Audit Report

OFFICE OF THE INSPECTOR GENERAL

ADVANCED MATERIALS AND ELECTRONIC DEVICES RESEARCH, DEVELOPMENT, TEST, AND EVALUATION LABORATORIES WITHIN DOD

Report No. 95-069 December 30, 1994

Department of Defense

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Acronyms

ARL	Army Research Laboratory
ARPA	Advanced Research Projects Agency
BMDO	Ballistic Missile Defense Organization
BRAC	Base Realignment and Closure Commission
DDR&E	Director, Defense Research and Engineering
DMRD	Defense Management Review Decision
DSB	Defense Science Board
FFRDC	Federally Funded Research and Development Center
GAO	General Accounting Office
IG	Inspector General
JDL	Joint Directors of Laboratories
JSPP	Joint Services Program Plan
RDEC	Research, Development, and Engineering Center
RDT&E	Research, Development, Test and Evaluation
SDIO	Strategic Defense Initiative Organization
USD(A)	Under Secretary of Defense for Acquisition
USD(A&T)	Under Secretary of Defense for Acquisition and Technology
S&T	Science and Technology

INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
400 ARMY NAVY DRIVE
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December 30, 1994

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION AND TECHNOLOGY
DIRECTOR, DEFENSE RESEARCH AND ENGINEERING
ASSISTANT SECRETARY OF THE NAVY (FINANCIAL MANAGEMENT)
ASSISTANT SECRETARY OF THE AIR FORCE (FINANCIAL MANAGEMENT AND COMPTROLLER)
AUDITOR GENERAL, DEPARTMENT OF THE ARMY

SUBJECT: Audit Report on Advanced Materials and Electronic Devices Laboratories Within DoD (Report No. 95-069)

We are providing this final report for your information and use. Comments on the draft report were considered in preparing this final report and are included in Part IV, Management Comments.

The Director, Defense Research and Engineering's comments to the draft report were responsive; however, we request that an estimated completion date be provided for Recommendation B.2. Also, we request the Under Secretary of Defense for Acquisition and Technology to address the feasibility of additional resources for the Director, Defense Research and Engineering. In accordance with DoD Directive 7650.3, we request that the Under Secretary provide comments by February 28, 1995.

The courtesies extended to the audit staff are appreciated. If you have questions on the audit, please contact Mr. Raymond A. Spencer, Program Director, at (703) 604-9071 (DSN 664-9071) or Mr. David F. Vincent, Project Manager, at (703) 604-9058 (DSN 664-9058). Appendix M lists the distribution of this report.

Robert J. Lieberman
Assistant Inspector General
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Office of the Inspector General, DoD

Report No. 95-069 **December 30, 1994**
Project No. 3AB-0058

ADVANCED MATERIALS AND ELECTRONIC DEVICES RESEARCH, DEVELOPMENT, TEST, AND EVALUATION LABORATORIES WITHIN DOD

EXECUTIVE SUMMARY

Introduction. The Director, Defense Research and Engineering (DDR&E), has primary responsibility for implementing the Department of Defense Science and Technology program. The DDR&E exercises authority, direction, and control over the Advanced Research Projects Agency and all laboratories and research, development, and engineering centers operated by the Military Departments or other DoD Components.

Objectives. The overall audit objective was to determine whether DoD was making redundant investments in Advanced Materials and Microelectronics Research and Development Laboratories. Specific objectives included evaluating the adequacy of DoD management and oversight of the various laboratories and the effectiveness of Project Reliance as implemented by the Joint Directors of Laboratories. We also evaluated laboratory consolidations and realignments to verify cost avoidance claimed by Project Reliance in response to Defense Management Review Decision 922 initiatives.

Audit Results. The DDR&E lacked the resources to provide adequate policy guidance and oversight of the Military Department laboratories and the Advanced Research Projects Agency. At the conclusion of our audit, DDR&E was in the process of issuing science and technology programing guidance, but more needs to be done (Finding A). The Department of Defense is making redundant investments in laboratory facilities and equipment, as well as research projects (Finding B). Project Reliance as implemented by the Joint Directors of Laboratories has resulted in minimal savings and few consolidations of laboratory facilities (Finding C).

Internal Controls. Internal controls were not effective for monitoring DoD science and technology funds. Internal controls were also ineffective in establishing the need for new facilities and equipment for DoD laboratories and for controlling and monitoring Joint Services Program Planning. All recommendations cited in this report, if implemented, will correct these material weaknesses. Additional details are provided in Part II of this report.

Potential Benefits of Audit. We made recommendations to strengthen internal controls. Improved internal control measures will reduce redundant investments in laboratories and laboratory equipment and avoid overlapping research projects. In addition, more of the benefits projected for Project Reliance would be achievable. Appendix K summarizes the potential benefits of this audit.

Summary of Recommendations. We recommended that the Under Secretary of Defense for Acquisition and Technology authorize adequate resources for DDR&E to provide DoD-level management and oversight of the science and technology program. We also recommended that the DDR&E be directed to review all proposed Military

Construction projects for laboratories and all proposed research equipment procurements with a cost threshold of more than $250,000. In addition, we recommended that the DDR&E be directed to act as chair and final arbiter of the Project Reliance joint Services planning process and that DDR&E be directed to establish project planning control measures.

Management Comments. The Director, Defense Research and Engineering, concurred with all recommendations in the draft report except for the second recommendation of Finding B, where we recommended that all proposed research equipment procurements costing more than $250,000 be submitted to the DDR&E for coordination and approval. The Director believed the recommendation was impractical because of the administrative burden it would impose on the DDR&E. She also said it is counter to the DDR&E objective of empowering laboratory directors. Rather, she would employ a redefined Reliance process to eliminate overlap.

Although not required, the Director, Advanced Research Projects Agency (ARPA), and the Director, Ballistic Missile Defense Organization (BMDO), provided comments on a draft of this report. They both nonconcurred with recommendations that would impact ARPA and BMDO operations. The Directors of ARPA and BMDO both maintained that the Services are involved in planning joint programs and there is substantial coordination between them and the Services in developing an investment strategy. Although these processes have not been formal or institutionalized, substantial interaction takes place with executing agents in the Services.

Audit Response. We consider the comments from the Director, Defense Research and Engineering, including the alternative to Recommendations B.2, to be responsive. However, in response to the final report, Under Secretary of Defense for Acquisition and Technology needs to comment on plans to provide resources to DDR&E.

In FY 1993, ARPA and BMDO combined were funded at $2.7 billion. The magnitude of this investment requires a strategy and formalized planning that is coordinated across the DoD. We do not believe that merely using the Services as contracting agents or undertaking joint research projects with the Services satisfies the need for the planning and coordination of science and technology investments. We believe it is inappropriate to rely on informal communications between scientific and technical personnel as the means to coordinate and plan a $2.7 billion annual investment in science and technology.

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Part I - Introduction

Background

Acting under the authority, direction, and control of the Under Secretary of Defense for Acquisition and Technology (USD[A&T]), the Director, Defense Research and Engineering (DDR&E), has primary responsibility for implementing the Department of Defense Science and Technology program. The DDR&E is the principal staff assistant and advisor to the USD(A&T) for DoD scientific and technical matters, basic and applied research, and the development of weapon systems other than Command, Control, Communications, and Intelligence weapon systems. The DDR&E exercises authority, direction, and control over the Advanced Research Projects Agency and all laboratories and research, development, and engineering centers operated by the Military Departments and other DoD Components. As of October 14, 1993, the Deputy Under Secretary of Defense for Advanced Technology was delegated authority for all activities supported by Advanced Development (budget category 6.3A and 6.3B) funds.

The Advanced Research Projects Agency (ARPA) has the mission of guarding against unforeseen technological advances by potential adversaries and maintaining U.S. technological superiority. ARPA accomplishes this mission by funding imaginative and innovative high-risk research ideas offering the potential for technological impact beyond normal developmental approaches. Some of these research ideas become projects and demonstrate technical feasibility by the development of prototype systems.

The Military Departments and the Defense Nuclear Agency operate approximately 56 distinct laboratories and research, development, and engineering centers. The mission of these laboratories and research, development, and engineering centers is to maintain technological superiority over potential adversaries. They also provide technical expertise to the Military Departments to educate them as buyers and users of new and improved weapon systems and support capabilities.

In October 1989, the Deputy Secretary of Defense issued a draft Defense Management Review Decision (DRMD) initiative to increase efficiency in the Research, Development, Test and Evaluation (RDT&E) activities of the Military Departments. Defense Management Review Decision 922 originally proposed that the Under Secretary of Defense for Acquisition (USD[A]) (renamed Under Secretary of Defense for Acquisition and Technology in May 1993) develop a comprehensive management plan to control the efforts of the Military Departments to increase efficiency and reduce the cost of the Department's RDT&E operations. Two primary alternatives emerged from meetings among the Deputy Secretary of Defense; the Under Secretary of Defense for Acquisition; the Director, Defense Research and Engineering; and the Military Departments' Science and Technology executives. The first alternative, eventually accepted, was termed Project Reliance. The second alternative, eventually rejected, would have created a Defense Science, Engineering and Test Agency.

Project Reliance was tasked to enhance the quality of Defense Science and Technology activities; ensure the existence of a critical mass of resources that will develop "world class products"; reduce redundant science and technology capabilities and eliminate unwarranted duplication; gain productivity efficiency through collocation and consolidation of in-house science and technology work, when appropriate; and preserve the mission-essential capabilities of the Military Departments through the process.

The Joint Directors of Laboratories (JDL) manage the Project Reliance implementation process. The JDL technology panels are responsible for developing the Joint Services Program Plan detailing the formal planning agreements for the individual tri-Service technology programs.

Objectives

Our overall audit objective was to determine whether redundant investment was being made by DoD in Advanced Materials and Electronic Devices Research and Development Laboratories. Specific objectives included an evaluation of the adequacy of DoD management and oversight of those laboratories and an evaluation of the effectiveness of Project Reliance as implemented by the Joint Directors of Laboratories. We also evaluated laboratory consolidations and realignments to verify cost avoidance claimed by Project Reliance in response to DMRD 922 initiatives.

Scope and Methodology

This economy and efficiency audit was conducted in accordance with standards issued by the Comptroller General of the United States as implemented by the Inspector General, Department of Defense, and accordingly included such tests of internal controls as were deemed necessary. The audit was performed from May 10, 1993, through May 9, 1994. We limited the scope of the audit to Advanced Materials and Electronic Devices (Microelectronics) Research and Development Laboratories. The Director, Defense Research and Engineering, provided technical assistance by assigning Staff Specialists for Materials and Structures and Microelectronics (Electronic Devices) to assist the audit team in analyzing research and development program documentation and evaluating facilities and laboratory equipment.

We analyzed research and development program documentation and other relevant information for the most recent 3-year period. We also evaluated Project Reliance implementation agreements among the Military Departments for evidence of cooperation, collocation, or Military Department leads in the

specified technology areas and to verify cost avoidance claimed by Project Reliance in response to DMRD 922 initiatives. Computer-processed data was not used in these analyses. Appendix L lists organizations we visited or contacted.

Internal Controls

We evaluated internal controls for monitoring DoD technology funds and for evaluating new facilities and equipment for DoD laboratories. We also evaluated internal controls for controlling and monitoring Joint Services Program Planning. The audit identified material internal control weaknesses as defined by DoD Directive 5010.38, "Internal Management Control Program," April 14, 1987.

We also reviewed the portion of the Internal Management Control Program (IMCP) applicable to the assigned responsibilities, functions, relationships, and authorities of the DDR&E. The Program failed to prevent or detect the internal control weaknesses because the IMCP risk assessment was made only from the perspective of DDR&E direct fund expenditures, rather than relating the IMCP to DDR&E responsibilities, functions, relationships, and authorities.

Accordingly, controls were not effective for monitoring DoD science and technology funds. Controls were also not effective in determining the need for new facilities and equipment for DoD laboratories and for controlling and monitoring Joint Services Program Planning. All recommendations cited in this report, if implemented, will correct these weaknesses. Potential monetary benefits to be realized from implementing those recommendations were not quantifiable. A copy of our final report will be provided to the senior official responsible for internal controls within the Office of the Secretary of Defense and the Military Departments.

Prior Audits and Other Reviews

The General Accounting Office (GAO) completed two reviews related to the consolidation of DoD laboratories. The Inspector General, DoD, has issued two audit reports on base closures and realignments within the Naval Surface Warfare Center and two audit reports concerning new construction for Army and Navy advanced materials laboratories and new construction of an Army microelectronics laboratory. The Army Audit Agency has also issued two audit reports regarding laboratory construction costs and a review of DMRD 922. A detailed discussion of these prior reviews is in Appendix A.

Other Matters of Interest

On May 3, 1988, the Secretary of Defense chartered the Base Realignment and Closure Commission to recommend military installations for realignment and closure. The Commission recommended 59 realignments and 86 base closures using cost estimates provided by the Military Departments. Subsequently, Public Law 100-526, "Defense Authorization Amendments and Base Closure and Realignment Act," October 24, 1988, enacted the Commission's recommendations. Public Law 100-526 also established the DoD Base Closure Account to fund any necessary facility renovation or Military Construction projects related to the realignments and closures.

Section 2902 of Public Law 101-510, "Defense Base Closure and Realignment Act of 1990," November 5, 1990, re-established the Commission and chartered it to meet during calendar years 1991, 1993, and 1995. To ensure that the process for realigning and closing military installations was timely and independent, Public Law 101-510, Section 2904, stipulated that realignment and closure actions must be completed within 6 years after the President transmits the recommendations to Congress. The 1991 Commission recommended that an additional 34 bases be closed and 48 bases be realigned.

Section 2822 of Public Law 102-190, "National Defense Authorization Act for Fiscal Years 1992 and 1993," December 5, 1991, was amended by the National Defense Authorization Act for Fiscal Year 1993, Section 2825, Revision of Requirements Relating to Budget Data on Base Closures (Public Law 102-190, sec. 2822, December 5, 1991, 105 Stat. 1546, as amended by Public Law 102-484, sec. 2825, October 23, 1992, 106 Stat. 2609; 10 U.S.C. 2687 note). This law requires that the Secretary of Defense ensure that the authorization amount DoD requests for military construction relating to the closure or realignment of each military installation in each of the fiscal years 1992 through 1999 not exceed the original estimated cost (adjusted as appropriate for inflation) that the Commission was provided.

The Secretary of Defense may submit a request for authorization that exceeds the estimated cost submitted to the Commission, if he determines the greater amount is necessary. However, if he does, a complete explanation of the reasons for the increase must accompany the request to the Congress.

