitations which sometimes were used to excuse ineffective management.

"REFLEX significantly improved the general operating climate within the laboratories."

Future plans

In September 1972 the Army Chief of Research and Development authorized a test of the REFLEX management concept at RDT&E activities not included in the original experiment.

Army Materiel Command:
- Army Material and Mechanics Research Center
- Ballistic Research Laboratories
- Human Engineering Laboratories
- Natick Laboratories
- Directorate for Research, Development, and Engineering and Missile Systems Laboratory, Army Missile Command
- Mobility Systems Laboratory, Army Tank-Automotive Command
- Weapons Laboratory, Army Weapons Command
- Benet Research and Engineering Laboratory, Army Weapons Command

Office of the Chief of Engineers:
- Cold Regions Research and Engineering Laboratory
- Waterways Experiment Station
- Construction Engineering Research Laboratory
- Engineer Topographic Laboratories
- Army Research Institute for the Behavioral and Social Sciences

This test is to operate for 3 years beginning July 1, 1973, to provide sufficient time for initial adjustment and response. The objective is to further evaluate the feasibility of managing RDT&E activities with fiscal controls alone.

The Army test differs from the DOD experiment in that it

"* * * is designed to accommodate the possibility that the Army and its developing agencies, when viewed as organizational entities, may have to operate within numerical manpower ceilings or other constraints on civilian direct hire employment levels. Certain modifications in policy and procedures from those allowed under the DOD experiment are incorporated to handle these differences."

In February 1973 the Army Adjutant General announced "Extension of a Type Project (REFLEX) to Selected Army Installations." On the basis of experience under REFLEX, the Army proposes to test REFLEX concepts at two Continental Army Command installations-- Fort Polk, Louisiana, and Fort Lewis, Washington--and two AMC installations--Picatinny Arsenal, New Jersey, and Red River Army Depot, Texas.

The test objective is to determine if commanders can manage their resources the same as, or perhaps even more efficiently and effectively, when permitted to operate without various controls placed on them. The concept of the test is to give the commanders their funds and allow them use of the funds in the most efficient and effective manner.

In implementing this concept, the Comptroller of the Army intends to eliminate as many of the existing controls as legally permissible. Performance measurements will be used when possible so that the advantages or disadvantages of managing without civilian personnel ceilings and certain other personnel restrictions can be identified and quantified as precisely as possible.

NAVY

Navy officials have given much consideration to developing effective means of evaluating REFLEX. The Chief of Naval Material instructed the directors of the participating laboratories to implement the appraisal process outlined in the May 18, 1970, instructions issued by DDR&E. (See p. 8.)

Evaluation techniques were discussed at several conferences of the Director of Laboratory Programs, directors of the REFLEX laboratories, and consultants. Each laboratory submitted statistical and financial data but it was of little value in evaluating project effectiveness.

Each REFLEX laboratory technical director and advisory committees of scientists, engineers, and consultants prepared evaluations.

The Technical Director of the Naval Weapons Laboratory summarized his evaluation of operations under REFLEX after the first year as follows:

> "* * * Project REFLEX has had a significant impact by emphasizing the need for careful financial planning and resources management. Obviously REFLEX was not essential to the above actions, nor would reestablishment of administrative personnel ceilings totally negate the above processes. These things have been accomplished under Project REFLEX and it is a mute argument as to whether they could have been done without REFLEX. The fact remains that they have been done and REFLEX must share in the credit for this accomplishment whether we accept the thesis that it was the prime mover or not. REFLEX has been a significant factor in expediting and bringing about management improvement in the Laboratory and it is believed the same would be true in other activities. In addition, one may initially conclude that since no negative effect has resulted from the removal of the administrative ceilings, these ceilings have served no essential purpose other than political control."

When our review was completed, the Director of Laboratory Programs had not prepared a formal evaluation report on REFLEX. However, his staff had summarized the Navy's experience:

> "The inability to quantify the results of Project REFLEX, at least over a 2-1/2 year experience,

forces principal reliance on subjective evaluations. Navy experience * * * may be summarized as follows:

"a. REFLEX has enabled the local manager to better coordinate his civilian personnel resources with workload. This is a particularly valuable tool in an activity operating under the industrial fund system. In the case of the CNM [Chief of Naval Material] laboratories the management command assigns less than 10 percent of the laboratories' workload, yet controls their entire CIVPERS [civilian personnel] ceiling. Many anomalous situations arise which makes it difficult for the local manager to coordinate since personnel resources are controlled centrally whereas the workload planning is decentralized.

