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Defense Research: A Primer on the Department of Defense's Research, Development, Test and Evaluation (RDT&E) Program

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ABSTRACT

This report describes the basic elements and issues of the Department of Defense's (DOD) Research, Development, Test and Evaluation (RDT&E) Program. It defines basic activities supported by the program, presents budget trends, discusses the management of program, and describes the infrastructure in which the program is implemented. This report is for staff new to the area of defense research and for senior staff interested in historical trends. This report will be updated periodically. For tracking congressional action on the current year's budget, the reader is referred to the Issue Brief entitled *Defense Research: DOD's Research, Development, Test and Evaluation (RDT&E) Program,* by the same author.

Defense Research: A Primer on the Department of Defense's Research, Development, Test and Evaluation (RDT&E) Program

Summary

Over the last 10 years, the country has spent an average of $36 billion a year on DOD's RDT&E program. About 80% of that goes toward the development of specific military systems or system components. Most of the rest, between $7 billion and $8 billion, goes toward more fundamental research, development, and demonstrations of sciences and technologies identified as important to military capabilities and operations (called the Science and Technology program).

Total RDT&E funding for the last 10 years has remained relatively level in nominal terms. However, when accounting for inflation, RDT&E funding peaked in FY1987 and declined fairly steadily until FY1997. The decline primarily occurred in those activities associated with developing specific weapon systems. Science and Technology funding during that time, although more volatile from year to year, has kept up with inflation. Maintaining a healthy Science and Technology program is a continuing concern of Congress.

The Undersecretary of Defense for Acquisition and Technology has been given the responsibility of overseeing the overall RDT&E budget. Reporting to the Undersecretary is the Director of Defense Research and Engineering (DDR&E), who is responsible for overseeing the Science and Technology program. Actual program management responsibility belongs to the Services and a number of Defense Agencies. Each Service and Defense Agency has its own process for planning its RDT&E and Science and Technology investment. The DDR&E is responsible for publishing a DOD-wide Science and Technology Strategy and Plan.

DOD's RDT&E budget supports work at universities, private firms, non-profits, federally financed research and development centers, Service-owned research facilities, and other federally owned research facilities. DOD currently has over 80 Research and Development facilities and 26 Test and Evaluation Centers.

Some issues that Congress has been addressing and likely will continue to deal with include: maintaining a healthy Science and Technology (S&T) investment; accelerating the transition of new technology from the laboratory to the field; downsizing DOD's RDT&E infrastructure; and integration with the commercial sector.

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Introduction

This report describes the basic elements and issues of the Department of Defense's (DOD) Research, Development, Test and Evaluation (RDT&E) program. Over the last 10 years, the country has spent an average of $36 billion a year on DOD's RDT&E program. About 80% of that goes toward the development or demonstration of specific military systems or system components. Most of the rest, between $7 billion and $8 billion per year, goes toward more fundamental research, development, and demonstrations in sciences and technologies identified as important to military capabilities and operations. Because it represents such a large investment and supports the development of the nation's high technology weapons systems, and the technology base upon which those systems rely, Congress has shown considerable interest in overseeing DOD's RDT&E program. And, although its share of the nation's overall expenditure on science and technology research and development has diminished over the years, the program still plays an important role in developing certain key technologies that impact commercial products and the overall economy. This report discusses the types of activities supported by the RDT&E program, trends in the program's budget, program management, and DOD's RDT&E infrastructure.

Program Activities

DOD's RDT&E program is one of the major elements of DOD's total budget. Other major elements include Personnel, Operations and Maintenance, and Procurement. For an introduction to DOD's overall budget, the reader is referred to CRS Report RL30002, *A Defense Budget Primer* (see For Additional Reading). The RDT&E program supports a wide range of activities; from basic research in science and engineering (e.g. physics, mathematics, materials, electronics) to the full scale development of specific weapons systems (e.g., the F-22 fighter or the Comanche helicopter).

The RDT&E budget is accordingly sub-divided into 7 separate activities: basic research, applied research, advanced technology development, demonstration and validation, engineering manufacturing development, management support, and operational systems development. These 7 activities are designated as 6.1 through 6.7. A description of each is given in **Figure 1**.

Figure 1 RDT&E Activities

6.1 Basic Research: Supports research that produces new knowledge in a scientific or technological area of interest to the military. Areas include atmospheric and space sciences, ocean sciences, biological and medical sciences, chemistry, cognitive and neural sciences, computer sciences, electronics, materials science, mathematics, mechanics, ocean sciences, physics, and terrestrial sciences. For example, basic research may study the electronic effects of infrared radiation on a certain class of materials.

6.2 Applied Research: Supports the exploratory development and initial maturation of new technologies for specific military application (or further developing existing technology for new military applications). An example would be studying the feasibility of integrating infrared detecting materials and electronics for night vision. Any hardware development would be primarily to demonstrate the capability of the technology to meet a military need in a simulated or laboratory environment.