The law requires the Inspector General (IG), DoD, to investigate each military construction project where the IG, DoD, considers the cost differences to be significant. The IG, DoD, is required to determine why the amount requested for that project exceeds the estimated cost submitted to the Commission and whether the relevant information submitted to the Commission for that project was inaccurate, incomplete, or misleading in any material respect. Additional audit work may therefore be necessary if the ongoing base realignment and closure studies impact any of the laboratories addressed in this report. Conversely, however, nothing in this report directly affects those studies.

Part II - Findings and Recommendations

Finding A. Policy Guidance and Oversight

The DDR&E has historically provided limited policy guidance and oversight of the Military Department laboratories and Advanced Research Projects Agency. Although the DDR&E has the responsibility to provide this guidance and oversight, she lacks the staff and resources to do so. As a result, the Science and Technology investment strategy and the degree of coordinated planning accomplished from a DoD perspective is limited. To begin to address those deficiencies, DDR&E was preparing to issue science and technology programming guidance for use in prioritizing FYs 1996 through 2001 Future Years Defense Programs.

Background

The Director, Defense Research and Engineering, is responsible for oversight of the DoD Science and Technology program, which consists of basic research (budget category 6.1) and exploratory development (budget category 6.2). As of May 1993, the DDR&E and Deputy Under Secretary of Defense for Advanced Technology shared oversight of advanced development (budget category 6.3A). For FY 1994, the overall DoD research, development, test, and evaluation program was funded at $34.9 billion. The science and technology component was funded at $10.1 billion, with $24.8 billion for overall systems development. The science and technology funds are expended through the Advanced Research Projects Agency, the Military Department Offices of Scientific Research, Military Department laboratories and engineering/warfare centers, and other Defense Agencies.

Within the DoD, the DDR&E is the focal point for providing the "DoD perspective" needed to ensure that science and technology funds are expended in the most efficient and effective manner. This DoD perspective is necessary to balance strategic questions impacting the overall science and technology program. These strategic decisions should address the proper mix of in-house versus out-of-house research and development. Once the correct amount of in-house research and development is determined, further strategic decisions are needed as to the specific in-house laboratory(ies) to fund for each type of science and technology project.

This DoD perspective should balance all elements when considering the research and development needs of the DoD. If a decision is made to fund particular research and development projects out-of-house, this DoD perspective is needed to determine what type of contracting organizations such as universities or Defense contractors should be selected to conduct the research. Future threats as perceived by the Joint Staff should be a major factor when decisions are made as to the technology areas in which to concentrate research and development investment.

This DoD perspective was lacking because the overall DoD science and technology program is fragmented under numerous organizations, each impacting the program, but in an uncoordinated manner. For example, in FY 1993 the Advanced Research Projects Agency (ARPA) funding was 20 percent of the total DoD science and technology funding. ARPA makes independent decisions as to which areas to concentrate its investments. Specifically, in the technological areas of advanced materials and microelectronics research, ARPA represented 64 percent of all funding available. Similarly, the Ballistic Missile Defense Organization (BMDO) accounts for approximately 23 percent of the overall DoD science and technology funding and makes independent decisions as to which areas it will concentrate its funding. In addition, the Military Departments make many decisions, independent of DDR&E, that are outside the scope of Project Reliance regarding what science and technology areas in which to concentrate research and development funding.

The DDR&E has started preparing science and technology programming guidance for use in prioritizing the FY 1996 through FY 2001 Future Years Defense Program. This guidance gave first priority to fully funding science and technology efforts that address the Future Warfighting Capabilities identified by the Joint Chiefs of Staff. Starting in June 1993, the DDR&E also started evaluating and approving Military Department and Defense Agency Program Objective Memorandums. However, the coordination of facilities and equipment purchases has been delegated to Project Reliance. Project Reliance has not considered this DoD perspective when evaluating laboratory and research equipment investment decisions. Each Military Department or Defense agency continues to consider only its own perceived requirement for that investment.

In numerous prior studies, reinforced by our observations during the audit, the actual research planning that is accomplished is characterized as "bottoms-up" planning and, as such, no defined strategy relates the research and development work being performed in the laboratory to the needs and requirements created by a perceived threat. This type of research planning eventually percolates to the top levels of the DoD. Accordingly, no plan or strategy determines who does what, when, where, or how.

No investment strategy exists with respect to the relative amount of in-house versus out-of-house research and development that DoD should fund. In addition, quasi-independent organizations contribute independent planning and significant funding to the overall DoD science and technology program in an uncoordinated manner.

Advanced Research Projects Agency. ARPA funds high-risk research and development projects that offer significant potential for technological impact. In most cases, this funding awards research contracts to private industry or universities through Military Department laboratories. ARPA utilizes Military Department laboratory personnel as contract agents performing functions such as contract award and oversight of technical efforts and for various support functions.

In FY 1993, ARPA funded about $1.1 billion for Advanced Materials and Microelectronics RDT&E. Approximately 87 percent of the project funding went to private industry, 8 percent to universities, and 5 percent to DoD in-house research and development. ARPA project planning is performed by program managers monitoring Science and Technology programs to select potential areas for development of revolutionary new technologies that will form the basis for new Defense and civilian capabilities.

ARPA is organizationally under the control of the DDR&E. However, ARPA independently plans, contracts, and funds RDT&E projects. ARPA manages projects with very limited DDR&E staff guidance and oversight. In FY 1993, ARPA was funded for $2.3 billion and was authorized 180 personnel.

Military Department Laboratories. According to the latest available draft of the DoD In-House RDT&E Activities Report for FY 1992, 56 distinct Defense RDT&E facilities employ 120,500 personnel. In FY 1992, total funding for these facilities amounted to $15.7 billion. These facilities include Research, Development, and Engineering Centers (RDECs) operated by the Military Departments. Most of these RDECs are organizationally aligned with a major Warfare Center in the Navy or a Major Command in the Army or the Air Force. In addition to performing their mission related to Systems Development (budget categories 6.3b, 6.4, 6.5, 6.7), many RDECs also have a significant Science and Technology program (budget categories 6.1, 6.2, 6.3a). Each Military Department independently manages, funds, and operates numerous Advanced Materials and Electronic Devices research and development laboratories. In FY 1993, these laboratories spent about $653 million on Advanced Materials research and development and $1.1 billion on Microelectronics research and development in budget categories 6.1, 6.2, and 6.3A.

Ballistic Missile Defense Organization. In January 1991, the Strategic Defense Initiative Organization (SDIO) was redirected from a program for space-based weapons to a program to provide protection against limited ballistic missile strikes against the United States, its forward deployed forces, and its allies and friends. On May 13, 1993, the SDIO was renamed the Ballistic Missile Defense Organization (BMDO) to reflect the administration's concentration on new dangers of the post-Cold War world. In FY 1993, the BMDO funded about $420 million in science and technology research and development focused on three broad objectives: theater missile defense, national missile defense, and follow-on research.

Since its inception, SDIO/BMDO has advanced technologies that lead to capabilities against threats by nuclear ballistic missiles of all ranges. Working with the Military Departments and allies, SDIO initiated several theater architecture studies that included other ballistic missile threats and laid the foundation for development of Theater Missile Defense element capabilities.

The Deputy Under Secretary of Defense for Advanced Technology provides oversight and guidance for the BMDO. The BMDO was also a significant source of funding for the overall DoD science and technology program. For example, during FY 1993, BMDO funded the Air Force Phillips Laboratory for

a total of $266 million. At the Phillips Laboratory, $18 million of this amount was for Electronic Devices RDT&E. The Office of the Director, Defense Research and Engineering, estimated for this same time that BMDO funded a total of $16.8 million to Advanced Materials RDT&E and $31.3 million to Electronic Devices RDT&E.

Director, Defense Research and Engineering

DDR&E Responsibility. The DDR&E is responsible for providing policy guidance and leadership for management of the DoD scientific and technology effort. As illustrated in Figure 1, the DDR&E is the DoD focal point for coordination of actions, decisions, guidance, planning, and resource allocations of the offices within the Office of the Secretary of Defense that impact the operations, conditions, and capabilities of DoD laboratories. Appendix B defines acronyms used in Figure 1.

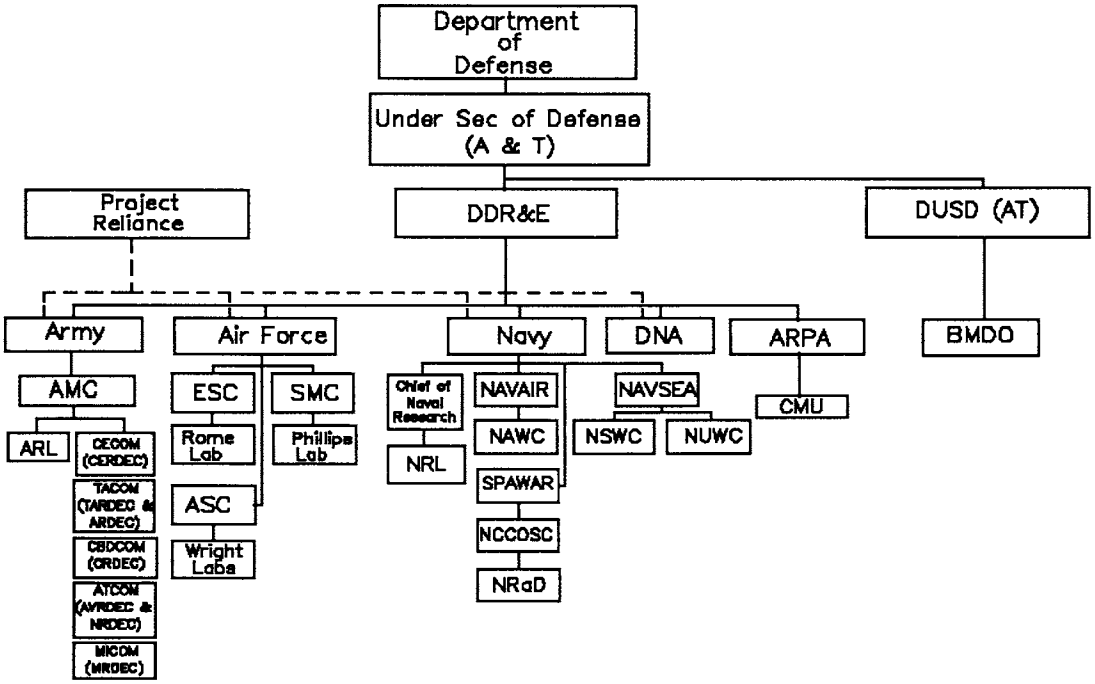


Figure 1. Organizations Involved in Science and Technology

Department of Defense Directive 3201.1, "Management of DoD Research and Development Laboratories," March 9, 1981, assigned day-to-day management responsibility for DoD laboratories to the Military Departments. This decentralized management policy results in the Military Departments independently managing their RDT&E efforts.

Decentralized Laboratory Management. The 1987 Defense Science Board (DSB) Summer Study on Technology Base Management identified at least 22 studies of the science and technology program conducted by DoD over 25 years. This study included a review of 16 of these prior studies focusing on two primary issues:

o Is the technology base efficiently producing technology options adequate in number and quality for DoD users and operators?

o How can the transition of new technology to the field be accomplished most effectively?

Regarding the management of research, the 1987 DSB study concluded that

> where once Office of the Secretary of Defense exerted a centralized point of unified leadership and budgetary authority and control for the 6.1 (basic research) program, the Study Group is concerned that this leadership is fragmented by too much delegation to the Services and agencies; the 6.1 program has, in effect, been relegated to a position of second order importance and lacks top management attention.

The 1987 DSB Summer Study on Technology Base Management specifically recommended that

> The Under Secretary of Defense for Acquisition should explicitly recognize the 6.1 program as an integrated corporate program and should re-assert the corporate budget and management authority already resident with the Office of the Secretary of Defense.

However, this decentralized management policy remains in effect and the Military Departments still manage their RDT&E efforts independently.

Department of Defense Directive 5134.3, "Director of Defense Research and Engineering," January 9, 1989, designated the DDR&E as principal staff assistant and advisor to the Under Secretary of Defense for Acquisition for DoD scientific and technical matters, basic and applied research, and the development of weapon systems. This Directive also assigned specific responsibilities, functions, relationships, and authorities concerning Science and Technology RDT&E. In an August 12, 1991, memorandum concerned with strengthening the technology function, the Deputy Secretary of Defense clarified the functions of the Director, Defense Research and Engineering. Specifically, the DDR&E is to exercise authority, direction, and control over the Advanced Research Projects Agency. In addition, DDR&E is to establish and ensure implementation of policies and program plans, including funding, for the Department of Defense on all research and technology associated with all laboratories and research, development, and engineering centers operated by the Military Departments or other Department of Defense Components.

The functions of the DDR&E can be interpreted as planning, organizing, directing, and controlling the DoD science and technology program.

Science and Technology Planning. No connectivity exists between the thrust plan and the actual research being conducted in the DoD laboratories; therefore,

very little science and technology planning coordination provided the necessary DoD perspective. DDR&E advised us that beginning with the FY 1996 science and technology Program Objective Memorandums, the DDR&E has initiated planning programming guidance for the Military Departments and Defense agencies. The DDR&E had also recently prepared a draft science and technology investment strategy that is now awaiting final approval.

DDR&E has also drafted a Technology Plan that defines the goals, objectives, schedules, and funding for each of 21 technology areas. This technology plan is also awaiting final approval. However, the science and technology planning accomplished to date has used a "bottoms up" approach. Under the proposed new technology plan, Project Reliance will continue to be the primary focal point for any coordinated planning with the DoD. The Military Departments dominate Project Reliance with the DDR&E serving as an "ex officio" adviser. In addition, Project Reliance cognizance over total science and technology funding is limited, as the Advanced Research Projects Agency and Ballistic Missile Defense Office participate informally in an "ex officio" capacity. Therefore, only a fraction of the overall science and technology funding in DoD has been planned from a DoD perspective.

Science and Technology Organization. Considering the scope of the DoD science and technology program and the size and complexity of the laboratory community, the DDR&E lacks the personnel and other resources necessary to effectively accomplish its assigned leadership and management roles. Current authorized strength for all DDR&E functions is 29 full-time personnel, with an additional 34 personnel available to the DDR&E for task assignment from the Defense Support Agency; not all billets have ever been filled.