"b. Within REFLEX laboratories, a greater appreciation for planning and justifying the manpower resource is evident at all levels of management. Without REFLEX, the general practice is to take the centrally-assigned activity ceiling and break it down by departments, divisions, branches, etc. in pretty much pro rata fashion, since realistically, new or additional requirements cannot be accommodated at headquarters and the penalties are too severe for not being up to ceiling when the critical time arises for taking inventory. Under REFLEX a laboratory supervisor is not constrained to be at a certain predetermined number but can formulate his plans for people to match his budget and requirements. Lower echelons must carefully justify their requirements to top laboratory management who now hold the responsibility for determining the activity employment level.

"c. Prior to REFLEX it was not possible for the labs to obtain ceiling increases for programs which sponsors required and had funded for an increased level of effort. The problem required shifting some other work from a lab element to contract and then reassigning the relieved element

to support the increasing program. REFLEX allows manpower adjustments to accommodate such increases and allows the decisions to be made more on an economic basis rather than on a ceiling limitation basis.

"d. Project REFLEX allows the local managers to propose more new projects than the top management expects to have funded. In the past, each new proposal normally carried with it recommendations for corresponding reductions in existing work to provide the manpower to carry out the new program. Under this situation lab personnel were reluctant to propose new systems which might alienate the sponsors of certain ongoing programs. Under REFLEX it is unnecessary to consider which projects will be dropped until final funding decisions are made at top Navy level. After these decisions are made the labs have the choice of increasing the workload of the present workforce, of hiring new personnel or of dropping weaker programs."

A Director of Laboratory Programs official said that the Navy planned to make the following additional evaluations of REFLEX:

--Each REFLEX laboratory will be evaluated by a Navy committee of competent scientists, engineers, and technical managers.

--The technical director of each laboratory will be asked to submit appraisals on how REFLEX impacted the management of his laboratory.

Future plans

In summarizing the Navy's experience under REFLEX, the Director of Laboratory Programs observed that:

"From experience to date, operation of these R&D laboratories under the Navy Industrial Fund have proven to be feasible and effective. Our conclu-

sion is that the experiment should be broadened to all R&D laboratories."

AIR FORCE

In July 1972 Headquarters, AFSC, established a working group--that included representatives of the REFLEX laboratories--to consider criteria for, and determine the data that should be accumulated to assist in, evaluation of REFLEX effectiveness. In November 1972 the Deputy Chief of Staff for Development Plans established a steering group that included four other Air Force officials and two consultants to help evaluate the project.

Approaches used in gathering and analyzing data included:

--Subjective appraisals by the commanders of the REFLEX laboratories.

--Comparison of the REFLEX laboratories before and after 2-1/2 years of project experience.

--Comparison of the three REFLEX laboratories with three non-REFLEX laboratories and 48 DOD non-medical laboratories.

--Interviews with laboratory customers and with supporting agencies.

Although REFLEX laboratories furnished quantitative data to Headquarters, AFSC, the data was of little value in measuring changes in productivity and efficiency. AFSC summarized assessments made by laboratory officials in its April 1973 report on Project REFLEX:

"All current and former commanders of REFLEX laboratories have enthusiastically endorsed the flexibility provided by management under fiscal controls only. * * * Typical benefits obtained by the laboratories operating under Project REFLEX are summarized from their appraisals.

"1. Better able to respond to critical Air Force needs in a timely manner without significant impact upon other important ongoing programs.

"2. Permitted the establishment or strengthening of in-house technical competence and expertise in selected critical areas of long-term laboratory and Air Force needs.

"3. Provided the opportunity to accomplish selected technical programs in-house in preference to going on contract. Examples are cited to show significant cost savings, improved response, and in some cases a better end product as a result of his in-house work.

"4. Provided the flexibility to obtain sufficient support personnel (i.e. typists, clerks, logistic personnel) resulting in better utilization and support to professional personnel.

"5. Helped in the evolution of the role of the S&E [scientist and engineer] personnel from that of being primarily contract monitors to that of actively participating in and contributing to the research and development, as well as to more effectively evaluating and guiding the efforts of contractors.

"6. Better able to provide timely and effective support to laboratory customers without serious impact on long-term in-house and technology base programs.

"7. Better able to react to the frequent fluctuations in programs caused by changes in needs and priorities, and changes in higher headquarters direction.

"8. Improved the attitude and morale of laboratory personnel, increased the awareness of cost, and improved program management at all levels of laboratory management.

"9. Better able to adjust the composition and size of the work force to match the workload, funds and mission."

