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Defense Research: DOD's Research, Development, Test and Evaluation Program

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SUMMARY

In its FY2004 budget proposal, the Bush Administration requested $380 billion for the Department of Defense, including $61.8 billion in Title IV Research, Development, Test and Evaluation (RDT&E) funding. This year's RDT&E request is $5 billion more than the amount available for RDT&E in FY2003, and represents the largest single-year request in constant dollars going back to FY1962. The Administration also requested $66 million in research and development within the Defense Health Program and $252 million for research and development in the Chemical Agents and Munitions Destruction Program. According to the FY2004 budget, the Administration is planning to request $394 billion for RDT&E through FY2009, with annual funding reaching $69.4 billion in FY2009.

The Administration's request for the S&T portion of the FY2004 RDT&E budget was $10.2 billion. This is $500 million below the amount available for S&T in FY2003. Through FY2009, the Administration estimates it will request $66.2 billion for S&T. After the initial drop this year, S&T would steadily increase, although it would not reach FY2003 levels again until FY2009, in constant dollars.

The Administration requested $7.7 billion in research and development for missile defenses, $1 billion more than what is available in FY2003.

MOST RECENT DEVELOPMENTS

The Bush Administration released its defense budget February 3, 2003.

BACKGROUND AND ANALYSIS

Congress supports the research and development efforts of the Department of Defense (DOD) with a Research, Development, Test and Evaluation (RDT&E) appropriation. The appropriation primarily supports the development of the nation's future military hardware and software and the technology base upon which those products rely. It is the federal government's single largest research and development account. Besides supporting the nation's military needs, some of the technology developed with RDT&E funds spills over into the commercial sector. For these reasons, RDT&E funding draws a considerable amount of attention within Congress each year.

During the Clinton Administration's tenure, Congress appropriated between $34 billion and $41 billion a year in RDT&E funding. In FY2003, funding reached $57 billion. Traditionally, almost 80% of the RDT&E funding goes toward the development and demonstration of operational military hardware and software. The rest, over $10 billion in FY2003, goes toward basic research and more fundamental technology development and demonstration, referred to as the Science and Technology (S&T) program.

Most of the RDT&E appropriation is provided for in Title IV of the defense appropriations bills (Title II in the defense authorization bill). However, over the last few years, Congress has also provided RDT&E funds separately in two other accounts: the Defense Health Program and the Army's Chemical Agents and Munitions Destruction Program. The Defense Health Program supports a wide range of activities, including research in areas such as breast and prostate cancer. The Chemical Agents and Munitions Destruction Program supports activities to destroy the U.S. inventory of lethal chemical agents and munitions to avoid future risks and costs associated with storage. While this issue brief tracks RDT&E funding in these other areas, most of the focus of the issue brief is on those RDT&E funds provided in Title IV.

Every year, Congress must review and approve or revise how much money the Administration requests in RDT&E funding and how that money is allocated. This issue brief tracks the evolution of the RDT&E budget from the Administration's budget request through Congress's final authorization and appropriation (see **Table 2**), and discusses key issues that arise.

Funding data presented in this issue brief are expressed as total obligational authority (TOA), except where noted otherwise. Total obligational authority is a budget concept used by DOD that represents the value of the direct Defense program for a fiscal year. It is equivalent to the sum of all budget authority granted by Congress, plus amounts from other sources authorized to be credited to certain accounts, plus unobligated balances of funds from prior years which remain available for obligation. Rescissions, transfers and other budget modifications affect TOA and budget authority (BA) differently. Therefore, TOA and BA differ by a few tens of millions of dollars when examining past year funding levels.

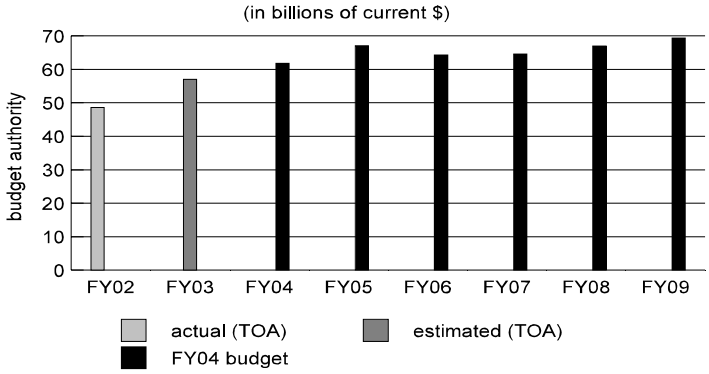
Budget requests are in terms of budget authority and Congress authorizes and appropriates budget authority. However, funding data for individual program elements and cumulative RDT&E budget activities in DOD's R-1 document (used by this issue brief as the primary source of budget data in **Tables 1 and 2**) are reported as TOA. To remain consistent, all data in this brief are expressed as TOA, except where noted. It should be noted that in the current year (in this case FY2004), and beyond, BA and TOA for RDT&E are the same. Differences occur only when considering past year activities.

For a general discussion of the fundamental principles and concepts of the RDT&E account, as well as long term budget trends and recurring issues, the reader is referred to CRS Report 97-316 SPR, *The Department of Defense's Research, Development, Test and Evaluation Program: A Primer*. For a discussion of last year's defense authorization and appropriations bills in their entirety, the reader is referred to CRS Appropriations Report RL31305, *Appropriations and Authorization for FY2003: Defense*.

Total RDT&E Budget

The Bush Administration requested $61.8 billion in Title IV RDT&E funding for FY2004. This is about $5 billion more than the TOA available for RDT&E in FY2003. Furthermore, the budget sets out a funding plan that would request $394 billion for RDT&E through FY2009, with annual funding reaching $69.4 billion in FY2009. See **Figure 1**.