Of these 29 personnel, only 3 are currently assigned to DoD laboratory management. Two personnel are assigned to Federally Funded Research and Development Centers (FFRDCs) and eight personnel are assigned to advanced technology. In FY 1993, the DDR&E spent $74,500 on travel funds, we believe an inadequate amount to support the assigned mission of the DDR&E. As a result, the DDR&E has been able to provide very limited guidance and leadership over research and technology in the DoD. This lack of resources has precluded the DDR&E from formulating and implementing an overall DoD science and technology investment plan and strategy. In addition, because of a lack of management information systems, the DDR&E has been unable to exercise any meaningful oversight of the funding for the science and technology program. The DDR&E advised us that they are establishing a Corporate Information Management System to fully integrate existing and proposed management information systems.

Although exact comparisons with the research offices of the Military Departments cannot be made, a comparison shows a relative evaluation of the staffing levels and resources available to their respective science and technology executives. This comparison of the respective science and technology organizations does not consider the scope of activities for which the DDR&E has oversight responsibility. For example, the DoD science and technology program consists of in-house and out-of-house research and development. To optimize the overall utilization of Government resources, the amount of out-of-

house research and development to be conducted should be analyzed and a determination made as to an allocation of the available funding for out-of-house research that considers private contractors, universities, and other Government laboratories and their FFRDCs.

FY 1990 was the last year for which the Department of Defense In-House RDT&E Activities Report separately identified personnel and funding levels of the research offices of the Military Departments. Many responsibilites of these personnel parallel those of the Office of the DDR&E, but only within that respective Military Department as it related to that Military Department's science and technology program. Specifically, at the end of FY 1990:

o the Army Research Office had 112 personnel authorized and was funded $6.6 million annually;

o the Office of the Chief of Naval Research had 631 personnel authorized with annual funding of $23.4 million; and

o the Air Force Office of Scientific Research had 214 personnel authorized with annual funding of $257.6 million, which included amounts for other research.

Therefore, the Military Departments assigned a total of 957 personnel to their research offices, as compared to the 29 personnel authorized for the Office of the DDR&E. This comparison does not consider the scope of DDR&E responsibilities outside the Military Department laboratories. The comparision considers neither the oversight responsibility of DDR&E as it relates to the ARPA and its FY 1993 funding of $2.3 billion for science and technology nor the oversight responsibility of DDR&E as it relates to DoD FFRDCs, which were funded for $1.4 billion in FY 1992.

Direction of the Science and Technology Program. DoD Directive 3201.1, March 9, 1981, assigns DDR&E to be the focal point within the DoD for resource allocations that impact the operations, conditions, and capabilities of DoD laboratories. Additionally, DoD Directive 5134.3, January 9, 1989, assigns the DDR&E the responsibility to formulate budget estimates; recommend resource allocations; and participate in planning, programming, and budgeting activities.

The DDR&E monitors DoD Science and Technology funds by program elements and by research and technology areas. The program element funding is based on appropriations data, and the research and technology funding is based on judgmental estimates of program element funds into specific research and technology areas. To monitor funding by research and technology area, the DDR&E prepared a research and technology taxonomy. This taxonomy consists of one science area for basic research and small business innovative research and 21 other technology areas that the DDR&E uses to identify and account for funding levels. The DDR&E and the DoD Components use a judgmental process to prorate program element appropriated funds into these

21 technology areas. Since an individual program element might consist of multiple research and technology areas, this proration process results in significant discrepancies and errors.

For example, the DDR&E's FY 1993 draft proration of funds indicates that BMDO would have funded a total $29 million for the Materials and Structures taxonomy. BMDO actually reported funding of $2.6 million in the Materials and Structures taxonomy to DDR&E. However, for this same taxonomy, the BMDO subsequently reported funding of $17 million in Advanced Materials to us. DDR&E records estimated that BMDO funded a total $28 million in Electronic Devices RDT&E; however, BMDO did not report any actual Electronic Devices funding to the DDR&E. For the electronic devices taxonomy, BMDO subsequently reported funding of $31 million in the Electronic Devices taxonomy to us.

Similarly, DDR&E estimates indicated that the FFRDC, Lincoln Laboratory, had FY 1993 total funds of $24.9 million in Program Element 63250F and estimated that $12 million of the funds would be spent on Electronic Devices. However, Lincoln Laboratory reported to us that of FY 1993 total funds of $17.3 million in Program Element 63250F, $7.8 million of the funds was spent on Electronic Devices, a difference of $7.6 million and $4.2 million, respectively. The lack of an effective management information system and improper reporting of expenditures against program elements generated these large variances.

Another example of these large variances is Program Element 62204F, which indicated a total of $11 million in expenditures. The Air Force Wright Laboratories implemented Program Element 62204F and reported to us that it expended a total $9.8 million for this program element. Meanwhile, the Air Force reported to the DDR&E a total expenditure of $61.4 million for this same program element. When queried by the DDR&E as to this discrepancy, the Air Force explained that allocating other technology funds to Electronic Devices Technology caused the $51.6 million difference.

DDR&E does not have the necessary management information system and internal control procedures in place to provide for a timely and correct accounting of DoD technology funds. An example of the problems caused by this lack of internal controls is the DDR&E review of expenditures for the two taxonomy areas of Materials and Structures and Electronic Devices. Specifically, this review demonstrated a total discrepancy for Materials and Structures of $263 million and for Electronic Devices of $499 million. The summary DDR&E review of 11 of the 21 technologies revealed a total fund allocation discrepancy of approximately $1.6 billion for budget categories 6.2 and 6.3A funds. The source of the FY 1993 data is a draft copy of expenditures dated January 24, 1994; a final report is not yet available. Although the DDR&E reconciles known discrepancies, no procedures are in place to verify that any reconciled balances are correct and free from errors. The DDR&E advises us that improvements for meeting these reporting requirements are being addressed by a combination of methods currently under investigation by Technical Area Planning Teams and development of a Corporate Information Management System.

Control of the Science and Technology Program. The DDR&E is responsible for preparing the DoD In-House RDT&E Activities Report. Numerous organizations such as DoD, Office of Technology Assessment, DoD and Military Departments' audit agencies, various committees of the Congress, and the General Accounting Office use these reports. The DoD Laboratories used the reports as an internal management document and as a catalog of general activity. The private sector also used these reports to explore the potential for technology cooperation with DoD Laboratories.

Because of the lack of DDR&E resources and the absence of a reliable management information system, these reports are not prepared on a timely basis and contain erroneous and incomplete information. Specifically, these reports do not reflect the total DoD RDT&E program. Rather, they are management summaries covering only "RDT&E In-House Activities," which are those activities where In-House RDT&E funding is at least 25 percent of the In-House portion of the activities' total annual budget. The DoD total RDT&E funds (all budget category 6 funds) for FY 1991 was $34.9 billion; however, the DoD In-House RDT&E Activities Report for FY 1991 accounts for only $8.8 billion (25 percent of the total), a $26.1 billion difference. The DoD total Science and Technology (S&T) funds (budget categories 6.1, 6.2, 6.3A funds) were $9.2 billion; however, the FY 1991 report accounts for only $4.0 billion (39 percent of the total), a $5.2 billion difference.

The FY 1991 report identified FY 1990 funding levels, which compared the same data in the FY 1990 report, and contained discrepancies. For example, the FY 1991 report indicated the Army funded a total of $50 million more for FY 1990 than the FY 1990 report indicated. Additionally, the FY 1991 report is dated April 9, 1993, which is 18 months after the close of FY 1990. The DDR&E lacks a reliable Management Information System for adequate reporting of DoD RDT&E technology, which is relied on by DoD management, congressional committees, other Government Agencies, and the private sector.

Conclusion

No central point in the DoD planned or executed an overall science and technology investment strategy. Actual research project planning is divided among not only the Military Departments, but also the Advanced Research Projects Agency, and the Ballistic Missile Defense Organization. The overall Advanced Research Projects Agency investment strategy does not have a process to link the interests of the DoD and Military Departments; therefore, this investment strategy may not be in the overall best interest of the DoD.

We could not identify any plan or strategy to identify and balance science and technology investments among in-house, Military Department-controlled laboratories, universities, out-of-house contractors, and FFRDCs.

The Military Departments conduct their science and technology programs without adequate planning, coordination, and oversight by the DDR&E. When

viewed from an overall DoD perspective, the Military Department's science and technology investment decisions only optimize benefits for each respective Military Department.

The leadership mission assigned to the DDR&E has remained relatively constant over the years while the actual oversight and coordination roles of the DDR&E have diminished considerably. The diminution of the role of DDR&E in planning, organizing, directing, and controlling the DoD science and technology program has been the result of decentralized laboratory management, inadequate accounting for Science and Technology funds, and inadequate reporting of DoD RDT&E efforts.

DDR&E lacks the personnel and resources to effectively plan, organize, direct, and control the science and technology effort of the DoD. This lack of personnel and resources is especially evident when the resources allocated to DDR&E are compared to those resources allocated to the Scientific Offices of the Military Departments for whom the DDR&E has oversight authority. The DDR&E advises us that within the limits imposed by their constrained resources, they have started a number of initiatives to address these problems. Specifically, the DDR&E has started preparing science and technology programming guidance for use in prioritizing the FY 1996 through FY 2001 Future Years Defense Program; starting in June 1993, the DDR&E started evaluating and approving Military Department and Defense Agency Program Objective Memorandums; a draft science and technology investment strategy has been prepared and is now awaiting final approval; and the DDR&E has drafted a Technology Plan defining the goals, objectives, schedules and funding for each of 21 technology areas. This technology plan is also awaiting final approval.

Recommendations, Management Comments, and Audit Response

We recommend that the Under Secretary of Defense for Acquisition and Technology:

1. Authorize additional personnel and funding for the Office of the Director, Defense Research and Engineering, to provide adequate DoD-level management and oversight of the DoD laboratories.

2. Ensure that the Office of the Director, Defense Research and Engineering, prepares strategic plans, annual planning guidance, and investment plans to coordinate the science and technology efforts of the DoD Components.

3. Require the Office of the Director, Defense Research and Engineering, to develop a management information system to accurately monitor laboratory funding resources.

Management Comments. The Director, Defense Research and Engineering, responded for the Under Secretary of Defense for Acquisition and Technology. The Director said that she concurs with all recommendations associated with this finding and that they are currently in various stages of implementation. However, she also believed that implementation of the recommendations in the report would be meaningless without adequate personnel and timely, accurate information. The Director further indicated that when the audit was initiated, the internal controls in place were the result of the decentralized management practices of the previous administration.

Regarding personnel resources, the Director indicated that the specific office charged with the responsibility for exercising management and oversight of the DoD laboratories in the DDR&E has only one officially approved and staffed position. Specifically, in the Office of the Deputy Director, Defense Research and Engineering (Laboratory Management), this position is a GS-6-level secretary. The Director indicated that action has been initiated to authorize a permanent Senior Executive Service level staff position for this office. However, this one additional position is inadequate to satisfy the personnel requirements necessary for the DDR&E to effectively exercise management and control responsibilities. The Director also said that by leveraging the personnel and expertise within the Military Departments, she could minimize required expansion of the DDR&E staff. This expansion can be accomplished by assigning DDR&E the responsibility for implementing Project Reliance and requiring the Joint Directors of Laboratories to report to the DDR&E for Project Reliance activities (see recommendations for Finding C).

Audit Response. We consider the comments from the Director, Defense Research and Engineering, to be responsive except for providing estimated dates of completion. In a recent reissuance of DoD Directive 5134.3, "Director of Defense Research and Engineering (DDR&E)," August 31, 1994, we noted no diminution in the assigned responsibilities, functions, relationships, and authorities of the DDR&E. In response to the final report, we need to know the status of USD(A&T) actions regarding the provision of resources to DDR&E that are commensurate with that office's responsibilities.

Finding B. Investment in Laboratories

The Department of Defense is making redundant investments in Advanced Materials and Electronic Devices laboratories. Redundant investments are occuring because the Military Departments are not adequately coordinating and controlling their investments in research facilities, equipment, and research projects because of a lack of oversight by the Office of the Director, Defense Research and Engineering. This lack of oversight results in questioned costs for facilities and equipment.

Background

DoD Directive 5134.3, "Director of Defense Research and Engineering," January 9, 1989, provides the DDR&E with the authority to approve, modify, or disapprove research and development projects of the Military Departments and other DoD agencies in assigned fields. The DDR&E is also authorized to determine and decide scientific and technical matters, basic and applied research, and the development of weapon systems.

Consolidation of Laboratories

A Defense Science Board Task Force on Microelectronics Research Facilities was formed to assess the advantages and disadvantages of a single microelectronics research facility for all three Military Departments. The Defense Science Board Task Force subsequently submitted its report to the Director, Defense Research and Engineering, in June 1992, concluding that a single DoD Tri-Service microelectronics facility to conduct basic research should be capable of developing Defense-unique technologies. The study also concluded that one corporate microelectronics research facility serving the needs of all DoD was necessary and sufficient. The Defense Science Board also recommended that one existing applications-oriented microelectronics research facility for each Military Department would be sufficient to develop Military Department-unique microelectronics applications.

In a January 14, 1993, memorandum, the Under Secretary of Defense for Acquisition directed implementation of this DSB Report. The Under Secretary specifically stated that "Each Military Department shall consolidate the microelectronics research capabilities for materials growth and solid state device processing and fabrication into a single applications microelectronics research facility." Nevertheless, the Military Departments continued to operate and fund multiple microelectronics research laboratories. The Navy and the Air Force continued to maintain numerous laboratories for microelectronics applications purposes. The Army ignored the DSB recommendation to designate an

applications microelectronics laboratory from an existing facility and continued plans to build a new facility at Adelphi, Maryland.

Military Department Laboratory Organization. Each Military Department uses a different means to determine the alignment of laboratories and research, development, and engineering centers.

Army. The Army Research Laboratory (ARL) was established from the Army Laboratory Command and constituent elements from other separate Army laboratories including the Army Electronic Technology and Devices Laboratory, the Belvoir Research and Development Center, and the Center for Night Vision and Electro-Optics. At the time of our review, the Army plans called for closing its existing microelectronics laboratory at Fort Monmouth, New Jersey, and building a new facility at Adelphi, Maryland. In addition to the microelectronics research that would be conducted at the new laboratory, elements of the Army's Night Vision Laboratory at Fort Belvoir would continue to be involved with elements of microelectronics research.