AFSC's report concluded:

"1. Significant progress in the REFLEX laboratories has been achieved in the resolution of the problems identified for the Air Force laboratories by the joint CSC [Civil Service Commission] DOD study and the DOD in-house laboratories (Glass) report. Conversely, these problems are still largely unsolved, and in some cases getting more severe, in the non-REFLEX laboratories.

"2. The management flexibility afforded by REFLEX has been enthusiastically endorsed by all the current and former commanders of the REFLEX laboratories.

"3. Major interruptions effectively reduced the original 3 year test period. This inhibited observation of the predicted level off of manpower growth as the laboratories achieved their desired posture.

"4. The period of observation to date has generally been one of correcting manpower deficiencies and of increasing workload and funding. Observation of the laboratories' reaction to a declining budget (as forecast for FY 74 and 75) should provide significant data for the evaluation.

"5. At the inception of the experiment resources management data systems such as JOCAS [Job Order Cost Accounting System] and MASIS [Management and Scientific Information System] were not available to the selected laboratories. These systems can enhance management under fiscal only controls by providing cost and manhour data.

"6. The limited source of military scientists and technicians, and the way they are assigned and

paid make it difficult to establish procedures that would not defeat the effectiveness of fiscal controls and also be fair to non-REFLEX organizations.

"7. Procedures relative to REFLEX laboratory funding were not developed to compensate for the exemption for command-wide reductions in force or for the salaries of added military personnel.

"8. An extension or expansion of Project REFLEX would enable the Director of Science and Technology and the associated laboratory commanders to apply the lessons learned to date and give a more comprehensive demonstration of what can be accomplished under fiscal only controls."

Future plans

In its April 1973 evaluation report on Project REFLEX, Headquarters, AFSC, recommended that the:

--Experiment be extended for 2 more years contingent upon the development of improved procedures and controls by the AFSC Director of Science and Technology.

--Extended experiment be limited to removal of manpower ceilings for civilian personnel only and additional military personnel be justified and procured through established procedures.

--AFSC Director of Science and Technology develop procedures to direct and control the evolution of the laboratories' structure and manning, that he require plans from each of the laboratories defining their needed capabilities and the manning to achieve them, and that he establish tolerance ranges for manpower-related parameters.

CHAPTER 6

LABORATORY MANAGEMENT

OUTSIDE DOD

Laboratories outside DOD where we inquired about management policies and practices all manage their activities with fiscal controls rather than a combination of fiscal and manpower controls. Pertinent policies and practices are discussed below.

ATOMIC ENERGY COMMISSION (AEC)

AEC's R&D is conducted through Government-owned, contractor-operated laboratories.

The initial AEC financial plans are issued at the beginning of each fiscal year and are consistent with the approved (or pending) congressional budget.

After the Congress approves the AEC appropriation, adjusted financial plans are prepared for each program area, each field office within the program area, and each contractor of the field offices. The funds made available to a laboratory provide the control over the resources to be used in carrying out its approved programs. Monthly reports prepared by each laboratory are compared with the program estimates in the adjusted financial plan, and actual and anticipated cost overruns or underruns are analyzed for control purposes.

Headquarters, AEC, does not assign personnel ceilings for the laboratories to its contractors. Laboratory personnel are employees of the contractors, not the Federal Government.

Officials at AEC's Brookhaven National Laboratory, a Government-owned laboratory operated by Associated Universities, Inc., a contractor, told us that the primary means of managing Brookhaven's activities was the same as that used under the Project REFLEX concept--fiscal controls rather than a combination of fiscal and manpower controls. Program priorities are

established through formal program reviews. Each department chairman prepares a 6-year forecast and presents it to the Laboratory Director. He reviews the forecasts and presents them to the contractor's Board of Trustees for review and approval. The approved forecasts are forwarded to the AEC program division directors to be used in formulating program plans.

A Brookhaven project is initiated by a scientist with an idea who discusses it with his department chairman. If the department chairman sees merit in the idea, he may give the scientist the go-ahead to discuss it informally with AEC officials. If AEC thinks it will be a beneficial project, the scientist is asked to prepare a proposal, showing a 3-year estimate of man-years, funds, and work to be accomplished and a list of individuals expected to work on the project, for submission to the department chairman. The budget officer adjusts the funding costs and man-years, if necessary, and sends the proposal to the cognizant Brookhaven associate director for final approval.