6.3 Advanced Technology Development: Supports larger scale hardware development and integration and experiments that can demonstrate capability in more operationally realistic settings. An example might be equipping soldiers taking part in a training operation with a new prototype night vision goggle.

6.4 Demonstration and Validation: Supports the initial development and demonstration of a product designed specifically to meet an agreed upon set of performance standards associated with a validated operational need. Dem/Val, as it is often called, supports a formal acquisition program and typically involves a competition among different designs.

6.5 Engineering & Manufacturing Development: Supports the continued development and refinement of a specifically designed product that has demonstrated it can meet performance requirements and development of the necessary manufacturing processes needed to build that product.

6.6 Management Support: Supports the overhead costs associated with managing the RDT&E activities and running facilities.

6.7 Operational Systems Development: Supports the continued improvement and upgrading of products already in production.

Funding for 6.1 and 6.2 activities constitute what is called DOD's **Technology Base** program and is often referred to as the "seed corn" of DOD's technological capabilities. It is here where new technologies and their potential for military application are explored and developed (sometimes over long periods of time). A number of the technologies utilized with such great effect during the Gulf War (e.g. laser guided bombs, stealth, cruise missiles, night vision) can trace their origins to Technology Base programs initiated in the late 1960s and early 1970s.

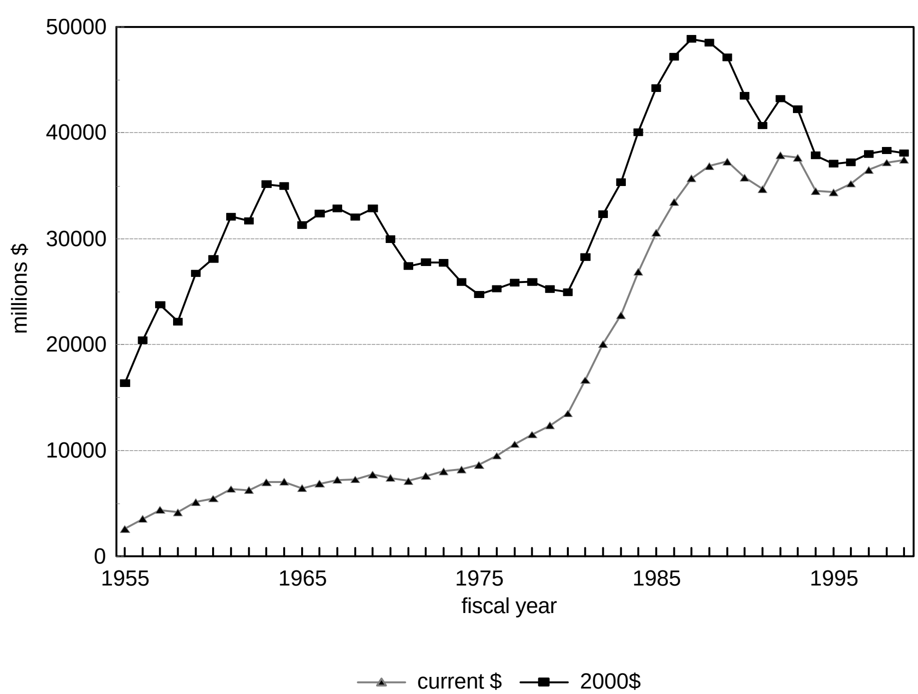
Advanced technology development (6.3) activities are meant to help technology make the transition from the laboratory to the field. Among these activities are **Advanced Technology Demonstrations** (**ATDs**, conducted by the Services individually for relatively unique Service needs) and **Advanced Concept Technology Demonstrations** (**ACTDs**, managed by the Office of the Secretary of Defense in cooperation with one or more of the Services for needs associated with joint operations). Taken together, these first three activities (6.1-6.3) constitute what is called DOD's **Science and Technology (S&T)** program. The S&T program does not support development in a formal acquisition program, although as one goes from 6.1 to 6.3, the connection to a specific military operational capability becomes more important and apparent.

Funding for 6.4, 6.5 and 6.7 activities does support a formal acquisition program where a specific new product (or product upgrade) is designed and developed to meet a certified military requirement. The lion's share of the RDT&E budget goes toward support of these activities. The acquisition process is discussed later in this report.

Budget Trends

RDT&E funding for the last 10 years has remained relatively flat in nominal terms. However, when accounting for inflation, RDT&E funding peaked in FY1987 and declined fairly steadily until FY1997 (see **Figure 2**). The steep increase in total RDT&E funding during the early part of the 1980s was the result of increased support for the development a specific new weapon systems associated with the Reagan Administration's military build-up. The decline in total RDT&E since the last half of the 1980s is the result of a slowing down in the development of specific new weapon systems. The decline in spending was initially in concert with other efforts to control federal budget deficits and then, later, continued in response to the break-up of the Soviet Union and the end of the Cold War.