Navy. The Naval Research Laboratory is aligned directly with the Office of the Chief of Naval Research. Also, four Naval Warfare Centers maintain their own laboratory structures. As a result, advanced materials research is not only conducted by the Naval Research Laboratory, but also by the Naval Air Warfare Center, Aircraft Division, Warminster, Pennsylvania, and the Naval Surface Warfare Center. The Naval Surface Warfare Center conducts advanced materials research at two locations: the Carderock Division, Annapolis Detachment, Maryland, and the Dahlgren Division, White Oak Detachment, Maryland.

Microelectronics research is also conducted at the Naval Research Laboratory. Although not the primary function of the laboratory, the Navy also conducts microelectronics research at three other locations: the Naval Command, Control, and Ocean Surveillance Center, San Diego, California; the Naval Air Warfare Center, Aircraft Division, Indianapolis, Indiana; and the Naval Surface Warfare Center, Crane Division, Crane, Indiana.

Air Force. In the Air Force, each major Command has a "super" laboratory aligned with the Command. The Aeronautical Systems Command uses the Wright Laboratories, Wright-Patterson Air Force Base, Ohio, which are involved with both advanced materials and microelectronics research and development. The Space and Missile Command uses the Phillips Laboratory, Kirtland Air Force Base, New Mexico, which conducts microelectronics research and development. The Electronic Systems Command uses the Rome Laboratory, located at both Griffiss Air Force Base, New York, and Hanscom Air Force Base, Massachusetts, which also conducts microelectronics research and development. In addition, the Air Force sponsors a Federally Funded Research and Development Center at the Massachusetts Institute of Technology, Lincoln Laboratory, also located at Hanscom Air Force Base, Massachusetts, that is also predominantly involved with microelectronics research and development.

The Rome Laboratory has dual locations. The 1993 Base Realignment and Closure Commission recommended closing Griffiss Air Force Base. This closure will result in all base support personnel leaving. Therefore, the Air Force Rome Laboratory located on Griffiss Air Force Base will become a stand-alone facility. The Air Force estimated that the annual operating cost of the Rome Laboratory will increase by more than $20 million.

Investment in Laboratory Facilities. Our review identified 15 separate laboratory locations operated by the Military Departments that are currently conducting Microelectronics (Electronic Devices) and Advanced Materials research and development (Appendix C). Each location represents a significant investment in facilities and equipment. These laboratories contain a total of 1,582,564 square feet of facilities; employ more than 2,500 military and civilian personnel; and have an investment of more than $320 million for equipment.

Nevertheless, the Army and Navy plan to build and equip new advanced materials laboratories that will cost as much as $160 million. In addition, the Army plans to build and equip a new microelectronics laboratory as part of the creation of the Army Research Laboratory that would cost as much as $306 million. This proposed construction may be unnecessary and redundant to an already existing DoD laboratory capability. These Military Construction projects were approved as part of the Base Realignment and Closure process. Accordingly, the Army and Navy were not required to submit normal military construction justifications of the need for these new laboratories to the DDR&E.

Investment in Laboratory Equipment. At each site visited, we collected and reviewed an inventory of laboratory equipment with a unit cost greater than $100,000. We identified more than $216 million of equipment at the microelectronics facilities we visited and more than $169 million of equipment at the advanced materials laboratories. Analysis of expensive equipment utilized by these research laboratories indicates significant redundancy. We analyzed the types of equipment and their functions and capabilities at each audit site. Our analysis indicated that the Military Departments have redundant equipment valued at more than $23 million for advanced materials research and $27 million in redundant equipment for microelectronics research. While this equipment is not identical in all cases, it provides the same capability.

The audit found discrete examples of redundant research equipment. For example, in February 1991 the Air Force installed a 1,000-ton, computer-controlled forging press at the Advanced Materials Directorate at Wright Laboratories. This press is valued at $1.6 million. From August 1992 through June 1993, this press was utilized only 13 of 199 workdays. This utilization rate of 6.5 percent of the total time available is based on a 5-day workweek with 8-hour shifts. During our visit to the Army Research Laboratory, we found that the Army Materials Directorate planned to procure a similar, 800-ton forging press valued at $800,000, yet they had not studied the feasibility of using the Air Force press. Some level of redundancy may be necessary. Since the forging press at Wright Laboratories is underutilized, the Army's decision to invest $800,000 in a new press is questionable.

The Military Departments independently procure expensive, state-of-the-art research and development laboratory equipment without DDR&E oversight. The result is often redundant equipment capability. This redundant equipment is especially evident when certain Military Department investment decisions are reviewed across Military Department lines. Specifically, at the nine materials laboratories visited, we found 27 microscopes costing more than $100,000 each with a total value of $7.5 million. The Materials Directorate at Wright Laboratories, Dayton, Ohio, has five electron microscopes valued at $1.6 million that we did not observe being used during our visit. Meanwhile, the Materials Directorate of the Army Research Laboratory, Watertown, Massachusetts, has six electron microscopes valued at $1.4 million. We identified these electron microscopes as having redundant capability. The more expensive microscopes were considered capable of doing more extensive analysis than the less expensive microscopes. Currently, no DDR&E procedure provides procurement oversight of costly RDT&E equipment. Based on our analyses of research equipment inventories, we believe that a significant reduction in redundant RDT&E equipment can be accomplished, if DDR&E coordinated and approved proposed procurements of research equipment costing $250,000 or more. We established this threshold at $250,000 because we identified many items of redundant equipment that had an original price at approximately this level.

Facility and equipment requirements for research and development projects are determined by the specific types of advanced materials science and technology projects performed at each laboratory. Therefore, the question arises: should most work be done at one or two facilities, thereby reducing redundant investments in relatively under-utilized facilities and equipment? This question is especially relevant to microelectronics research and development where every 5 years it is apparently necessary to completely reinvest in microelectronics laboratory equipment. According to the Report of the Defense Science Board Task Force on Microelectronics Research Facilities, June 1992, "The microelectronics research equipment replacement rate is projected to be 20%. The rate is based on typical commercial microelectronics research equipment investments and is higher than for other laboratory equipment because the rate of change of microelectronics research is very rapid."

Investment in Research Projects

At the laboratory locations we visited, we did not find evidence of duplication of research programs or projects, because the parent organizations coordinate their activities so that they do not research exactly the same project. However, the work generally falls into the same class of research and technology.

During the audit, we evaluated each ongoing program at the laboratory sites visited. We found that, although research projects are not exactly duplicative, a significant amount of overlap exists between these projects at the various Military Department laboratories. For example, in microelectronics, laser and electronic device fabrication and evaluation, optical and electronics fabrication

and evaluation, and microelectronics fabrication and evaluation research projects are being conducted at several different laboratories. In advanced materials, categories of armor, carbon, ceramics, composites, pollution, and polymers research projects are being conducted at various laboratories.

With relatively few exceptions, the Army, the Navy, and the Air Force are conducting advanced materials and microcelectronics science and technology research projects that require common types of laboratory equipment and space. Specifically, unique Army advanced materials projects are limited to armor materials, chemical and bio-protection materials, electro-ceramic materials, and smoke obscurants. Unique Navy advanced materials projects are limited to magnetic, piezoelectric and magneto-strictive materials, and fire-retardant materials. The only unique Air Force advanced materials science and technology is in the area of space-based hardened materials. Unique Army microelectronics projects are limited to frequency controls and devices, and display components. The only unique Air Force category is in generic antenna technologies. The Navy's only unique category in microelectronics is vacuum electronics.

The Army Tank-Automotive Research, Development, and Engineering Center at Warren, Michigan, is the Project Reliance-designated lead Military Department for RDT&E in composite and alloy materials for ground vehicles such as tanks and trucks. However, in spite of the Army's lead in this technology area, the Navy performs independent RDT&E in the same technology area for the Marine Corps. The DDR&E guidance and oversight is inadequate to prevent the Military Departments from performing redundant RDT&E in technology areas.

Planning for Research Projects

Research projects are being conducted within the DoD without adequate coordination and control. Despite the Joint Services Program Planning initiated by Project Reliance, each Military Department continues to develop and implement a separate research project work plan. During our review, we found that only 7 of 18 organizations coordinated their research work plans with the Joint Services Program Plan prepared by each technology panel. At the various Military Department laboratories, the types of research being conducted significantly overlap.

Conclusions

DoD advanced materials and microelectronics laboratory facilities and equipment have redundant investments as well as significant overlap in research projects. This redundant investment has occurred because DDR&E and the Joint Directors of Laboratories through Project Reliance have not been effective

in their oversight of the DoD laboratory community. Because of this lack of oversight from a DoD perspective, the Military Departments are increasing their investments in the RDT&E infrastructure and continue to procure additional redundant equipment.

To reduce redundant investments in laboratories, laboratory equipment, and research projects, one focal point is needed to provide coordination and control. Having a centrally designated DoD office that reviews and approves all Military Construction projects is the best solution. This same office should also have the authority to review and approve all laboratory equipment procurements beyond a certain threshold. To reduce redundant research projects, technical specialists assigned to a DoD-level office should approve annual research program plans developed by each laboratory.

Recommendations, Management Comments, and Audit Response

We recommend that the Under Secretary of Defense for Acquisition and Technology:

1. Require the Military Departments and Defense agencies to submit all proposed laboratory Military Construction projects to the Office of the Director, Defense Research and Engineering, for coordination and approval.

2. Develop a comprehensive facilities and equipment database so that Project Reliance can be more effective in identifying and avoiding potential duplication.

3. Require the Military Departments and Defense agencies to submit, on a more timely basis, detailed annual research program plans to the Office of the Director, Defense Research and Engineering, for coordination and approval.

Management Comments. The Director, Defense Research and Engineering, responded for the Under Secretary of Defense for Acquisition and Technology. She concurred with our conclusion that DDR&E can improve coordination of infrastructure investments across the Military Departments.

The Director concurred with Recommendations 1 and 3 and nonconcurred with the original formulation of Recommendation 2. The Director stated that Recommendation 3 concerning the coordination and approval of annual research program plans has already been implemented.

However, the Director believed Recommendation 2 in the draft report, which called for DDR&E review of projects over $250,000, was impractical because of the administrative requirements necessary to implement it. She also said it is counter to the DDR&E objective of empowering laboratory directors. Rather, she would employ a redefined Reliance process to eliminate overlap.

The Director stated that she believed that the best way to eliminate duplication of equipment is through consolidation and downsizing of the laboratory infrastructure. She believed the next best way is to prevent the future procurement of very expensive equipment by making Reliance participants accountable for coordinating such procurements. She suggested that this coordination would be partially accomplished by developing a comprehensive facilities and equipment database that laboratory directors could access.

Audit Response. We consider the comments from the Director, Defense Research and Engineering, to be responsive and have modified Recommendation 2. We agree with the Director in the need for a comprehensive facilities and equipment database that would provide an inventory of laboratory equipment available for use by laboratory directors. We believe the Director's alternative of making Reliance participants accountable for coordinating research equipment procurements is reasonable. This increased accountability combined with the inventory of laboratory equipment should reduce redundant investments. In reply to this final report, we request the DDR&E to indicate when the database will be operational.

Finding C. Project Reliance

Project Reliance as currently implemented for the laboratories does not assure that research is conducted in the most efficient and effective manner throughout DoD. This condition is occurring in part because Director, Defense Research and Engineering, participation in and oversight of Project Reliance has been limited. As a result, the large savings originally promised by the establishment of Project Reliance have not been realized and few consolidations have occurred.

Background

Defense Management Review Decision (DMRD) 922 originally proposed that the Under Secretary of Defense for Acquisition develop a comprehensive management plan to control the efforts of the Military Departments to increase efficiency and reduce the cost of the Department's Research, Development, Test and Evaluation (RDT&E) operations. DMRD 922 considered two primary alternatives:

o The Military Departments proposed the Tri-Service Science and Technology Reliance (Project Reliance).

o The second proposed alternative was to create a Defense Science, Engineering and Test Agency to centrally manage and operate all DoD Science and Technology and Test and Evaluation activities.

The Deputy Secretary of Defense approved implementation of Project Reliance, even though estimated savings were significantly higher with the centrally managed alternative. Accordingly, a savings baseline of $1.1 billion was established for the Military Departments' Science and Technology Program for the FYs 1992 through 1997 Future Years Defense Plan (Appendix D).

Management of Project Reliance for the Science and Technology Program is the responsibility of four groups: the Joint Directors of Laboratories (JDL); the Armed Services Biomedical Research, Evaluation and Management Committee; the Training and Personnel Systems Science and Technology Evaluation and Management Committee; and the Joint Engineers. The JDL and Armed Services Biomedical Research, Evaluation Management Committee were in existence before the creation of Project Reliance. The Training and Personnel Systems Science and Technology Evaluation and Management Committee was being formed while Project Reliance was being planned. The Joint Engineers were established as a result of Project Reliance.

Project Reliance Objectives

Project Reliance provides a forum for the development of joint planning. However, the Military Departments retained their unique infrastructures for the implementation of research plans and programs.

Specific Project Reliance objectives were to:

o enhance the quality of Defense Science and Technology (S&T) activities;

o ensure the existence of a critical mass of resources that will develop world class products;

o reduce redundant S&T capabilities and eliminate unwarranted duplication;

o gain productivity efficiency through collocation and consolidation of in-house S&T work, when appropriate; and

o preserve the vital mission-essential capabilities of the Military Departments throughout the process.

Joint Directors of Laboratories

The JDL organization consists of the principals, an executive secretariat, a management panel, a basic research panel, and 13 technology panels. The principals, which are the Joint Directors, are the Army Deputy Chief of Staff for Research, Development, and Engineering; the Chief of Naval Research; and the Air Force Deputy Chief of Staff for Science and Technology. One principal serves as the chairman of the JDL and appoints the executive secretary. The chairmanship rotates among Military Departments on a 2-year basis. The principals oversee the executive secretariat, the technology panels, the basic research panel, and the management panel.

The technology panels develop and publish Joint Services Program Plans (JSPPs), which detail the formal planning agreements for the individual technology programs. The technology panels are also responsible for monitoring implementation of Project Reliance agreements, overseeing the joint segments of the Military Departments' research, ensuring coordination, and assessing industry's independent research and development efforts. The Military Departments have representatives on the technology panels. Each panel also has a chairman, which position rotates among the Military Departments every 2 years.

During the audit, we looked at laboratories included in Project Reliance by 2 of the 13 technology panels, the Technology Panel for Advanced Materials and the Technology Panel for Electronics Devices. Both panels have subsequently defined specific categories of research into taxonomy elements as subpanels.