Requests for personnel at Brookhaven are initiated by the departments. They are issued by the first- or second-line supervisor and must be approved by the department chairman, the budget officer, and the cognizant associate director. After verifying all the information, the personnel manager handles the request for all personnel other than scientific staff appointments. The employment supervisor publicizes the open position and fills it with the best qualified person available. Employees at Brookhaven are given first opportunity at open positions. Requests for scientific staff are forwarded to the assistant director for scientific personnel who handles all recruiting and other actions for this class of employees.

When there is a major cutback in funding, Brookhaven generally phases out one or more projects completely rather than apply a percentage of the reduction to all projects. There is little problem in terminating employees whose projects have been eliminated. Scientific personnel (those having a bachelor's degree, or equivalent, and above) can be

separated in 6 months or less, depending on their appointments. Although efforts are made to reassign them, there are no contractual agreements for continued employment.

Nonscientific personnel--e.g., technical administrative employees--can be separated quite rapidly. Separation action is started by the immediate supervisor of the employee and approved by the department chairman. If the separation is approved by the employment supervisor, nonscientific weekly employees in past reductions have been given 2 weeks' notice and nonscientific monthly employees have been given 1 month's notice. The separation pay is based on length of service with a minimum of 1 week's pay and a maximum of 12 weeks' pay. There is a contractual obligation with a union to call back in the order of seniority those personnel laid off if jobs of their classification reopen within 1 year.

AEC officials indicated that use of both financial plan (dollar) ceilings and personnel ceilings results in some duplications, is sometimes inconsistent, and accordingly is more difficult to manage. However, in isolated cases individual field offices many use personnel ceilings in program direction or otherwise manage contract activities.

GENERAL ELECTRIC SPACE DIVISION,
VALLEY FORGE, PENNSYLVANIA

The Space Division has an R&D operational plan which includes goals, objectives, and resources planning for a designated period, such as a year. The Division is not subject to personnel ceilings. It does, however, have a manpower plan, a forecast for a year. To exceed the plan requires showing that increased sales will support hiring additional employees.

The R&D budget begins with the technical staff which prepares the project support. The project proposals from all operations are put together as they proceed up the management chain, and the Division

Manager decides how available discretionary funds will be spread among the operations. As R&D proceeds within the overall plan during the period, budget cuts, priority revisions, and trade-offs are made as required.

If it is necessary to separate employees during times of decreasing budgets, the company policy of paying termination benefits equal to 1 week's pay for each year of service is considered a constraint. The Division must keep a minimum of technical skills in-house, and before any employee is separated a determination is made as to which employees can be used productively on other work and which will be separated. Division officials contrasted this process with the Government's policy which permits "bumping" and release of employees with the least service or other retention rights regardless of technical ability.

HUGHES AIRCRAFT COMPANY RESEARCH LABORATORIES, MALIBU, CALIFORNIA

R&D projects are selected to support current or ongoing business and areas planned for development by the company. New projects are started only if it appears that there is potential for payoff. Each project is reported on and reviewed quarterly, and the direction of effort and funding are reassessed.

At one time Hughes used personnel ceilings but discontinued them. When ceilings were used the staff tended to become unbalanced with too many professional employees and too few support employees. Also laboratories' ability to move employees as projects and products evolved was constrained.

When work force reductions are necessary, the laboratories' policy is to separate the least productive employees regardless of age, but officials believe they should be somewhat humane in the treatment of older employees.

INTERNATIONAL BUSINESS MACHINES (IBM),
FEDERAL SYSTEMS DIVISION,
ELECTRONICS SYSTEMS CENTER,
HUNTSVILLE, ALABAMA

The Center--one of three in the Federal Systems Division--annually prepares a detailed plan explaining each project to be continued or initiated and an accompanying financial plan. The plan for each project includes estimates of cost and man-years.

No constraints are imposed on the project manager as to the number of people needed to complete a project. Additional personnel may be obtained from other IBM units in Huntsville, other centers, or the Division or outside IBM. The control is by funds, not numbers of employees.

In periods of decline, employees are assigned to other projects, centers, or divisions. As a last resort they are separated. Conversely, during periods of increased budgets, employment is increased slowly.

LOCKHEED AIRCRAFT CORPORATION,
RYE CANYON RESEARCH CENTER,
SAUGUS, CALIFORNIA

Lockheed tries to anticipate the market as far ahead as possible and selects a spectrum of the market on which it focuses its R&D. Lockheed tries to connect its research today with products tomorrow.

Lockheed uses a project manager concept--positions by project. It tracks labor costs by actual labor rates and forecasts using average labor rates. Each project has objectives--time and dollars--which essentially form a contract with management. Management holds that personnel ceilings are not needed. According to officials, fiscal controls indirectly create employment ceilings.