Figure 2 Total RDT&E Funding



Beginning in the Carter Administration, funding for Science and Technology programs also grew, but at a slower rate (see **Figure 3**). With the end of the Cold War, Congress became concerned that a drop in near-term weapons development might adversely impact DOD's long term ability to develop new weapons systems. Congress maintained and even increased slightly funding for Science and Technology. After three years, however, faced with internal budget trade-offs, Congress was unable to sustain that level of investment (in real terms). If DOD and Congress seek to increase support for force modernization in the next few years, 6.4 and 6.5 funding may increase again, relative to the Science and Technology program.

Figure 3 Total RDT&E vs Total S&T

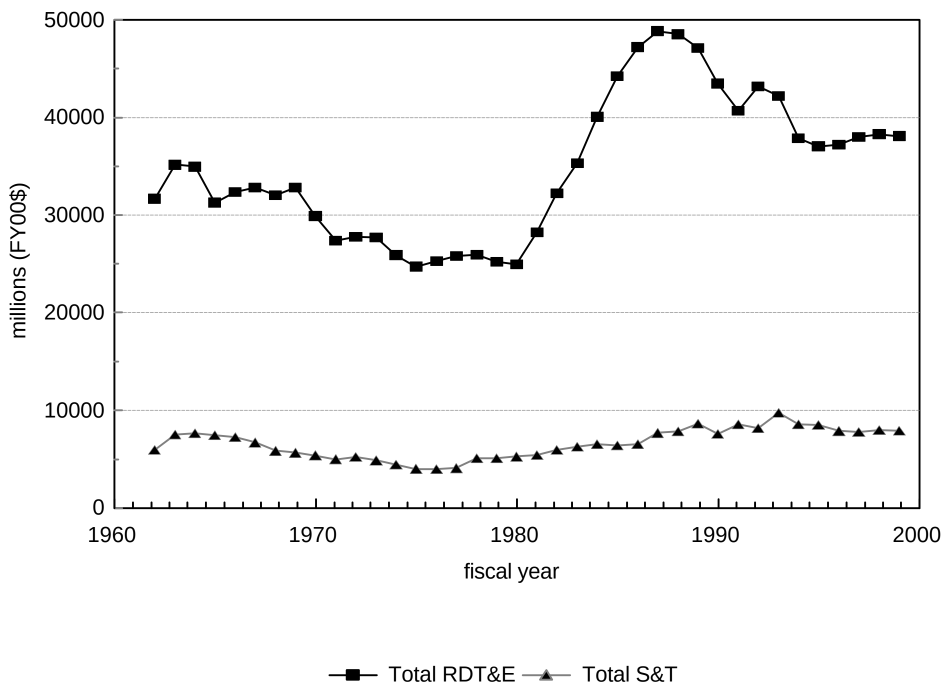
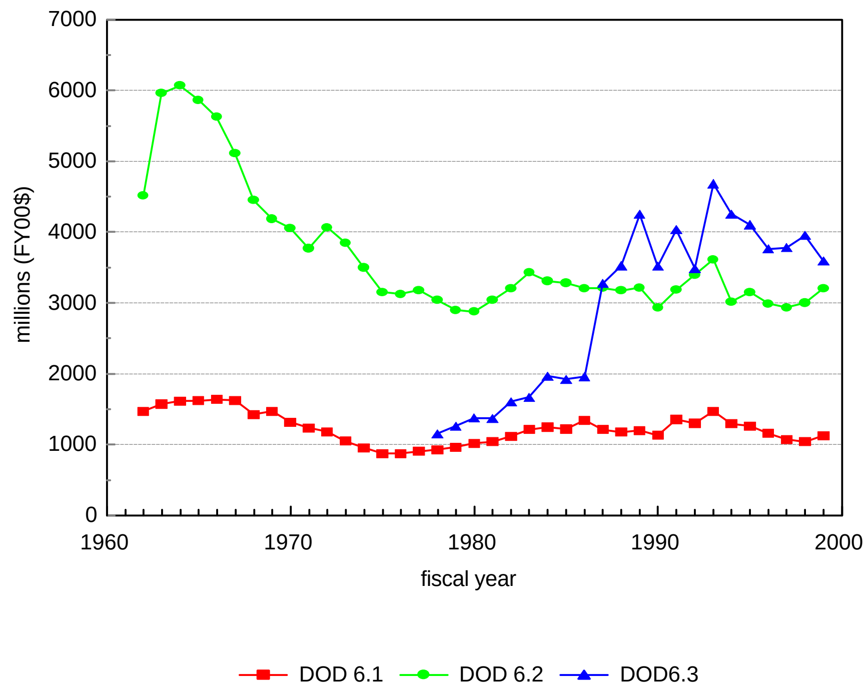