The Basic Research Panel concentrates on joint planning for Basic Research (6.1). This panel has established 12 Scientific Planning Groups to coordinate the Basic Research of the Military Departments as well as to coordinate with the JDL technology panels and the Armed Services Biomedical Research, Evaluation and Management Committee; Training and Personnel Systems Science and Technology Evaluation and Management Committee; and Joint Engineers. The Basic Research Panel is developing an additional Scientific Planning Group for coordination of manufacturing science and technology. The Basic Research Panel publishes an annual report on its joint planning.

The Management Panel of the JDL provides general management support and oversight of the JDL. In addition, this panel performs coordination of certain research activities that do not fall within the oversight of a technology panel.

Project Reliance Accomplishments

The Project Reliance Technical panels that developed the taxonomies have contributed significantly to organizing the science and technology planning process. We believe that the Project Reliance planning process assisted in breaking down barriers among the Military Departments and, thereby, contributed to the overall DoD science and technology program. In addition, although the results are difficult to quantify, many scientists we interviewed expressed a high degree of satisfaction with the "synergistic" benefits of participating in the Project Reliance planning process with their scientific peers. At each laboratory site visited, we collected data on ongoing research projects for the purpose of testing for redundancy and duplication. Those audit tests did not reveal any instance of outright duplication of research projects in the laboratories. We attribute this result, at least in part, to the Project Reliance planning process.

Project Reliance has also achieved some efficiencies through physical collocations. One such collocation involved research in Survivability and Protective Structures at the Army's Waterways Experimentation Station in Vicksburg, Mississippi. The Air Force placed scientists at the station for collocation. The Air Force will continue its own funding of research, using its in place scientists and funding tasks for Army researchers. Another example of collocation attributed to Project Reliance involved the move of the Army's Fuels and Lubricants research program from the Fort Belvoir RDEC to the Air Force Wright Laboratory. Under Project Reliance, "collocation" indicates in-house programs will be located at a single site, but with the individual Military Department maintaining its own funding controls.

Laboratory Planning of Research Projects

A significant output developed by Project Reliance is a JSPP for each technical panel. According to the December 1992 Project Reliance Annual Report, the JSPPs are developed by the technology panels, in conjunction with the Military Departments' plans, and submitted by the panels' principal members. The Military Departments and later the JDL review the JSPPs. The JSPPs are approved by the JDL principals. When the Military Departments execute the approved plan, the technology panels oversee the implementation of joint segments.

The JSPP development process does not include DoD input. The research planning is accomplished through the JDL and the Military Departments. In addition, within individual laboratories, compliance with these JSPPs is mixed. Only some laboratories consider the JSPPs when they develop research work plans, and others appear to ignore them.

Generally, the microelectronic laboratories considered the JSPPs when they developed their work packages. Specifically, prepared work packages were directly related to the JSPPs at six of the eight microelectronics laboratories visited. Of the six laboratories, only Phillips had limited efforts related to the JSPPs. According to Phillips personnel, their laboratory had only a couple of related JSPP projects because the research work was in space and missiles, which was Military Department-unique and applications-oriented. We did not review work packages at the remaining two laboratories.

However, the materials research laboratories generally did not consider the JSPP in the development of their planned work packages. Information for 2 of the 10 facilities was not obtained because of their limited amounts of materials research. Of the remaining eight materials research laboratories, only one laboratory considered the JSPPs in developing its research plans, according to laboratory personnel. The other seven laboratories developed their planned research internally.

Specifically, we discussed the research planning process with management at each laboratory visited to determine the degree of consideration given to the JSPPs. At the 17 laboratories detailed in Appendix E, about half said they considered the JSPPs and the other half did not.

We also reviewed research agreements at each laboratory visited to determine the impact of Project Reliance on microelectronics and advanced materials laboratories. The review indicated that only 3 of the 174 agreements (about 2 percent) (Appendix F) between the laboratories and other research organizations referred to Project Reliance or its planning process. Accordingly, we determined that Project Reliance and the JSPPs had only a limited impact on the actual research being conducted at the laboratory level.

Personnel Staffing Levels and Funding. We found that personnel headcounts have not significantly changed from the baseline years 1990 through 1993. Advanced Materials and Microelectronics technology areas employed

2,754 employees in FY 1990 and 2,593 in FY 1993, a 6 percent decrease over 3 years (see Appendix G). Most employees lost were support staff. We also found that funding for these two technology areas has increased by $8.6 million or 1.3 percent. Funding in FY 1990 was $645.4 million and $654.0 million in FY 1993 (see Appendix H).

House Armed Services Committee. The House Armed Service Committee (Committee) Report on H.R. 2401, "National Defense Authorization Act for Fiscal Year 1994," Report 103-200, stated that the "Reliance process has led to a number of service agreements, but it still suffers from a number of weaknesses that have diminished its overall effectiveness." The Committee directed the Secretary of Defense to strengthen the Project Reliance process by assigning the Director, Defense Research and Engineering, the responsibility for coordinating the Project Reliance process through the Defense Technology Board. The Committee also recommended that the Defense Technology Board's Project Reliance Group establish procedures for measuring the goals and the amount of dollar savings from Project Reliance activities. The DDR&E and the Defense Technology Board Reliance Group have not yet established procedures for measuring the goals of Project Reliance or the amount of dollar savings from Project Reliance activities.

Project Reliance Oversight. Project Reliance oversight is limited to approximately 26 percent of total DoD Science and Technology (S&T) funding. Only RDT&E funding categories 6.1, 6.2, and 6.3A are under the cognizance of Project Reliance. For FY 1993, the total S&T funding in the DoD was $11.7 billion. Project Reliance has cognizance of about $3 billion (26 percent), all of which the Military Departments funded. Of the remaining $8.7 billion, $6.7 billion is S&T funding from DoD agencies, such as BMDO and ARPA. This $6.7 billion represents 57 percent of the total S&T funding for FY 1993, none of which falls under the purview of Project Reliance, as in Figure 2.

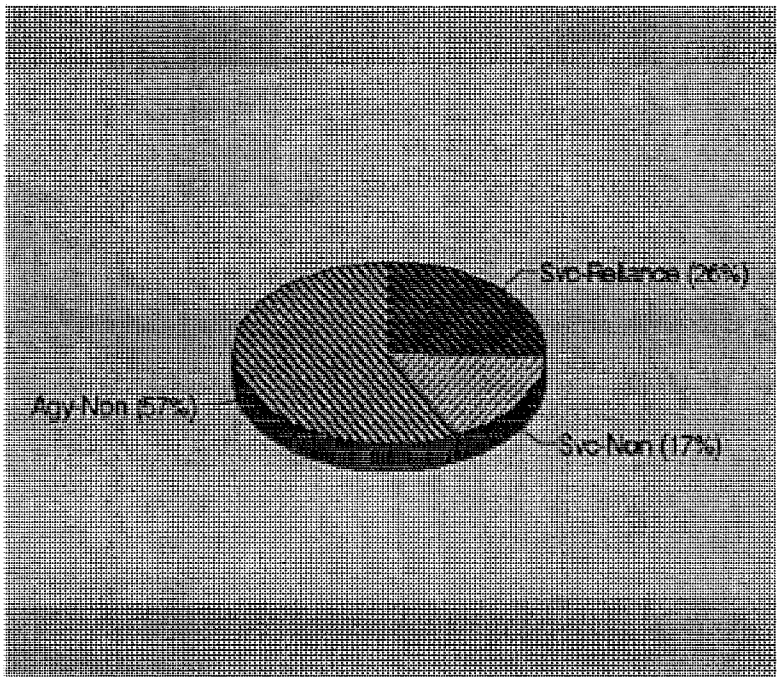


Figure 2. DoD S&T Funding-FY 1993

OSD Participation in Reliance

The structure of Project Reliance, the funding process, and the actions of the Office of the DDR&E limit participation in, and oversight of, Project Reliance by the Office of the Secretary of Defense (OSD).

The Project Reliance structure excludes OSD personnel from a leadership or directing role in the JDL. The Office of the DDR&E staff specialists for microelectronics and for materials and structures attend meetings of the Technical Panels for Electronic Devices and for Advanced Materials, respectively. But their attendance is in an "ex officio" capacity; therefore, their input is limited to nonbinding suggestions. Additionally, the staff specialists are not officially or formally in the organizational structure of the technical panels.

OSD oversight of the laboratories through the Project Reliance process is limited to approximately one quarter of the overall science and technology funding. ARPA is a major source of funding for the DoD Science and Technology program. However, ARPA does not actively participate as a member of the Tri-Service Project Reliance.

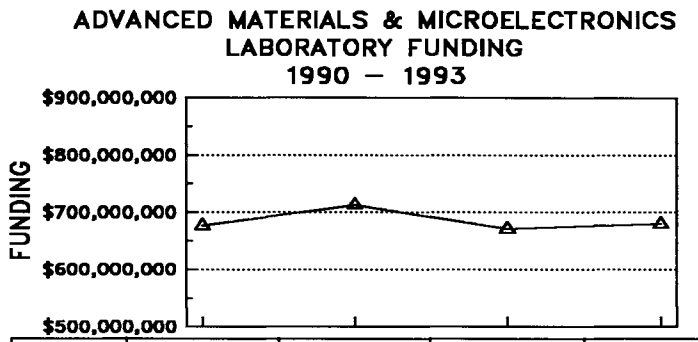
Project Reliance Science and Technology Reporting

The Tri-Service S&T Reliance Program prepares an annual report on technology panel activities. However, the value of this information is diminished because Project Reliance reports are not prepared at the laboratory level. Specifically, no formal laboratory management reports of Project Reliance activities are available for use by the laboratories, sponsoring Commands, and the Military Departments.

Project Reliance Taxonomy. A taxonomy is an organizational structure that shows the components of the technical panel and the types of research performed by that panel. Project Reliance attempts to coordinate and consolidate research and development on the basis of technological similarity. However, the Navy 6.2 and 6.3 programs are organized based on warfare centers, where each center maintains the full spectrum of technologies necessary for its specific assignment and the funding is tracked using the Defense Business Operating Fund method of accounting that disregards budget fund categories. These differences result in taxonomy incompatibilities that create significant gaps, overlaps, and gray areas when attempting to map the Navy Research and Development program into the Project Reliance panel and subpanel structure (Appendix I).

Project Reliance Planning Cycle. Scheduling incompatibilities between the Navy research and development planning cycle and the Project Reliance planning cycle challenge effective joint planning. For any given year, the Project Reliance plan is due before the Navy plan is approved and generally before the Navy plan is completely formulated. As a result, new Navy Research and Development project starts are typically absent from the Project Reliance plan. Likewise, the Project Reliance plan occasionally includes efforts for which Navy funding was not approved or was cut. The most extreme example of this scheduling problem lies with the Naval Warfare Centers' in-house 6.1 Independent Research efforts. Typically, those efforts are determined in August or September for new October starts although Project Reliance plans are due nearly a year earlier. When Project Reliance planning is occurring, independent research proposals have not been solicited, evaluated, or approved. The Navy's 6.2 program also suffers from scheduling incompatibilities because the Project Reliance planning occurs before the Navy planning.

Project Reliance Savings. Despite some laboratory consolidations in each Military Department, personnel numbers and funding levels at the laboratories have not been significantly reduced. We collected data on actual and budgeted funding and expenditures for FYs 1990 through 1993 at each audit site visited. The FY 1990 funding baseline was $681.7 million and $686.4 million in FY 1993, a 0.7 percent increase, as shown in Figure 3.



YEAR	1990	1991	1992	1993
—	$676,600,000	$ 712,700,000	$ 671,100,000	$ 679,900,000

We also collected data on authorized and actual personnel strength from FYs 1990 through 1993. For FY 1990, we identified total personnel of 2,754 and for FY 1993 of 2,593, a personnel reduction of 5.8 percent.

Collocation and Consolidation. Collocation is the act or result of placing or arranging together. Consolidation is the process of uniting or the unification of two or more organizations by dissolution of existing ones and creation of a single new organization. DMRD 922 states, "A consolidation approach would eliminate or consolidate weaker laboratories and establish Research and Development Centers of Excellence somewhat akin to the Department of Energy National Laboratories. This would strengthen DoD's technology base with fewer and larger laboratories." Project Reliance, created through DMRD 922, defines collocation and consolidation only in the funding sense and not in a physical sense. It defines consolidation as funding the "lead service" in the specific technology, and collocation as having separate funding with a single in-house site for a specific technology area.

We identified only two instances of physical collocation or consolidation as being under Project Reliance. As previously discussed under Project Reliance Accomplishments, one of these involved the Army collocating its fuels and lubricants science and technology research from Fort Belvoir, Virginia, to Wright Laboratory, Wright-Patterson Air Force Base, Ohio. However, this action consisted of relocating only two individuals.

Military Construction Costs. We identified numerous military construction projects associated with advanced materials and microelectronics laboratories. Specifically, we identified an Army construction project at the Army Research Laboratory (ARL), Aberdeen, Maryland, for $109 million and Navy construction projects at the Naval Surface Warfare Center, Carderock, Maryland, for $38 million, and Naval Air Warfare Center, Patuxent River, Maryland, for $14 million to build new advanced materials laboratories. In addition, we identified Army construction projects at ARL, Adelphi, Maryland, for $169 million and at the Missile Command, Redstone Arsenal, Alabama, for $3 million associated with creation of the Army Research Laboratory and a new microelectronics laboratory. The Army would also incur $134 million in implementation costs for the ARL.

As demonstrated in Appendix J, the proposed $415 million Army military construction costs associated with creation of the Army Research Laboratory essentially negates any planned savings the Army reported under DMRD 922. Under DMRD 922, the Army only showed implementation costs of $15.1 million for FYs 1992 through 1997, instead of the $415 million the Army now estimates.

Lack of Internal Controls. Internal management controls are those policies, procedures, and practices established to ensure that DoD Components manage resources effectively and efficiently. DDR&E was unable to provide a specific management action plan or milestones to implement DMRD 922 or to achieve the Military Departments' planned savings. The Military Departments were also unable to provide specific management plans or milestones to meet planned savings.

An accurate and reliable management information system does not currently exist so the DDR&E can monitor laboratory personnel and funding resources. At the completion of our audit, DDR&E advised us that they have established and filled a position specifically focused on the laboratory infrastructure. In addition, the DDR&E advised us that the Department is establishing a Corporate Information Management System to fully integrate existing and proposed management information systems.

Conclusions

Project Reliance provides a meaningful feedback mechanism from the scientific community for planning RDT&E within the DoD. Project Reliance efforts have successfully reduced redundant research projects and defined a taxonomy for conducting this research. However, greater Project Reliance oversight and improvements in inter-Service coordination could further reduce research overlap. Additionally, Project Reliance has not been successful for significant laboratory consolidation or collocation.