The professional staff is reduced by procedures similar to civil service RIF procedures with two important exceptions: (1) separation can be completed

in 2 weeks and (2) performance and seniority are weighted equally in determining which employees are to be retained.

THE RAND CORPORATION,
SANTA MONICA, CALIFORNIA

Rand initiates projects, primarily basic research, at the request or order of customers to meet specific goals, but it also undertakes self-initiated projects in areas which management believes are worth pursuing. Rand's contracts with its customers generally are on a "best effort" basis, and projects are evaluated by various management levels and by customers to determine the value of the research or the need for redirection of effort.

Rand does not consider personnel ceilings feasible. Employment levels are controlled by the availability of funds and skills. Department heads hire employees as needed, and top management acts only if the number of employees seems to be out of line with projected work.

In periods of decline, efforts are made to reduce employment levels through attrition. When RIFs are necessary, the least needed employees are separated. Seniority is not a major consideration.

STANFORD RESEARCH INSTITUTE,
HUNTSVILLE, ALABAMA

Stanford Research conducts projects in basic research and in evaluating test plans. Employment levels are controlled through available funds and workload. Personnel ceilings are not used.

Stanford tries to maintain a stable work force. When R&D budgets increase, care is exercised to hire only the number of employees that can be used over an extended period. When budgets decrease, contract effort is reduced first and employees are separated as a last resort.

CHAPTER 7

CONCLUSIONS, AGENCY COMMENTS, AND RECOMMENDATIONS

CONCLUSIONS

The purpose of Project REFLEX was to test the concept of using fiscal controls instead of combined fiscal and manpower controls to manage in-house RDT&E organizations. The intent was to increase the management flexibility of the laboratory directors and observe how they responded to the increased flexibility and corresponding responsibility.

AEC's Government-owned, contractor-operated laboratory and the six laboratories in the private sector which we visited conduct their operations with fiscal controls. None operates under personnel ceilings. Officials of several of the laboratories said, in essence, that, if R&D is to be accomplished economically, effectively, and efficiently, it is essential that the laboratories have responsible, dedicated, and involved management with substantial control over available resources.

By letter of March 19, 1973, the Secretary of Defense agreed that the concept of managing civilian personnel resources with fiscal controls rather than personnel ceilings holds promise as an effective mechanism for controlling DOD's personnel strengths without unduly limiting the freedom of operating officials to carry out their programs. A test of alternative controls on civilian employment within the Defense components without specific ceilings, started in March 1971, was interrupted from January to June 1972 when employment was sharply reduced. The test was reinstated in July 1972.

Although instructions for implementing Project REFLEX provided for removing personnel ceilings, REFLEX laboratory managers operated under some constraints during the test period. Hiring freezes were imposed at times, and in some cases ceilings were only partially lifted. Government-wide programs for reducing employ-

ment levels and average grade levels affected the laboratories. Regulations and guidelines of the Civil Service Commission and the agencies limited the laboratories' ability to hire or separate employees.

Extensive efforts have been made to develop quantitative and qualitative techniques to measure project success. When our review was completed, OSD and Army, Navy, and Air Force officials concerned with making the evaluation had not developed a system that produced meaningful quantitative data. We analyzed a substantial amount of statistical data but found it to be of little value in evaluating the project.

All REFLEX laboratory managers agreed that the project had been successful. They said that personnel management had improved and that they could more prudently control manpower resources. Fears were voiced before project implementation that elimination of manpower ceilings would result in irresponsible action by REFLEX managers. This has not materialized.

REFLEX laboratory managers concede that some economies and other benefits attributed to REFLEX probably could have been achieved through good management practices without REFLEX. However, they point to an environment, created by encouraging flexibility, which permits management to meet rapid change.

Even though constraints were not removed entirely, an evaluation of Project REFLEX in operating the test laboratories indicated that a number of benefits had been realized. Managing with fiscal controls and without personnel ceilings helped operations.

--Planning for and matching funds, workload, and manpower improved.

--Delegation of responsibility and authority to lower management levels was encouraged.

--Management was provided with more options for determining the manpower sources to be used; i.e., direct-hire or contracting.

--Management's capability for advancing new technology in-house improved, and more effective technical direction was given to contractors.

--High-level management was relieved of costly and time-consuming administration associated with personnel ceilings.

--Management was allowed the flexibility of acquiring employees with the appropriate skills and levels of experience and organizing them in balanced working groups to increase efficiency and productivity.