Figure 4 shows the funding trend for each activity within the Science and Technology program (6.1 through 6.3). Much of the increase in Science and Technology spending during the Reagan build-up was concentrated in Advanced Technology Development (6.3). The big step increase in 6.3 funding beginning in FY1986 was primarily due to the Strategic Defense Initiative, much of the funding for which was characterized as Advanced Technology Development. Funding for Basic Research (6.1) and Applied Research (6.2) has been relatively flat, in constant dollars, over the last 10 years. The university community, however, has expressed some concern over the slow erosion of Basic Research from its peak in FY1993. Much of the funding for Basic Research is spent at universities. While universities, as a whole, receive a decreasing share of their R&D funds from DOD, DOD does provide a disproportionate share of funding in certain engineering fields (such as electrical engineering and materials) and mathematics.

Figure 4 S&T Funding by Activity



Management

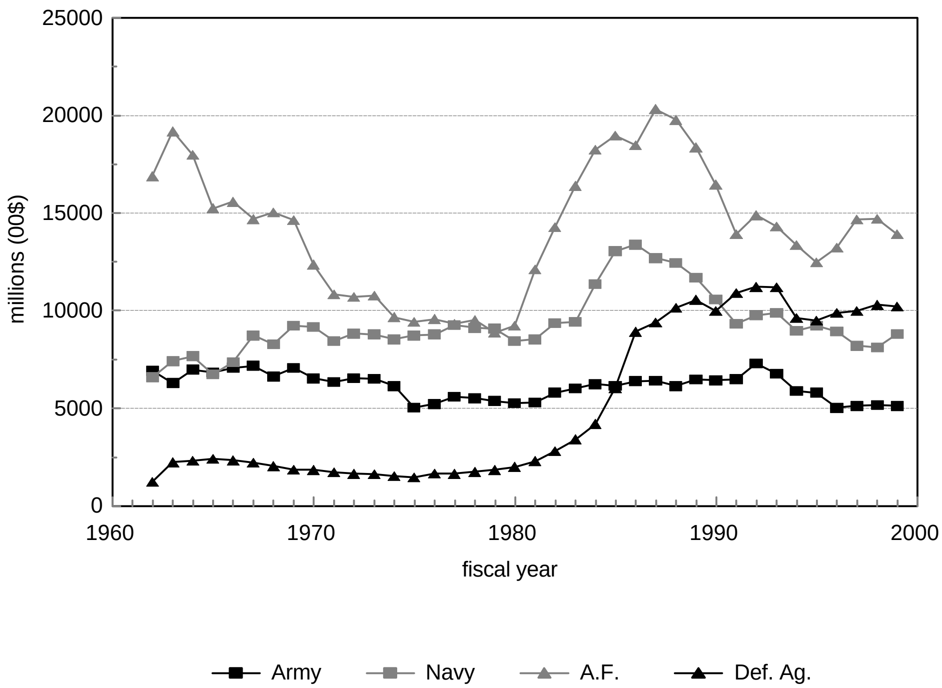
Organization. The Secretary of Defense, through the **Undersecretary of Defense for Acquisition and Technology** (**USDAT**), has overall responsibility for managing the total RDT&E budget. Reporting to the Undersecretary is the **Director of Defense Research and Engineering** (**DDR&E**) who oversees the S&T program.

While the Office of the Secretary of Defense (OSD) provides guidance and final approval of the RDT&E program and budget, it is the Service Departments (Army, Air Force, and Navy) and Defense Agencies that develop the plans and budgets and implement the RDT&E program. The Defense Agencies that manage significantly large RDT&E programs include the **Defense Advanced Projects Agency** (**DARPA**, which only supports 6.1-6.3 activities), the **Ballistic Missile Defense Organization** (**BMDO**), and the Office of the Secretary of Defense itself (primarily through the DDR&E). In addition, the Defense Special Weapons Agency, the Chemical and Biological Defense Program, and Special Operations Command manage relatively large RDT&E programs. Finally, there are the **Director of Developmental Test and Evaluation** and the **Director of Operational Test and Evaluation** who receive RDT&E funds for carrying out their responsibilities for independent and/or joint testing of new systems. How best to maintain an independent evaluation of new military systems (independent of the organizations charged with developing those systems) has been the topic of some debate over the years.

Figure 5 shows the relative share of the total RDT&E budget between Services and Defense Agencies. Defense Agencies, primarily DARPA and BMDO, but also

OSD, have received an increasing share of the overall RDT&E budget as a result of their increased spending on S&T. The BMDO also has a significant investment in Demonstration and Validation (6.4) and Engineering and Manufacturing Development (6.5) programs. The relative share between the Services partly reflects the relative costs and complexities of the systems developed. As sophisticated as U.S. Army tanks have become, a fighter aircraft still costs more.