DoD Components have major science and technology funding available that impact the activities of the laboratories that do not fully participate in Project

Reliance or the JDL. Specifically, these organizations include the Office of the Director, Defense Research and Engineering; the Ballistic Missile Defense Organization that was added to Project Reliance during FY 1993; and the Advanced Research Projects Agency. Representatives from the Office of the DDR&E and the ARPA are on certain panel and subpanel meetings, but they have no decisionmaking authority within the JDL structure.

Analysis of documentation and discussions with laboratory personnel and the DDR&E's staff indicate that DoD management controls regarding Project Reliance were inadequate. Management plans and milestones have not been established or implemented to measure goals and dollar savings from Project Reliance activities.

Recommendations, Management Comments, and Audit Response

We recommend that the Under Secretary of Defense for Acquisition and Technology:

1. Assign responsibility to the Director, Defense Research and Engineering, for implementing Project Reliance. The Joint Directors of Laboratories should report to the Director, Defense Research and Engineering, for Project Reliance activities.

2. Assign responsibility to the Director, Defense Research and Engineering, for establishing control measures to eliminate overlap of research projects and capabilities.

3. Require that all Military Departments and Defense agencies that conduct, fund, or contract for research and development participate actively in the Project Reliance planning process.

Management Comments. The Director, Defense Research and Engineering, responded for the Under Secretary of Defense for Acquisition and Technology. The Director concurred with the finding and the substance of the associated recommendations, provided the DDR&E is resourced in accordance with Recommendation 1 of Finding A and that flexibility in implementation and operational nomenclature are recognized.

Audit Response. We consider the comments from the Director, Defense Research and Engineering, to be responsive. We agree with the Director that the DDR&E requires adequate resourcing to implement the recommendations associated with this finding. As discussed in Finding A, we agree that the DDR&E lacks the personnel and other resources necessary to effectively accomplish its assigned leadership and management roles. Accordingly, in response to the final report, we request the USD(A&T) to address the feasibility of adequately resourcing DDR&E.

Part III - Additional Information

Appendix A. Prior Audits and Other Reviews

General Accounting Office

Report No. GAO/NSIAD-93-150 (OSD Case No. 9391), "Military Bases: Army's Planned Consolidation of RDT&E Activities," April 29, 1993, concluded that the Army's April 1991 estimated military construction costs for the Army Research Laboratory consolidation have increased slightly. The estimated savings from the Army consolidation will result from the elimination of 774 civilian positions. The report contained no recommendations.

Report No. GAO/NSIAD-92-316 (OSD Case No. 9211), "Military Bases: Navy's Planned Consolidation of RDT&E Activities," August 20, 1992, concluded that the Navy's April 1991 estimated military construction costs for the Navy laboratory consolidation had not changed materially since the Navy submitted its estimates to the Base Realignment and Closure Commission (BRAC). The report also concluded that DoD is taking steps to reduce the Military Departments' duplication in common research areas through the Tri-Service Science and Technology Reliance Program. The report contained no recommendations.

Inspector General, DoD

Report No. 94-078, "Report on Microelectronics (Electronic Devices) Research, Development, Test and Evaluation Laboratories Within DoD," was issued April 8, 1994. This report identified Army plans to build a major new laboratory facility and to procure new equipment for microelectronic (electronic devices) research that may be unnecessary and redundant to an existing DoD capability. The audit concluded that as much as $306 million may be spent unnecessarily for new construction, equipment, and associated personnel-related expenses. The report recommended that the Comptroller of the Department of Defense (renamed Under Secretary of Defense [Comptroller] October 11, 1994) withhold the Military Construction funds for the project until an independent and objective analysis verifies the need for the proposed laboratory. The report also recommended that the Under Secretary of Defense for Acquisition and Technology task the Defense Science Board to study the need for new facilities from an overall DoD perspective. The Comptroller of the Department of Defense stated that a temporary withhold had been placed on Military Construction funds and suggested that BRAC 95 would provide an appropriate opportunity to restudy the issues. The Director, Defense Research and Engineering, nonconcurred because she felt that further study of the issue was not justified because BRAC 91 required the moves to the designated locations. The Army nonconcurred, stating that the report was factually inaccurate, had

badly flawed logic, and had legally objectionable conclusions. The Navy disagreed, stating that the Defense Science Board had conducted a thorough study of the issue of laboratory management. The Air Force agreed that an independent assessment by outside technical experts would be valuable. This report is now in the audit resolution process.

Report No. 94-075, "Report on Advanced Materials Research, Development, Test and Evaluation Laboratories Within DoD," was issued April 1, 1994. The audit identified Army and Navy plans to build major new laboratory facilities and to procure new equipment for advanced materials research that may be unnecessary and redundant to existing DoD capability. The audit concluded that the DoD could avoid as much as $160 million for new building construction and equipment by utilizing existing Air Force laboratory space and equipment. The report recommended that the Comptroller of the Department of Defense withhold the Military Construction funds for the identified projects until an independent and objective analysis has been completed that reevaluates the proposed new laboratories. The report also recommended that the Under Secretary of Defense for Acquisition and Technology task the Defense Science Board to study the need for those new facilities from an overall DoD perspective.

The Comptroller of the Department of Defense stated that a temporary withhold had been placed on Military Construction funds and suggested that BRAC 95 would provide an appropriate opportunity to restudy the issues. The Director, Defense Research and Engineering, nonconcurred because she felt that further study of the issue was not justified because BRAC 91 requires the moves to the designated locations. The Army nonconcurred, stating that the report was factually inaccurate, was badly flawed in logic, and contained legally objectionable conclusions. The Navy nonconcurred stating that the Navy has demonstrated a need for the planned materials facilities as part of the 1991 and 1993 BRAC process. The Air Force agreed that an independent assessment by outside technical experts would be valuable. This report is now in the audit resolution process.

Report No. 93-092, "Base Closure and Realignment Budget Data for the Naval Surface Warfare Center," was issued April 29, 1993. The audit objective was to evaluate increases in military construction project costs for base realignment and closure over the estimated costs provided to the BRAC Commission. This review concentrated on the realignments of portions of three facilities to the Naval Surface Warfare Center, Dahlgren Division, and another organization from the Annapolis Detachment to the Philadelphia Detachment of the Carderock Division. The report concluded that project costs, at a combined cost of $36.5 million for two construction projects, were overstated by at least $4.8 million. The audit questioned an additional $9.8 million. The report recommended that the Navy revise and resubmit military construction cost estimates and adjust allocated funding. The report also recommended that the Navy establish procedures to validate military construction estimates before budget submissions. The Navy concurred with the recommendations, submitted revised cost estimates, and reduced the funding allocations by $5.7 million.

The Navy also issued procedures for the validation of military construction estimates. The report also recommended that the Comptroller of the Department of Defense adjust Navy funding as appropriate. The Comptroller of the Department of Defense concurred and reduced the funding.

Report No. 93-052, "Base Closure and Realignment Budget Data for the Naval Surface Warfare Center," was issued February 10, 1993. The objective of the audit was to evaluate increases in military construction project costs for base realignment and closure over the estimated costs provided to the BRAC Commission. This audit focused on the realignment of two Naval Surface Warfare Center elements to Dahlgren, Virginia, and of another facility to Carderock, Maryland. The audit concluded that the costs for the Dahlgren project, estimated at $33 million, were overstated by $18.4 million and that the costs for the two Carderock projects, estimated at a total of $26.5 million, were understated by $7.5 million. The report recommended that the Navy revise and resubmit military construction cost estimates. The Navy concurred with the recommendations, but nonconcurred with the $18.4 million reduction for the Dahlgren project. The Navy's revision also reduced the cost for the Dahlgren project by $9.8 million and increased the Carderock project costs by $3.8 million.

Army Audit Agency

Report No. SR 92-702, "Base Realignment and Closure Construction Requirements," was issued August 12, 1992. The objective of the audit was to review the adequacy of support for construction projects related to realignments involving eight installations from the BRAC 91. Specifically, these installations included the Adelphi Laboratory Center and Aberdeen Proving Ground, Maryland. At the Adelphi Laboratory Center, the audit concluded that $10 million in construction costs could not be supported and that $15.2 million in construction costs were inappropriate for base realignment funding on a total estimated project cost of $126.3 million. The audit also concluded that a proposed $7.2 million parking structure that was part of the construction project at Adelphi was unnecessary. At the Aberdeen Proving Ground, the audit concluded that $2.9 million in proposed construction costs were not adequately supported and that $8.8 million in construction costs were inappropriate for base realignment funding on a total estimated project cost of $66.4 million. The audit also concluded that $20.6 million in construction costs should have been included that were not. The Army revised construction cost estimates in accordance with audit recommendations.

"Review of DMRD 922 Implementation: Memorandum Report to Assistant Secretary of the Army (Financial Management)" was issued March 30, 1992. The audit objective was to evaluate DMRD 922 savings and a baseline for measuring these savings. The audit concluded that the Army savings calculations for DMRD 922 could not be supported.

The audit also found that only a small portion of the costs associated with implementation of DMRD 922 had been reported. The Army responded by preparing a detailed implementation plan in accordance with the audit recommendations.

Appendix B. Acronyms Used in Organization Chart

Organizations Involved in Research

ALEX	Alexandria, Virginia
AMC	Army Materiel Command
ARDEC	Armament Research, Development and Engineering Center
ARL	Army Research Laboratory
ASC	Aeronautical System Center
ATCOM	Aviation and Troop Transportation Command
AVRDEC	Aviation Research, Development and Engineering Center
BMDO	Ballistic Missile Defense Organization
CBDCOM	Chemical and Biological Defense Command
CECOM	Communications, Electronics Command
CMU	CMU (DoD Software Engineering Institute)
CNA	Center for Naval Analyses
CERDEC	Cold Regions Research, Development and Engineering Center
CRDEC	Chemical Research, Development and Engineering Center
DNA	Defense Nuclear Agency
ESC	Electronic Systems Command
IAT	Institute for Advanced Technology
IDA	Institute for Defense Analyses
LMI	Logistics Management Institute
MICOM	Missile Command
MIT/LL	Massachusetts Institute of Technology, Lincoln Laboratory
MRDEC	Missile Research, Development and Engineering Center
NAVAIR	Naval Air Systems Command
NAVSEA	Naval Sea Systems Command
NAWC	Naval Air Warfare Center
NCCOSC	Naval Communication and Control Ocean Surveillance Center
NDRI	National Defense Research Institute
NRaD	Navy Research and Development
NRDEC	Natick Research, Development and Engineering Center
NRL	Navy Research Laboratory
NUWC	Naval Underwater Warfare Center
OT&E	Operational Test and Evaluation
RAND-PAF	Rand-Project Air Force
SPAWAR	Space and Naval Warfare Systems Command
SMC	Space and Missile Command
TACOM	Tank-Automotive Command
TARDEC	Tank-Automotive Research, Development and Engineering Center

Appendix C. Summary of Microelectronic and Material Laboratories

Microelectronic Laboratories - Data

Department Or Center	Laboratory	Square Feet	Equipment Cost ($ in Thousands)	Personnel Quantity
Army	ARL-EPSD	57,464	$24,200	333
Army	CECOM-NVESD	16,892	12,100	48
Navy	NRAD	30,928	26,200	87
Navy	NRL-ED	41,426	16,300	147
Air Force	Phillips	10,248	13,800	87
Air Force	Rome-Griffiss	13,033	18,000	127
Air Force	Rome-Hanscom	51,241	15,900	121
Air Force	Wright-EL	35,936	25,300	128

Advanced Materials (AM) Laboratories - Data

Department Or Center	Laboratory	Square Feet	Equipment Cost ($ in Thousands)	Personnel Quantity
Army	ARL-MD	506,205	$34,046	395
Army	ARDEC	19,587	7,175	155
Navy	NAWC	51,784	7,120	75
Navy	NRL	82,819	19,615	176
Navy	NSWC-CD	200,949	43,469	219
Navy	NSWC-DD	78,292	18,865	152
Air Force	Wright-ML	385,760	38,479	268

Electronic Devices and Advanced Materials Laboratories Totals

Total		1,582,564	$320,569	2,518

Appendix D. Project Reliance Projected Savings Estimates by Military Department

	Savings (Costs) In Millions						
	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	Totals
Army							
RDT&E	$34.5	$45.8	$56.8	$75.0	$75.0	$75.0	$362.1
Procurement	8.0	14.3	17.5	23.4	23.4	23.4	110.0
Military Construction	(5.5)	(1.4)	(1.6)	(2.2)	(2.2)	(2.2)	(15.1)
Sub-Total Army	$37.0	$58.7	$72.7	$96.2	$96.2	$96.2	$457.0
Navy							
RDT&E	$0.0	$0.8	$3.6	$6.7	$7.3	$7.6	$ 26.0
Navy Industrial Fund	4.8	34.6	58.9	92.6	118.9	121.8	431.6
Operations & Maintenance	(1.2)	(0.9)	(0.2)	0.6	(0.7)	(5.4)	(7.8)
Military Personnel	2.7	3.5	5.2	6.2	7.1	7.3	32.0
Military Construction	12.2	13.7	4.1	5.0	8.8	0.0	43.8
Sub-Total Navy	$18.5	$51.7	$71.6	$111.1	$141.1	$131.3	$525.6
Air Force							
Operations & Maintenance	$0.0	$3.4	$3.5	$3.6	$3.7	$3.8	$18.0
RDT&E	7.4	12.8	13.2	13.6	14.0	14.5	75.5
Sub-Total Air Force	$7.4	$16.2	$16.7	$17.2	$17.7	$18.3	$93.5
Total Project Reliance Projected Savings	**$62.9**	**$126.6**	**$161.0**	**$224.5**	**$255.3**	**$245.8**	**$1,076.1**

Appendix E. Consideration of Project Reliance in Laboratory Planning

Activity	Reliance in Planning
ARMY:	
EPSD, ARL, Fort Monmouth	Yes
Materials Directorate, ARL	No
Armament RDEC, Picatinny Arsenal	No
Natick RDEC, Natick	N/A
Tank-Automotive RDEC, Warren	No
NVESD, Fort Belvoir	Yes
AMSAA, Aberdeen Proving Ground	N/A
NAVY:	
NRL - Electronics, Washington, DC	Yes
NRL - Materials, Washington, DC	No
NAWC, Warminster	Yes
NSWC, Annapolis	No
NSWC, White Oak	No
NCCOSC, San Diego	Yes
AIR FORCE:	
Phillips Laboratory, Kirtland AFB	No
Rome Laboratory, Griffiss AFB	Yes
Wright Laboratory - Electronics, W-P AFB	Yes
Wright Laboratory - Materials, W-P AFB	No

Appendix F. Review of Agreements Between the Military Departments and Laboratories for Project Reliance References

Microelectronics Laboratories

Department Or Center	Laboratory	Number of Agreements	Refer to Reliance
Army	ARL-EPSD	42	N
Army	CECOM-NVESD	3	N
Navy	NRAD	1	N
Navy	NRL-ED	0	N
Air Force	Phillips	11	N
Air Force	Rome-Griffiss	4	N
Air Force	Rome-Hanscom	12	N
Air Force	Wright-EL	9	N
Total		82	

Materials Laboratories

Department or Center	Laboratory	Number of Agreements	Refer to Reliance
Army	ARL-MD	12	N
Army	ARDEC	2	N
Army	TARDEC	14	N
Navy	NAWC	5	Y[1]
Navy	NRL-MD	0	N
Navy	NSWC-CD	11	Y[2]
Navy	NSWC-DD	6	Y
Air Force	Wright-ML	42	N
Total		92	

[1]Only 2 of the 5 agreements referred to Project Reliance.
[2]Only 1 of the 11 agreements referred to Project Reliance.