AGENCY COMMENTS

By letter of December 11, 1973 (see app. I), the Director, OMB, said that:

"* * * The OMB agrees with the general objective of the test, namely, to improve management by allowing more flexible correlation of workload, funds and manpower.

* * * * *

"It should be noted * * * that the present ceiling control system is such that agency heads have wide latitude in which to maneuver, i.e., employment ceilings are assigned to each agency as a whole, and the agency head may re-allocate--intra-agency--as he sees fit. As a result, all agency heads already have the flexibility to further test the REFLEX concept.

"The OMB believes that the REFLEX concept appears to merit further testing, and that, on the basis of its experience with the concept, the DOD is the logical agency to conduct such testing. However, objective measures of productivity should be developed before additional experimentation is conducted. It would further seem appropriate, in view of recent delegations of authority to the General Services Administration, to ask the GSA to

work in concert with DOD to determine whether or not objective measures of productivity can be developed for the concept."

Even in the laboratory environment, for which effective productivity measurements have not yet been devised, the test of entrusting local managers with authority and responsibility for conducting their operations with fiscal controls improved management. We concur with the recommendations of officials concerned with laboratory operations in DOD and the Army, Navy, and Air Force that the project be continued in the REFLEX laboratories. Officials in the Office of DDR&E told us in May 1974 that the project has not been terminated. OSD has not given specific authorization and guidance pending completion of studies on laboratory utilization which include operations under Project REFLEX.

We believe that the test of management through fiscal controls should be extended to other Federal laboratories and to other DOD and civil agency activities,particularly activities in which productivity measurements have been or can be developed. A list of 45 agencies with 187 organizational elements that could develop reliable output-input data was given in the June 1973 report on "Measuring and Enhancing Productivity in the Federal Government" issued by the Joint Project Team of OMB, the Civil Service Commission, and GAO.

In REFLEX there has been little coordination since the initial planning and authorization, and implementation of the project has not been monitored centrally on a continuing basis. Further testing of management through fiscal controls should be made under common criteria and guidelines to provide a basis for identifying and comparing actions taken and results experienced by the participating activities.

Although agencies may have the flexibility to test the REFLEX concept, we believe that OMB should develop and furnish agencies with common criteria and guidelines for testing management through fiscal controls, encourage agencies to make the test, and monitor actions taken and results experienced. OMB continues to be the focal point

of the Government for policy leadership in respect to overall management improvement although functions relating to management procedures, measurement systems, facilities, and equipment were transferred to the General Services Administration in May 1973.

By letter of November 7, 1973 (see app. II), DDR&E said that DOD (1) concurred in the report and endorsed the recommendations and (2) was reviewing its total experience with REFLEX to establish the specifics of future use.

RECOMMENDATIONS

We recommend that the Director, OMB, delegating responsibilities to the Administrator of General Services, as appropriate:

--Develop and furnish agencies with common criteria and guidelines for implementing the test of managing through fiscal controls. These might include:

1. Financial operating budgets.

2. Operating plans integrated with operating budgets.

3. Constraints to be removed and constraints to remain in effect.

4. Criteria for allocation of costs.

5. Suggestions for delegation of decisionmaking authority and associated responsibilities.

6. Instructions for documenting actions taken and results experienced.

7. Techniques for evaluating performance against plans.

--Encourage agencies to test the use of fiscal controls to manage operations, particularly agencies in which productivity measurements have been or can be developed.

--Monitor actions taken and results experienced by the agencies.

We recommend that the Secretary of Defense specifically authorize continuation of Project REFLEX in Army, Navy, and Air Force laboratories for the purpose of developing and applying criteria and guidelines similar to those suggested above.

CHAPTER 8

SCOPE OF REVIEW

Our review focused primarily at the RDT&E laboratory level, with additional inquiries made at the Office of the Director of Defense Research and Engineering; the Headquarters of the Army Materiel Command and Air Force Systems Command; the Office of the Director of Laboratory Programs, Navy; and the Navy Office of Civilian Manpower Management. We also dicussed the project concept and personnel ceilings with OMB officials.

The following laboratories were visited or contacted.