Figure 5 Total RDT&E by Service (Agencies)

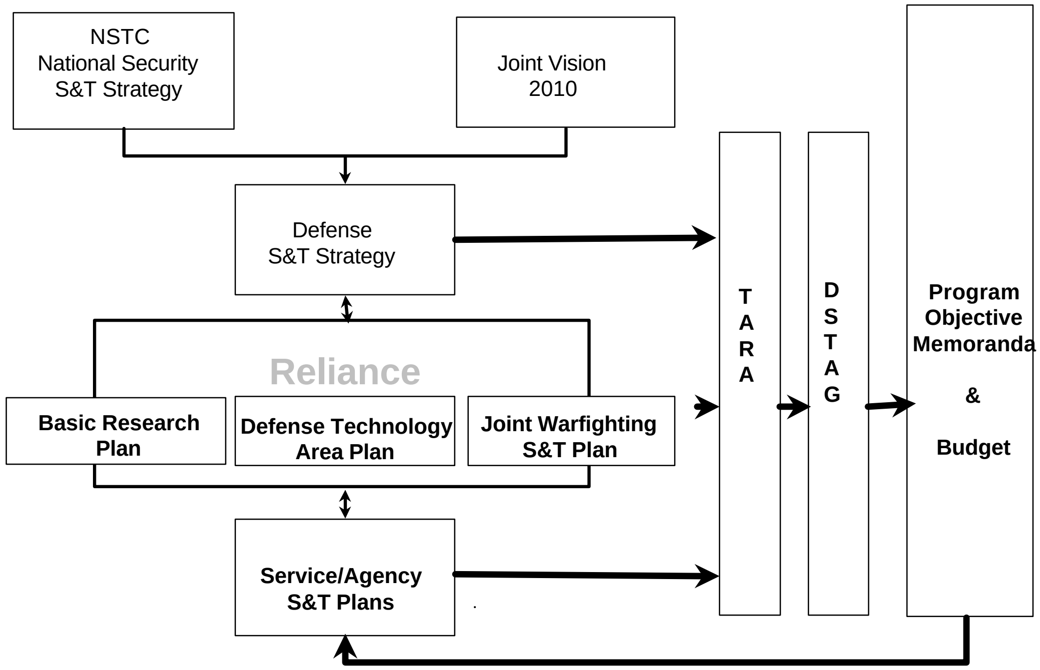


Investment Strategy and Planning. The following discusses S&T strategy and planning separately from acquisition strategy and planning. While the two processes do function somewhat independently of each other, they are intimately related. The S&T program develops the future generation(s) of technology, while acquisition programs bring that technology into the next generation of equipment. There is a time lag between technology development and the ability to get that technology into the field.

S&T Planning. In 1988, as part of its FY1989 defense authorizations (Section 823, P.L. 100-456), Congress instructed the USDAT to provide it with an annual plan for developing the technologies that the Office of the Secretary Defense (OSD) felt were most critical to ensure the long term qualitative superiority of U.S. weapons systems. The plan is to include the rationale for selecting those technologies, milestones associated with developing them, budgets allocated to developing them, and the potential contribution industry and allies could make to their development. Prior to this, there was no DOD-wide S&T strategy or plan to guide an integrated approach to technology development among the Services or to provide Congress with information useful for its oversight function. The first such plan was submitted in

1989. The process for generating the plan and the "look" of the plan has evolved considerably since then. **Figure 6** shows the current process.

Figure 6. S&T Planning Process



The S&T investment strategy and planning process occurs at two levels and in two directions. At one level, each Service has its own planning and review process to ensure that its S&T program supports the current and long-term needs of its own war fighting community. At a higher level, the DDR&E is responsible for ensuring that the combined S&T programs compliment each other, serve the joint-war fighting capabilities identified by Joint Chiefs of Staff and the area commanders-in-chiefs (as stated in Joint Vision 2010 in the figure below) and address the National Security Science and Technology Strategy generated by the National Science and Technology Council (also shown in figure below). The DDR&E is also responsible for ensuring that redundancies and deficiencies in the individual S&T programs of the Services and agencies are addressed. While war fighting needs are generally defined by the war fighting community and the S&T community seeks to develop technologies to meet those needs (top-down), the S&T community also provides the war fighter with new opportunities as new technologies are conceived and matured (bottom-up).