Appendix G. Microelectronic and Material Laboratories Comparison of Personnel Changes[1]

Advanced Materials Laboratories[2]	Fiscal Years 1990	1993	Change
ARDEC, Picitinny Army Arsenal	177[3]	155	(22)
ARL Materials Directorate	412	395	(17)
NAWC, Aircraft Div., Warminster	87	75	(12)
NRL Materials Science & Technology	193	176	(17)
NSWC Carderock Division, Annapolis	229	219	(10)
NSWC Dahlgren Division, White Oak	186	152	(34)
Wright Laboratory Materials Dir.	278[4]	268	(10)
Sub-Total	1,562	1,440	(122)

Electronics Devices Laboratories	Fiscal Years 1990	1993	Change
ARL EPSD, Fort Monmouth, NJ	306	333	27
CECOM, NVESD, Fort Belvoir, MD[5]	123	123	(0)
NRL ERD, Washington, DC	141	147	6
NRAD, San Diego, CA	90	87	(3)
Phillips Laboratory, Kirtland AFB	99	87	(12)
Rome Laboratory, Griffiss, AFB	146	127	(19)
Rome Laboratory, Hanscom AFB	146	121	(25)
Wright Laboratory, WPAFB, OH	141	128	(13)
Sub-Total	1,192	1,153	(39)
Total	2,754	2,593	(161)
Percent Increase (Decrease)			(5.8%)

[1]FY numbers include full-time and part-time permanent, full-time temporary, interns, co-ops, military, and overstrengths.
[2]Army Material Systems Analysis Activity, Aberdeen, MD, and Tank-Automotive Research, Development and Engineering Center, Warren, MI, were excluded as their materials work was less than 1 percent of their total funding.
[3]Numbers include Benet personnel.
[4]Baseline numbers not available, FY 1991 numbers substituted.
[5]About 75 staff transferred from Night Vision Electronic Sensors Directorate to the Adelphi Laboratory.

Appendix H. Summary of Funding Changes in Advanced Materials and Electronic Devices Laboratories

Funding
(Dollars in Millions)

	Baseline FY 90	Current FY 93	Percent Change
Advanced Materials Laboratories[1]			
ARL Materials Directorate	$ 25.4	$ 22.9	(9.8%)
Picitinny Army Arsenal, ARDEC	9.6	10.6	10.4%
NAWC, Aircraft Div., Warminster	14.0	17.4	24.3%
NRL Materials Science & Technology	21.9	31.6	44.3%
NSWC Carderock Division, Annapolis	47.8[2]	53.6	12.1%
NSWC Dahlgren Division, White Oak	31.5	29.2	(7.3%)
Wright Laboratory Materials Dir.	139.7	140.3	0.4%
Sub-Totals	$289.9	$305.6	5.4%
Electronics Devices Laboratories			
ARL EPSD, Fort Monmouth, NJ	$ 84.8	$ 91.3	7.7%
NVESD, Fort Belvoir, VA	27.0	16.5	(38.9%)
NRL EPSD, Washington, DC	45.8	46.6	(1.7%)
NRAD, San Diego	20.4	23.9	17.2%
Wright Laboratory, WPAFB, OH	53.5	67.6	26.4%
Rome Laboratory, Griffiss AFB	18.2	21.5	18.1%
Phillips Laboratory, Kirtland AFB	86.9	54.2	(37.6%)
Rome Laboratory, Hanscom AFB	18.9	26.8	41.8%
Sub-Totals	$355.5	$348.4	(2.0%)
Totals	$645.4	$654.0	1.3%

[1]Army Materials Systems Analyses Activity, Aberdeen, Maryland, and Tank-Automotive Research, Development and Engineering Center, Warren, Michigan, were not included as their materials work was less than 1 percent of their total funding.
[2]FY 1990 figures were not available, FY 1991 figures are used as the baseline.

Appendix I. Research Overlap by Technology Sub-Areas

Department Or Center	Laboratory	Microelectronics Laboratories			
		Microelec-tronics	Electro-Optical	Radio Frequency	Electronic Materials
Army	ARL-EPSD	X	X	X	X
Army	CECOM-NVESD		X		
Navy	NRAD	X	X	X	X
Navy	NRL-ED	X	X	X	X
Air Force	Phillips	X	X	X	
Air Force	Rome-Griffiss	X	X	X	X
Air Force	Rome-Hanscom		X	X	X
Air Force	WL-EL	X	X	X	X

Department Or Center	Laboratory	Materials Laboratories										
		1	2	3	4	5	6	7	8	9	10	11
Army	ARL-MD	X	X	X	X		X	X	X	X		X
Army	ARDEC	X		X			X				X	X
Army	TARDEC			X	X		X				X	X
Navy	NAWC	X	X		X	X	X	X	X	X	X	X
Navy	NRL-MD					X			X			
Navy	NSWC-CD	X	X			X	X	X	X	X		X
Navy	NSWC-DD		X		X	X	X	X			X	
Air Force	WL-ML	X	X		X	X	X	X	X	X	X	X

Advanced Materials:
AM-1 Structural
AM-2 High Temperature
AM-3 Armor and Anti-Armor
AM-4 Electromagnetic Protection
AM-5 Electrical, Magnetic, & Optical
AM-6 Special Function
AM-7 Biomolecular and Processes
AM-8 Processing and Manufacturing Research
AM-9 Nondestructive Inspection Evaluation
AM-10 Transition & Technology Demo
AM-11 Signature and Control

Appendix J. Project Reliance Projected Savings and Implementation Costs

	Savings (Costs) in Millions						
	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	Totals
Army							
RDT&E	$34.5	$45.8	$56.8	$75.0	$75.0	$75.0	$362.1
Procurement	8.0	14.3	17.5	23.4	23.4	23.4	110.0
Military Construction	(5.5)	(1.4)	(1.6)	(2.2)	(2.2)	(2.2)	(15.1)
Sub-Total							
Savings (Per Army)	37.0	$58.7	$72.7	$96.2	$96.2	$96.2	$457.0
Less:							
Army Research Laboratory Implementation							
Costs (Per Auditors)	0	(23.2)	(162.1)	(109.7)	(36.7)	(83.7)	(415.4)
Net Savings (Increased Costs)							
Costs (Per Auditors)	$37.0	$35.5	($89.4)	($13.5)	($59.5)	($12.5)	$41.6

Appendix K. Summary of Potential Benefits Resulting From Audit

Recommendation Reference	Description of Benefit	Amount and/or Type of Benefit
A.1.	Internal Control. Provide OSD-level management and oversight of the DoD laboratories.	Nonmonetary.
A.2.	Internal Control. Provide DoD planning guidance to the Advanced Research Projects Agency, Federally Funded Research and Development Centers, and Military Department laboratories.	Nonmonetary.
A.3.	Internal Control. Ensure accurate and timely submission of data for the Science and Technology Program.	Nonmonetary.
B.1.	Internal Control. Ensure that redundant and unnecessary laboratory facilities are not constructed.	Nonquantifiable because requirements for future laboratory facilities are undetermined.
B.2.	Internal Control. Ensure that redundant and unnecessary laboratory equipment is not procured.	Nonquantifiable because requirements for future procurements of laboratory equipment are undetermined.
B.3.	Internal Control. Ensure that redundant and unnecessary research projects are not started.	Nonquantifiable because future research projects have not been determined.
C.1.	Internal Control. Clarify responsibility for coordination of the DoD Science and Technology Program.	Nonmonetary.

Appendix K. Summary of Potential Benefits Resulting From Audit

Recommendation Reference	Description of Benefit	Amount and/or Type of Benefit
C.2.	Internal Control. Ensure participation of all activities that fund research projects in the planning process so as to reduce or eliminate funding of redundant and unnecessary research projects.	Nonquantifiable because future research projects have not been determined.
C.3.	Internal Control. Ensure participation of all activities that fund research projects in the planning process so as to reduce or eliminate funding of redundant and unnecessary research projects.	Nonquantifiable because future research projects have not been determined.

Appendix L. Organizations Visited or Contacted

Office of the Secretary of Defense

Comptroller, Department of Defense, Arlington, VA
Director, Defense Research and Engineering, Arlington, VA
Joint Directors of Laboratories, Bolling Air Force Base, Washington, DC

Department of the Army

Deputy Assistant Secretary of the Army (Research and Technology), Washington, DC
Army Communications and Electronics Command, Night Vision and Electronic Sensors Directorate, Fort Belvoir, VA
Army Tank-Automotive Command, Warren, MI
Army Natick Research, Development and Engineering Center, Natick, MA
Army Research Laboratory, Adelphi, MD
Army Research Laboratory, Materials Directorate, Watertown, MA
Army Research Laboratory, Electronics and Power Sources Directorate, Fort Monmouth, NJ
Army Material Systems Analysis Activity, Aberdeen, MD
Armament Research Development and Engineering Center, Picatinny, NJ

Department of the Navy

Naval Air Warfare Center, Indianapolis, IN
Naval Air Warfare Center, Patuxent River, MD
Naval Research Laboratory, Washington, DC
Naval Command, Control, and Ocean Surveillance Center, San Diego, CA
Naval Surface Warfare Center, Carderock Division, Annapolis, MD
Naval Surface Warfare Center, Crane, IN

Department of the Air Force

Phillips Laboratory, Kirtland Air Force Base, NM
Rome Laboratory, Griffiss Air Force Base, NY
Rome Laboratory, Hanscom Air Force Base, MA
Wright Laboratory, Wright-Patterson Air Force Base, OH

Defense Agencies

Advanced Research Projects Agency
Ballistic Missile Defense Office

Non-Defense Federal Organization

Congressional Research Service, Science Policy Research Division, Washington, DC

Contractor

Massachusetts Institute of Technology, Lincoln Laboratories, Hanscom Air Force Base, MA

Appendix M. Report Distribution

Office of the Secretary of Defense

Under Secretary of Defense for Acquisition and Technology
Under Secretary of Defense (Comptroller)
Director, Defense Research and Engineering
Assistant Secretary of Defense (Economic Security)
Deputy Under Secretary of Defense (Acquisition Reform)
Deputy Under Secretary of Defense (Logistics)
Assistant to the Secretary of Defense (Public Affairs)
Joint Directors of Laboratories

Department of the Army

Secretary of the Army
Deputy Assistant Secretary of the Army
Deputy Assistant Secretary of the Army (Research and Technology)
Army Communications and Electronics Command
Army Tank-Automotive Command
Auditor General, Department of the Army
Armament Research Development and Engineering Center
Army Natick Research, Development and Engineering Center
Army Research Laboratory
Army Material Systems Analysis Activity

Department of the Navy

Secretary of the Navy
Assistant Secretary of the Navy (Financial Management)
Comptroller of the Navy
Auditor General, Department of the Navy
Office of Naval Research
Naval Air Warfare Center
Naval Research Laboratory
Naval Command, Control, and Ocean Surveillance Center
Naval Surface Warfare Center

Department of the Air Force

Secretary of the Air Force
Assistant Secretary of the Air Force (Financial Management and Comptroller)
Deputy Assistant Secretary of the Air Force (Research and Engineering)
Auditor General, Department of the Air Force
Phillips Laboratory, Kirtland Air Force Base, NM
Rome Laboratory, Griffiss Air Force Base, NY
Rome Laboratory, Hanscom Air Force Base, MA
Wright Laboratory, Wright-Patterson Air Force Base, OH

Defense Organizations

Director, Defense Contract Audit Agency
Director, Defense Logistics Agency
Director, National Security Agency
Inspector General, Central Imagery Office
Inspector General, Defense Intelligence Agency
Inspector General, National Security Agency
Director, Defense Logistics Studies Information Exchange
Director, Advanced Research Projects Agency
Director, Ballistic Missile Defense Organization

Non-Defense Organizations

Office of Management and Budget
U.S. General Accounting Office, National Security and International Affairs Division, Technical Information Center
Congressional Research Service, Science Policy Research Division
Chairman and Ranking Minority Member of Each of the Following Congressional Committees and Subcommittees:
- Senate Committee on Appropriations
- Senate Subcommittee on Defense, Committee on Appropriations
- Senate Committee on Armed Services
- Senate Committee on Governmental Affairs
- House Committee on Appropriations
- House Subcommittee on Defense, Committee on Appropriations
- House Committee on Armed Services
- House Committee on Government Operations
- House Subcommittee on Legislation and National Security, Committee on Government Operations

Part IV - Management Comments

Director of Defense Research and Engineering Comments

DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING

WASHINGTON, DC 20301-3010

09 NOV 1994

MEMORANDUM FOR INSPECTOR GENERAL, DEPARTMENT OF DEFENSE

SUBJECT: Draft Report on Advanced Materials and Electronic Devices Laboratories Within DoD (Project No. 3AB-0058)

This responds to your request for comments regarding the subject report. In general the findings and recommendations of the report are acceptable although the details which form the basis for some of the findings may be argued. The report is outdated in that it overlooks many of the recent initiatives and actions taken within DDR&E, which have effectively implemented many of the recommendations of the report. We credit your efforts for contributing toward the implementation of some of these initiatives.

In keeping with your request, we have responded to the internal control weakness highlighted in Part I, and to each of the findings and recommendations of Part II. A separate response from the Ballistic Missile Defense Office is included.