REFLEX Laboratories:

- Army Electronics Command Laboratories, Fort Monmouth, New Jersey
- Army Harry Diamond Laboratories, Washington, D.C.
- Army Mobility Equipment Research and Development Center, Fort Belvoir, Virginia
- Army Air Mobility Research and Development Laboratory, Moffett Field, California
- Naval Undersea Center, California
- Naval Underwater Systems Center, Rhode Island
- Naval Weapons Laboratory, Virginia
- Air Force Armament Laboratory, Eglin Air Force Base, Florida
- Air Force Avionics Laboratory, Wright-Patterson Air Force Base, Ohio
- Air Force Flight Dynamics Laboratory, Wright-Patterson Air Force Base, Ohio

Non-REFLEX Laboratories:

- Army Natick Laboratories, Natick, Massachusetts
- Army Ballistics Research Laboratories, Aberdeen Proving Ground, Maryland
- Naval Electronics Laboratory Center, California
- Naval Ship Research and Development Center, Maryland
- Air Force Aero Propulsion Laboratory, Wright-Patterson Air Force Base, Ohio

Air Force Materials Laboratory, Wright-Patterson Air Force Base, Ohio
Air Force Cambridge Research Laboratories, Hanscom Field, Massachusetts
Rome Air Development Center, Griffiss Air Force Base, New York

Our review included:

--Examining and analyzing implementing instructions and criteria, reports, files, evaluations, and other data.

--Meeting with principal officials at DOD and at the Headquarters of the Army, Navy, and Air Force responsible for RDT&E.

--Interviewing laboratory directors, branch chiefs, managers, and other knowledgeable persons associated with the laboratory programs.

--Visiting AEC; its Government-owned, contractor-operated Brookhaven National Laboratory; and the following R&D laboratories in the private sector to discuss the policies and practices used to manage their activities:

General Electric Space Division, Valley Forge, Pennsylvania
Hughes Aircraft Company Research Laboratories, Malibu, California
International Business Machines, Federal Systems Division, Electronics System Center, Huntsville, Alabama
Lockheed Aircraft Corporation, Rye Canyon Research Center, Saugus, California
The Rand Corporation, Santa Monica, California
Stanford Research Institute, Huntsville, Alabama

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

DEC 11 1973

Honorable Elmer B. Staats
Comptroller General of the United States
General Accounting Office
Washington, D.C. 20548

Attention: Mr. Forrest R. Browne, Director
Federal Personnel and Compensation Division

Dear Mr. Staats:

We have reviewed the draft report prepared by your office entitled "Project REFLEX (Resource Flexibility)--a Demonstration Project on Reconciliation of Workload, Funds, and Manpower" (Code 960024).

In general, the report recapitulates the experience of the Department of Defense in its conduct of Project REFLEX. REFLEX was a demonstration project which called for a sample of DoD laboratories to operate without the constraints of manpower ceilings, providing management with the flexibility to adjust personnel levels in response only to fiscal resource constraints. The draft report sees considerable potential for improved manpower management in the REFLEX experiment, though manpower ceilings were at times imposed on the laboratories during its course, and though no objective standards of measurement were developed for use in the project. The report then goes on to recommend that OMB select agencies for further testing of the concept, providing these agencies criteria and guidelines for implementation and control.

The general aim of the recommendations is to establish a broader range of agencies tested, to control the conditions of the test, and to establish productivity measures while using fiscal controls. The OMB agrees with the general objective of the test, namely, to improve management by allowing more flexible correlation of workload, funds and manpower. The managers of those government laboratories which participated in Project REFLEX endorsed the concept, despite having had manpower controls of one kind or another placed on them during the test period. At the same time, the draft report notes that the DoD REFLEX Evaluation Committee "recognized that it would be difficult to develop a system or technique which would qualitatively and quantitatively measure the success or failure of the Project."

It appears this aspect of the REFLEX concept needs additional examination.

OMB commented on the general utility of employment ceilings in its letter of October 1, 1973, with reference to GAO draft report "Implementation and Impact of Reductions of Civilian Employment, Fiscal Year 1972" (Code 960005):

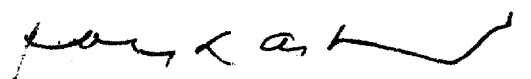
> ". . . Certainly, the merits and demerits of employment ceilings have been debated for years. The fact is, however, that the public, the Congress, and every President in recent memory have been favorably disposed toward them. There has been, and continues to be, an avid interest in reducing the number of Federal civilian employees, particularly in this and the preceding Administration. And, as is noted above, it is a fact that, occasionally, circumstances require employment ceilings to be established on very short notice. Under these circumstances, we must put major emphasis on effective agency personnel management systems to administer the ceilings within agencies."

With reference to Project REFLEX, that comment is equally valid today.

It should be noted, in addition, that the present ceiling control system is such that agency heads have wide latitude in which to maneuver, i.e., employment ceilings are assigned to each agency as a whole, and the agency head may re-allocate--intra-agency--as he sees fit. As a result, all agency heads already have the flexibility to further test the REFLEX concept.