Inter-Service and Agency coordination is facilitated by the **Defense Science and Technology Reliance** project. The Army and Air Force formed Reliance in 1990, primarily in response to the S&T planning process implemented in 1989. It expanded to include the Navy, and now includes DARPA, BMDO, the Deputy DDR&E and the Defense Special Weapons Agency. Reliance is an inter-service/agency forum where agreements on joint planning, collocation of in-house R&D, and lead-service/agency assignments are made. Reliance focuses primarily on those areas of common interest to more than one Service (e.g. aviation, electronics).

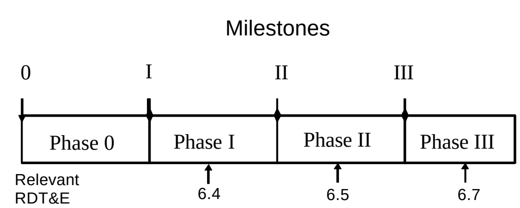
Reliance is responsible for developing the three plans listed in the figure above (the **Basic Research Plan**, the **Defense Technology Area Plans** and the **Joint War fighting Science and Technology Plan**). These plans lay out basic roadmaps for achieving certain military capabilities.

To achieve these levels of capability in the time required, specific **Defense Technology Objectives (DTOs)** or, in the case of Basic Research, **Strategic Research Objectives (SROs)** are identified. Each DTO (SRO) identifies a specific level of technological advancement or gain in knowledge that will be made, including estimated dates, funding levels, the RDT&E Program Elements (P.E.s) which will support that funding, and an explanation of how this effort will impact the war fighter's needs. Together over 300 DTOs are identified and account for about 50% of DOD's total 6.2 and 6.3 funding. SROs account for about 67% of DOD's total basic research funding.

These plans and technology (strategic research) objectives are reviewed by Technology Area Review and Assessment (TARA) teams. Program modifications or recommendations are forwarded to the Defense Science and Technology Advisory Group (DSTAG) chaired by the DDR&E, who then proposes any changes to the Program Review Group (PRG) which is part of the Defense Resources Board which prepares DOD's budget. Any changes approved by the PRG are sent back to the Service planners in the form of Program Decision Memoranda.

Acquisition Planning. The Deputy Secretary of Defense with the assistance of the Defense Resources Board, decides whether to acquire a new military system. The decision is based on military strategy, the mission capabilities needed to carry out that strategy, the equipment needed to achieve those capabilities and the affordability of developing and operating that equipment. Once a new acquisition program is begun, 6.4, 6.5 and 6.7 RDT&E funding supports certain phases of that program. A profile of the acquisition process that is supported by the RDT&E budget is shown in **Figure 7**. It consists of Phases, separated by Milestone Decisions. These decisions are made by the **Defense Acquisition Board (DAB)**, chaired by the USDAT. Work done during the Phases are managed by the Services or Agencies.

Figure 7. **Acquisition Process**



Phase 0 Concept Exploration

Phase I Program Definition & Risk Reduction

Phase II Engineering & Manufacturing Development

Phase III Production, Deployment, Operational Support

Before an acquisition program can begin, an operational component within one of the Services (e.g. the Air Force Air Combat Command) must identify a broadly stated mission need that cannot be satisfied by changes in tactics, doctrine, etc. If the materiel solution to this need is expensive enough (above a certain threshold), the Joint Requirements Oversight Committee (JROC) of the Joint Chiefs of Staff must review and approve it. At that point the USDAT reviews the JROC request and chooses one or more concepts for further study (Milestone 0). Phase 0 (Concept Evaluation) involves short-term studies evaluating the feasibility of competing concepts. At the end of Phase 0, the DAB assesses whether a new acquisition program is warranted and, if so, approves (Milestone I) a baseline acquisition strategy (which includes budgets, test and evaluation master plans, risk assessments and mitigation efforts, etc.). A Milestone approval also agrees on what needs to be demonstrated in the next phase of the program (exit criteria).

At this point, if the Deputy Secretary of Defense approves, a new program is begun. Phase I (Program Definition and Risk Reduction) will further develop one or more of the concepts studied in the previous phase, assessing advantages and disadvantages, and demonstrating prototype equipment if necessary to reduce risks (uncertainties). The acquisition strategy becomes more clearly defined as does the specific system requirements. When the exit criterion for Phase I has been met, the DAB decides whether to continue with one of the concepts (Milestone II). Phase II (Engineering and Manufacturing Development) translates the most promising concept into a stable, operational, affordable, and producible design. Also, during this time the manufacturing and production processes are validated. Once a prototype of the design demonstrates it can meet the requirements, low rate initial production is authorized by the DAB. Low rate initial production provides operational components for operational testing and to establish the initial production capability. At Milestone III, the DAB approves Phase III (Production, Deployment, and Operational Support). At this point RDT&E funds decline and Procurement funds take over.