For
Anita K. Jones

Attachments

INTERNAL CONTROLS

Controls were not effective for monitoring DoD science and technology funds. Controls were also not effective in determining the need for new facilities and equipment for DoD laboratories and for controlling and monitoring Joint Services Program Planning.

The internal controls in place when this audit was initiated were the result of the decentralized management practices of the previous administration. Decentralized management facilitates the rapid development of new concepts and ideas which helped win the Cold War yet, these practices do not always effect efficient or frugal use of resources. DDR&E has responded appropriately to changing world situations with management practices that reflect a balance of empowerment and stewardship of taxpayer resources.

FINDING A. POLICY GUIDANCE AND OVERSIGHT

The DDR&E has historically provided limited policy guidance and oversight of the Military Department laboratories and Advanced Research Projects Agency. Although the DDR&E has the responsibility to provide this guidance and oversight, she lacks the staff and resources to do so. As a result, the Science and Technology investment strategy and the degree of coordinated planning accomplished from a DoD perspective is limited. At the conclusion of our audit, positive indications showed that DDR&E was preparing to issue science and technology programming guidance for use in prioritizing FYs 1996 through 2001 Future Years Defense Programs.

RECOMMENDATIONS FOR CORRECTIVE ACTION

1. Authorize additional personnel and funding for the Office of the Director, Defense Research and Engineering, to provide adequate DoD-level management and oversight of the DoD laboratories.

2. Ensure that the Office of the Director, Defense Research and Engineering, prepares strategic plans, annual planning guidance, and investment plans to coordinate the science and technology efforts of the DoD Components.

3. Require the Office of the Director, Defense Research and Engineering, to develop a management information system to accurately monitor laboratory funding resources.

The recommendations related to this finding are in various stages of implementation and we therefore concur with them. The comments on page 14 of the draft audit report highlight the root cause of this finding:

Considering the scope of the DoD science and technology program and the size and complexity of the laboratory community, the DDR&E lacks the personnel and other resources necessary to effectively accomplish its assigned leadership and management roles. Current authorized strength for all DDR&E functions is 29 full-time personnel, with an additional 34 personnel available to the DDR&E for task assignment from the Defense Support Agency ...

Of these 29 personnel, only 3 are currently assigned to DoD laboratory management. ...

As the Inspector General indicates in the draft audit report, the Authority of the DDR&E is documented and in most cases sufficient. However, manpower and timely, accurate information with which to exercise this authority are extremely scarce. Without these resources implementation of the remaining recommendations associated with findings A, B, and C in the draft audit report would be meaningless. We address the specific recommendations of the draft audit report with this caveat in mind in the paragraphs that follow.

The only officially approved and staffed position in the Office of the Deputy Director of Research and Engineering (Laboratory Management), a position filled by an Interagency Personnel Agreement (IPA), which provides senior level DoD management and oversight dedicated to the DoD laboratories, is one GS-6 secretary. Authorization to make the Deputy Director a permanent Senior Executive Service level staff position has been initiated. One senior staff level position, however, will not satisfy the manpower requirement necessary for the DDR&E to effectively exercise management and oversight responsibilities. Assigning DDR&E the responsibility for implementing Project Reliance and requiring the Joint Directors of Laboratories to report to the DDR&E for Project Reliance activities (see recommendations for finding C) would allow DDR&E to leverage the manpower and expertise within the Services and thus minimize expansion of the DDR&E staff.

The Defense Science and Technology Strategy and a companion document, The Defense Technology Plan, have satisfied recommendation number two of this finding. Such documents will be improved and issued periodically as appropriate.

DDR&E recognizes the necessity of timely, accurate information to effect informed management decisions and is aggressively pursuing development and implementation of a management information system capable of providing this information in conjunction with the CIM initiative. Information must be available, not only to DoD but to the Service Science and Technology Executives and laboratory directors.

FINDING B. INVESTMENT IN LABORATORIES

The Department of Defense is making redundant investments in Advanced Materials and Electronic Devices laboratories. Redundant investments are occurring because the Military Departments are not adequately coordinating and controlling their investments in research facilities, equipment, and research projects because of a lack of oversight by the Office of the Director, Defense Research and Engineering. This lack of oversight results in questioned costs for facilities and equipment.

RECOMMENDATIONS FOR CORRECTIVE ACTION

1. Require the Military Departments and Defense agencies to submit all proposed laboratory Military Construction projects to the Office of the Director, Defense Research and Engineering, for coordination and approval.

2. Require the Military Departments and Defense agencies to submit all proposed research equipment procurements with a cost threshold of more than $250,000 to the Office of the Director, Defense Research and Engineering, for coordination and approval.

3. Require the Military Departments and Defense agencies to submit, on a more timely basis, detailed annual research program plans to the Office of the Director, Defense Research and Engineering, for coordination and approval.

The specific facts and dollar amounts of this finding have been disputed as incorrect and misleading[1] however the bottom line is that we can do better at coordinating infrastructure investments across the services. Infrastructure must be addressed in terms of both downsizing the existing infrastructure to eliminate excess capacity, and managing future investments to insure only facilities essential to meeting our warfighting needs and unavailable through other sources (industry, academia, other agencies) are constructed.

The BRAC '95 process is an opportunity not only to reduce our current infrastructure but to help effect a change in the way we do business by looking across the services for common capabilities and required capacity. The RDT&E organization and infrastructure recommended by this process will set the stage for how we do business in years to come.

Two significant recent study efforts have looked at RDT&E infrastructure. The first is a Defense Science Board Task Force which has served as counselor to DDR&E in shaping vision and providing implementation guidance. In its interim report, the Task Force stressed the need for outsourcing, modernization, and quality improvements; recommended a series of actions to help the Service Secretaries in the modernization of their laboratories;

[1] Army response to Report No. 94-078, "Report on Microelectronics (Electronic Devices) Research, Development, Test and Evaluation Laboratories Within DoD".

and stated criteria by which progress can be judged. DDR&E is aggressively pursuing implementation of the Task Force's recommendations. The second study is a Federal Interagency Laboratory Review directed by the National Science and Technology Council (NSTC). The Presidential Review Directive (PRD) asks DoD, DoE, and NASA to evaluate their core capabilities and comparative advantages in meeting a series of national needs. To respond to the Directive, DDR&E conducted a Laboratory Infrastructure Capabilities (LIC) study to assess the relative capabilities of in-house laboratories, FFRDCs, academia, and industry in 12 technology/product areas which are based on the 19 technology areas described in the Defense Technology Plan. Results of this study formed the basis for the DoD Interim Response to the PRD.

Additionally, the issue of converting some of DoD laboratories to Government-owned, Company-Operated (GOCO) operations has been explored by the Services. They found two major drawbacks to the GOCO approach: conversion is extremely expensive, and the regulatory burden and caps on GOCO's (FFRDC's) have increased so that the advantages are no longer as pronounced as they were. The National Academy of Science conducted the "GOCO" study for the Army. They recommended an alternative way of incorporating the best parts of both systems. The Army has implemented this concept through a very innovative "federated" approach with its flagship R&D organization, the Army Research Laboratory (ARL), that makes our vision for a new way of doing business a reality. It exemplifies the boldness and wisdom with which our Military Departments are addressing the challenges to our infrastructure; other services are evaluating and incorporating this concept.

While we concur with the recommendation that DDR&E coordinate and approve all proposed laboratory Military Construction projects, the recommendation regarding research equipment is impractical when considering the administrative requirements necessary to implement such a review, and counter to the DDR&E objective of empowering laboratory directors and employing a redefined Reliance process to eliminate overlap. Using the dollar figures reported by the Inspector General in the draft audit report, the equipment investments judged to provide similar capabilities accounted for only approximately 13% of the total equipment investments. In addition, the fact that equipment providing similar capabilities exists within DoD laboratories does not necessarily warrant a finding worthy of corrective action. It ignores realities of scientific and technological investigation.

The goal of this recommendation can best be achieved through other means. The best way to eliminate duplication of equipment is through consolidation and downsizing of the laboratory infrastructure. The next best alternative is to prevent the future procurement of very expensive equipment, when such equipment exists and is available either within labs or industry/academia for use by the DoD laboratory community, by making Reliance participants accountable for coordinating such

procurements. This would benefit from a comprehensive facilities and equipment database, accessible through a management information system, and available to the laboratory directors. The management information system would allow researchers to identify what equipment is available for their use within the DoD inventory, where it is located, and how to coordinate its use. This is one of the capabilities of the management information system under development by the DDR&E.

Recommendation three of finding B has been implemented. The DDR&E has developed and implemented an organized logical process for conducting the review of research program plans. Annual S&T reviews are conducted by the Office of the DDR&E and programs are measured against the road map developed in the Defense Technology Area Plans. Assessments of each services' programs are back briefed to the Military Departments for corrective actions as needed. This is an iterative, annual process.

FINDING C. PROJECT RELIANCE

Project Reliance as currently implemented for the laboratories does not assure that research is conducted in the most efficient and effective manner throughout DoD. This condition is occurring in part because Director, Defense Research and Engineering, participation in and oversight of Project Reliance has been limited. As a result, the large savings originally promised by the establishment of Project Reliance have not been realized and few consolidations have occurred.

RECOMMENDATIONS FOR CORRECTIVE ACTION

1. Assign responsibility to the Director, Defense Research and Engineering, for implementing Project Reliance. The Joint Directors of Laboratories should report to the Director, Defense Research and Engineering, for Project Reliance activities.

2. Assign responsibility to the Director, Defense Research and Engineering, for establishing control measures to eliminate overlap of research projects and capabilities.

3. Require that all Military Departments and Defense agencies that conduct, fund, or contract for research and development participate actively in the Project Reliance planning process.

We concur with finding C and the substance of the associated recommendations, provided the DDR&E is resourced in accordance with recommendation one of finding A and that flexibility in implementation and operational nomenclature is recognized.

Director of the Advanced Research Projects Agency Comments

ADVANCED RESEARCH PROJECTS AGENCY
3701 NORTH FAIRFAX DRIVE
ARLINGTON, VA 22203-1714

NOV 4 1994

MEMORANDUM FOR DIRECTOR, ACQUISITION MANAGEMENT DIRECTORATE, INSPECTOR GENERAL, DOD

SUBJECT: Draft Report on Advanced Materials & Electronic Devices Laboratories Within DoD (Project 3AB-0058)

The subject draft report, dated August 24, 1994, has been reviewed and discussed with Mr. Vincent of your office on September 27, 1994. While none of the Findings are specifically addressed to ARPA, we nonconcur with the positions taken by the IG in Findings A and C as they pertain to ARPA.

Finding A: The IG finds that there is no central point within DoD to plan or execute an overall DoD Science and Technology (S&T) investment strategy. The report states (page 18) that the "overall ARPA investment strategy does not have a process to link the interests of the DoD and Military Departments; therefore, this investment strategy may not be in the overall best interest of the DoD." The IG recommends that DDR&E provide management and oversight of the DoD laboratories; prepare strategic plans, prepare annual planning guidance and investment plans to coordinate the S&T efforts within DoD; and develop an MIS database to accurately monitor laboratory funding resources.

Comments: ARPA nonconcurs with the IG's recommendations as they pertain to ARPA. ARPA's mission is to explore technological alternatives that, in the long-term, would provide the DoD and the Military Services with the military capabilities required for future combat scenarios, not to respond to their immediate day to day requirements. Further, the Services are totally involved in ARPA technologies through joint research programs and through the use of the Services as ARPA contracting agents.

Finding C: The IG determined that Project Reliance oversight is limited to only 26% of the total S&T budget in RDT&E and specifically mentions that the Ballistic Missile Defense Organization and ARPA are not included. The IG recommends that USD(A&T) assign responsibility to DDR&E to fully implement Project Reliance, establish control measures to eliminate overlap of research projects and capabilities; and require all DoD components that have RDT&E funding to "participate actively in the Project Reliance planning process."

Comments: ARPA nonconcurs with the IG's recommendations as they pertain to ARPA. The ARPA mission is totally different from that of the Service laboratories. ARPA was established to prevent

technological surprise, while the Service laboratories are there to tackle the immediate needs of their respective Service.

While ARPA has participated in Project Reliance at the senior management level, ARPA lacks the staffing necessary to participate in the many lower level Project Reliance meetings. ARPA and the Services did participate in the preparation of the Technology Area Plans that were coordinated by DDR&E. Effective interchange of information also takes place continually through the S&T reviews held annually, coordinating meetings with DDR&E, and attendance at various technical conferences and workshops. In the area of electronics, programs are also briefed to the Advisory Group on Electron Devices (AGED) by either the Service member through which the program is contracted or the ARPA member who sits on AGED. In the materials area, programs are briefed to the Technical Panel on Advanced Materials. Full participation in Project Reliance would keep ARPA from being able to accomplish its primary mission without a substantial increase in personnel.

Please contact Mr. Jim Fargo, (703) 696-2393, if additional information is needed or if you have any questions.

Duane A Adams
for Gary L. Denman
Director

Department of Defense Ballistic Missile Defense Organization Comments

DEPARTMENT OF DEFENSE
BALLISTIC MISSILE DEFENSE ORGANIZATION
7100 DEFENSE PENTAGON
WASHINGTON, DC 20301-7100

September 30, 1994

TRI

MEMORANDUM FOR DIRECTOR, DEFENSE RESEARCH AND ENGINEERING

SUBJECT: DoDIG Draft Report on Advanced Materials and Electronic Devices Laboratories Within DoD

The Ballistic Missile Defense Organization (BMDO) has reviewed the IG's report on Advanced Materials and Electronic Devices and offers the following comments:

a. Contrary to the claim made by the IG on page 9 of the report, BMDO feels that substantial coordination has taken place between BMDO and the military services in constructing our investment strategy for science and technology (S&T). The processes have not been formal or institutionalized, but substantial interaction takes place between BMDO and its executing agents in the services before funding decisions are finalized. These interactions include a coordination process with other service S&T programs in similar technical areas.

b. The discrepancies in funding levels reported to the IG and to the DDR&E by BMDO on page 16 are due to differences in taxonomy, as well as some uncertainty over which BMDO projects should be included in the S&T program (namely, which are 6.1, 6.2, and 6.3 programs). This problem should be eliminated with the FY94 reporting cycle.

c. The report seems to infer, on page 36, that BMDO is only a part-time participant in Project Reliance. This is not true. BMDO began coordination with the Joint Directors of Laboratories on Reliance in FY92. BMDO formally joined the Project in FY93 and has been a full and equal participant since that time.

Gary E Payton

GARY E. PAYTON, Col, USAF
Deputy for Technology
Readiness (Acting)

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