The OMB believes that the REFLEX concept appears to merit further testing, and that, on the basis of its experience with the concept, the DOD is the logical agency to conduct such testing. However, objective measures of productivity should be developed before additional experimentation is conducted. It would further seem appropriate, in view of recent delegations of authority to the General Services Administration, to ask the GSA to work in concert with DOD to determine whether or not objective measures of productivity can be developed for the concept.

Sincerely,



Roy L. Ash
Director

DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, D. C. 20301

7 NOV 1973

Mr. Forrest R. Browne
Director, Federal Personnel
and Compensation Division
United States General Accounting Office
Washington, D. C. 20548

Dear Mr. Browne:

Your draft report on Project REFLEX, addressed to the Secretary of Defense, dated August 23, 1973, has been reviewed by the Military Departments and the Office of the Secretary of Defense (OSD). The observations expressed in your report are consistent with those encountered during the initial three-year demonstration and with the overview evaluations conducted by each Military Department and the OSD. We concur in the report and endorse the recommendations. We are currently reviewing our total experience with REFLEX to establish the specifics of future utilization.

Your report recognizes the benefits which were achieved in laboratory management through the use of fiscal controls without personnel ceilings. On the other hand, it also notes the lack of an evaluation system which is capable of producing quantitative measurement of the success or failure of the Project. Nevertheless, the concept is judged to have considerable merit--sufficient in the eyes of the GAO for additional testing, under a framework which will provide a better means of evaluation, both within the Department of Defense and in other sectors of the Federal Government. Although perhaps conservative in view of the enthusiasm expressed by the laboratory directors involved in the project, the GAO has produced a well-reasoned report.

Minor editorial suggestions are attached.

Sincerely,

Malcolm R. Currie

Attachment
As stated

PRINCIPAL OFFICIALS

RESPONSIBLE FOR ADMINISTERING ACTIVITIES

DISCUSSED IN THIS REPORT

	Tenure of office	
	From	To
DEPARTMENT OF DEFENSE		
SECRETARY OF DEFENSE:		
Dr. James R. Schlesinger	June 1973	Present
Vacant	May 1973	June 1973
Elliot L. Richardson	Jan. 1973	May 1973
Melvin R. Laird	Jan. 1969	Jan. 1973
DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING:		
Dr. Malcolm R. Currie	June 1973	Present
Dr. John S. Foster, Jr.	Oct. 1965	June 1973
ASSISTANT SECRETARY OF DEFENSE (MANPOWER AND RESERVE AFFAIRS):		
William K. Brehm	Sept. 1973	Present
Carl W. Clewlow (acting)	June 1973	Sept. 1973
Roger T. Kelly	Feb. 1969	June 1973
DEPARTMENT OF THE ARMY		
SECRETARY OF THE ARMY:		
Howard H. Callaway	May 1973	Present
Robert F. Froehlke	July 1971	May 1973
Stanley R. Resor	July 1965	June 1971
ASSISTANT SECRETARY OF THE ARMY (MANPOWER AND RESERVE AFFAIRS):		
Carl S. Wallace	Mar. 1973	Present
Hadlai A. Hull	May 1971	Mar. 1973

	Tenure of office	
	From	To
DEPARTMENT OF THE ARMY (continued)		
Donald W. Srull (acting)	Dec. 1970	May 1971
William K. Brehm	Apr. 1968	Dec. 1970
DEPARTMENT OF THE NAVY		
J. William Middendorf (acting)	Apr. 1974	Present
John W. Warner	May 1972	Apr. 1974
ASSISTANT SECRETARY OF THE NAVY (MANPOWER AND RESERVE AFFAIRS):		
Joseph T. McCullen (acting)	Aug. 1973	Present
James E. Johnson	June 1971	Aug. 1973
James D. Hittle	Mar. 1969	Mar. 1971
DEPARTMENT OF THE AIR FORCE		
SECRETARY OF THE AIR FORCE:		
John McLucas	July 1973	Present
Robert C. Seamans, Jr.	Jan. 1969	July 1973
ASSISTANT SECRETARY OF THE AIR FORCE (MANPOWER AND RESERVE AFFAIRS):		
James P. Goode	June 1973	Present
Richard J. Borda	Oct. 1970	June 1973
James P. Goode (acting)	Apr. 1970	Oct. 1970
Dr. Curtis W. Tarr	June 1969	Apr. 1970
J. William Doolittle	Apr. 1968	May 1969

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