Infrastructure

DOD's RDT&E program supports work at universities, research institutes, **federally funded research and development centers (FFRDCs)**, private firms and consortia, and at Service RDT&E facilities. Funds flow in different proportions to different entities depending on the type of activity being funded. A large part of DOD's Basic Research program (almost 60%) goes to universities. About 25% goes to DOD's own R&D facilities. Most of the 6.2 and 6.3 work is performed in industry (almost 50%) and at DOD's own facilities (30%). Just about all of the 6.4, 6.5 and 6.7 funding goes to private firms.

DOD's RDT&E infrastructure is divided into two groups: **research and development laboratories** and **test and evaluation centers**. Laboratories are DOD activities (cost centers) that perform one or more of the following activities: science and technology, engineering development, systems engineering, and engineering support of deployed materiel. There are over 80 DOD R&D laboratory facilities (e.g Naval Research Laboratory). Test and Evaluation Centers are facilities and the surrounding area (i.e. sea, air, ground, space) that are government-owned or controlled, and which are used to collect T&E data and deliver T&E products (e.g.

reports). There are 26 T&E Centers (e.g. the Army's White Sands Missile Range). Each of the Services supports its own R&D laboratories and T&E centers. Each manages them in its own way. It should be noted that DARPA and BMDO do not have any R&D laboratories of their own. BMDO does operate the Joint National Test Facility.

FFRDC's are not-for-profit organizations which are financed on a sole-source basis, exclusively or substantially by a federal agency, to perform specific research and development that the agency cannot do itself or contract from other organizations. The federal government supports a total of 42 FFRDCs. Each is administered, by contract, by an industrial firm, university, or other non-profit institution. DOD supports 12 FFRDCs (at one point DOD supported 39). An example is the Lincoln Laboratory, managed by the Massachusetts Institute of Technology, and begun in World War II to develop radar. About 3% of DOD's total RDT&E budget goes to FFRDCs.

As mentioned earlier, much of DOD's 6.1 research is performed by grant or contract at universities. Much of this is single-investigator research. However, 6.1 funding also goes to support centers of excellence and other "centers" at universities that take a multi-disciplinary team approach.

Besides providing direct funding to private firms for various research and development activities, DOD also provides indirect support for private firms' **independent research and development (IR&D)**. Based on negotiations between the firm and DOD, DOD will allow firms to count as an expense on its DOD contracts some share of the research and development the firm does with its own funds (and for its own purposes). These cost allowances have, in the past, amounted to $2 billion to $3 billion per year. Congress removed the limits on how much companies could be reimbursed in the early 1990s as part of Congressional efforts to continue supporting military R&D during the transition to a post-Cold War environment.

Issues

Issues that Congress has confronted and may continue to confront, relating to DOD's RDT&E budget include:

Maintaining a Healthy Science and Technology Investment: The Science and Technology program is perceived as imperative to maintaining DOD's technological edge over potential adversaries. Investments made here bear fruit later in the form of more sophisticated equipment and capabilities. However, because knowledge and information is the primary product at this stage in development (especially for 6.1 and 6.2 activities), a specific return on investment in the form of hardware or software is not always immediate. In fact, it is not always clear, beforehand, whether a new technology will ever prove useful. As a result, there is always concern within the S&T community that pressures for nearer-term developments or issues will crowd out the longer term investment associated with Science and Technology projects. Over the last 10 years, DOD's S&T investment has varied widely. But, since FY1993, when it peaked in real terms, it has steadily declined.

There is no clear objective way to determine how much S&T funding is appropriate to maintain a healthy technology base and to maintain DOD's technological advantage. The FY1999 defense authorization bill (P.L. 105-261, Sec. 214) expressed a sense of Congress that S&T funding should increase 2% above inflation each year through FY2006. The bill (same section) also called for a report by the National Research Council to study what level of S&T investment was appropriate and what the impacts might be of not maintaining that level of funding. As of the writing of this report, that study has not been initiated. In May 1998, the Defense Science Board studied this issue by looking at how industry determines how much to spend on research and development. The Board concluded that industry did not use a formal process for determining what to spend, but, instead, used a general rule of a certain percentage of sales. According to the study, technologically dynamic industries invested up to 3.5% of sales in research (15% of sales in research and development). Using this rule and equating DOD's total outlays to sales, the Board determined that an investment in FY1999 of about $8 billion would be appropriate.

Another issue is the level of basic research supported by the S&T program. Between FY1993 and FY1998, investment in basic research had slowly eroded in constant dollars. Much of DOD's basic research is invested in universities. DOD basic research investment in universities represents a relatively small share of universities' outside funding, but in certain areas, such as materials and electronics engineering and mathematics, DOD's investment is a significant source of funds. Reductions in 6.1 funding generate concern within the university community.

Accelerating the Transition of New Technology: The pace at which new technology moves from the laboratory to a fielded system has always been of concern, although the urgency to do so may have subsided with the end of the Cold War. Scaling technology up in size and integrating it with other technologies can present problems not identified in the laboratory. Trying to solve these "bugs" in an acquisition program can delay the program and/or greatly increase the costs of the program. Therefore, over the years more emphasis has been placed on technology demonstrations as a way to solve these problems before beginning an acquisition program. In the last few years, technology demonstrations have also been proposed as a way to quickly get new technologies into the field, short of a formal acquisition program. While agreeing on the need for such demonstrations, Congress has been cautious in support (especially of ACTDs). Even so, technology demonstrations have increased as a share of the S&T program.

Downsizing Infrastructure: DOD's downsizing since the end of the Cold War focused initially on reducing force levels and reducing or delaying the development of new weapons systems. The next phase of downsizing was directed at trying to reduce infrastructure across the board. The **Base Realignment and Closure (BRAC)** process has been the instrument by which DOD and Congress have agreed to close bases and other DOD facilities (in what is otherwise a highly politicized process). Closure and consolidation of defense R&D facilities to the extent they have occurred, have been a result of the BRAC process. In addition, DOD has been reducing the RDT&E workforce since FY1992. Reductions are to continue into the next century, at which point the workforce will have been reduced almost 30% from FY1992 levels. Additional reductions to the acquisition workforce (which includes

RDT&E personnel) were mandated in the FY1998 Defense Authorizations (P.L. 105-85, Section 912).

Although there have been some laboratory consolidations via BRAC, Congress felt more could be done, especially in regard to cross-servicing (i.e. co-locating the Services' RDT&E activity or assigning lead responsibility to a Service in a particular technology area). Section 277 of the National Defense Authorization Act for FY1996 (P.L.104-106) required DOD to develop a five-year plan, to be implemented between FY2001 and FY2005, that would consolidate and restructure its laboratories and T&E centers further (as much as is practical and possible). The process by which DOD intended to draw up this plan was called **Vision 21**. Vision 21 had made some progress in laying the groundwork for making further consolidations, including the design of a cost accounting system that would allow the cost of RDT&E to be compared across Services. However, Vision 21 efforts were later consumed by the Quadrennial Defense Review process. Draft legislation related specifically to laboratory and test center consolidation was dropped in favor of a general request for two more BRAC rounds relating to DOD's entire infrastructure. Congress has not been receptive to any more BRAC rounds in this larger context. Congress, however, continues to encourage the Services to find ways to improve efficiencies and to find ways to account for costs that will allow comparison across Services (P.L. 105-261, Sec. 906).

Integration with the Commercial Sector: While DOD's Science and Technology program has produced a wide range of sophisticated technologies, in some technology areas, it has not been able to keep pace with the level of technology development in the commercial sector. A prime example is microelectronics. While the semiconductor and integrated circuits were developed with private funds, DOD (and the space program) provided an early market for the devices and pushed the subsequent development of those technologies. By the 1970s, however, DOD's market share declined significantly and commercial demands pushed new developments. Soon commercial circuits outperformed circuits made for DOD. At the urging of Congress, part of the DOD's articulated S&T strategy has been to piggy-back on the commercial sector's technology base efforts where it can. It has sought to do this primarily by pursuing what it calls dual-use programs. These programs seek to cooperatively develop technologies of mutual benefit to DOD and the commercial sector, in a way that will accelerate their use by both.

Dual-use programs differ from core DOD RDT&E programs in that they are suppose to appeal more to commercially-oriented firms (or even firms that have not typically worked with DOD in the past), requiring cost-sharing with the private party (or parties), and contracts are drawn up independent of usual defense contracting regulations (to make them more palatable to commercially-oriented firms). Management of dual-use programs have undergone a great deal of evolution since they were initiated. Currently, each Service manages its own **Dual-Use Science and Technology** program with oversight by the DDR&E.

Other CRS Products

CRS Report RL30002, *A Defense Budget Primer*, by Mary Tyszkiewicz and (name r edacted).

CRS Report 95-738. *The difference Between DOD Programs That Develop Dual-Use Technologies and DOD's Dual-Use Technology Development Programs—A Fact Sheet*, by John Moteff.

CRS Report 95-489. *DOD's Federally Funded Research and Development Centers (FFRDCs)*, by Michael Davey.

CRS Report 95-322. *DOD's Dual-Use Strategy*, by (name redacted).

CRS Report 95-86. *DOD's Technology Reinvestment Project (TRP): Friend or Foe?* by (name redacted)

CRS Issue Brief 89056. *Cooperative R&D: Federal Efforts to Promote Industrial Competitiveness*, by Wendy Schact. (Updated regularly)

CRS Report 94-100. *DOD Support for University-based Research*, by Michael Davey.

CRS Report 93-1051. *DOD's Independent Research and Development Program: Changes and Issues*, by Michael Davey and Dahlia Stein.