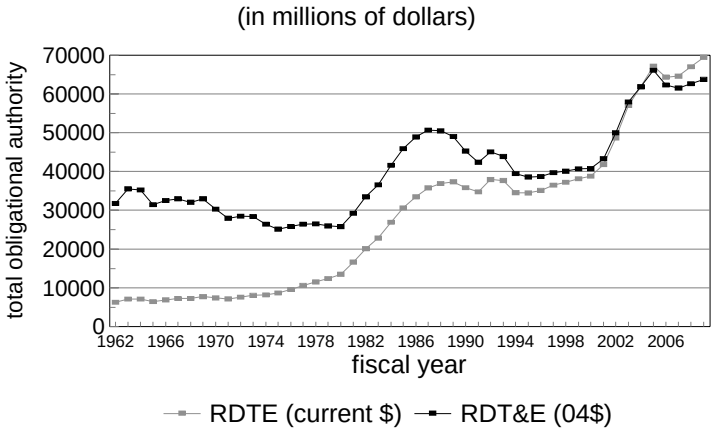
Figure 1. RDT&E (Title IV) FY2004 Budget



In addition to the $61.8 billion in Title IV RDT&E funding, the Bush Administration also requested RDT&E funds for the Defense Health Program ($66 million) and the Army's Chemical Agents and Munitions Destruction Program ($252 million). In FY2003, these programs received $457 million and $294 million, respectively. The Defense Health Program is where Congress places its appropriations for breast cancer, prostrate cancer and other medical research of special interest.

Historically, RDT&E funding has reached its highest levels, in constant dollars, looking back to FY1962 (**Figure 2**). Prior to FY2003, RDT&E had peaked in constant dollars in FY1987, at the end of the Reagan defense build-up. After FY1987, RDT&E funding declined over the next 8 years. Funding leveled off in FY1995 and FY1996 before beginning to rise again, relatively slowly. The increases were due primarily to Congress appropriating

Figure 2. RDT&E Funding Trend



more than what the Clinton Administration had requested. Congress has continued to increase RDT&E funding above requested levels, even during the first two years of the Bush Administration. FY2003 RDT&E funding surpassed the FY1987 level. The FY2004 request surpasses that, and the anticipated FY2005 budget request goes even higher. It is unclear if Congress will be satisfied by these budget requests.

In the past, the ability of Congress to increase RDT&E funding was constrained by the 1997 budget agreement which had set caps on defense spending. Increases in RDT&E had to come at the expense of other Department of Defense programs, or be declared as emergency spending. FY2000 was the first year Congress could increase defense spending above the agreement's caps by offsetting those increases with decreases in other non-defense discretionary programs. The constraint of budget caps subsided when the prospect of future budget surpluses allowed DOD's budget to increase, including RDT&E, without the need to offset those increases. The Bush Administration came into office indicating its intention to provide even larger increases in defense spending and RDT&E. However, prior to the September 11 terrorist attacks at the World Trade Center and the Pentagon, a tax cut and a declining economy introduced new stresses into the budget environment. Since September11, budget deficits do not appear to be a major constraint as Members and the Administration have expressed a willingness to provide whatever funds are deemed necessary to meet the terrorist and other challenges. Even the standard tensions within the DOD budget, between RDT&E, Procurement, Operations, quality of life issues, readiness, etc., which one might expect to be aggravated while the country is on a war-footing, do not appear to be a constraint. The Administration has signaled its intentions to request funding for war time operations with supplementals and emergency funding.

Science and Technology Funding

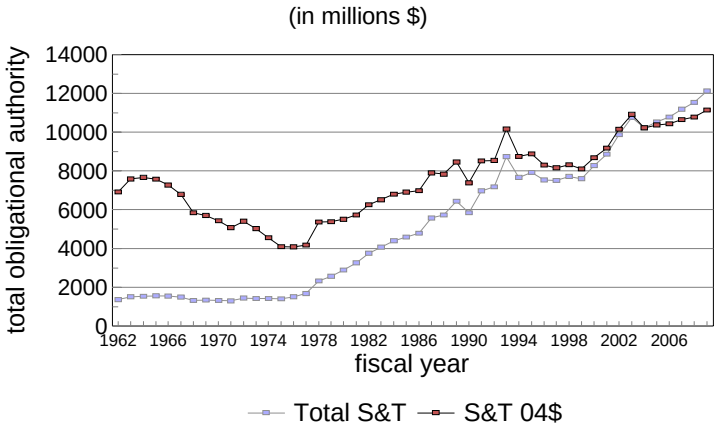
DOD's RDT&E budget supports a wide range of activities, from basic research (e.g., atmospheric sciences) to the full scale development of large military systems (e.g., the F-22 fighter). The RDT&E budget is accordingly divided into seven budget activities: basic

research, applied research, advanced technology development, demonstration and validation, engineering and manufacturing development, management support, and operational systems development. DOD has designated these activities as 6.1 through 6.7, respectively (see **Tables 1 and 2** at the end of this issue brief).

Basic research (6.1), applied research (6.2), and advanced technology development (6.3) together are referred to as DOD's Science and Technology (S&T) program. S&T projects seek new ways of accomplishing tasks of military value and developing the underlying scientific and engineering principles involved. S&T projects are not directed at developing specific operational weapon systems, although they may support such development by solving specific problems. Many of the weapon systems used with such effectiveness in recent military actions can trace their origins to earlier S&T projects. Besides developing the technology base upon which future weapons systems rely, S&T programs (primarily 6.1 projects) help develop the future manpower expertise that DOD relies upon. A large share of university research in certain scientific and engineering disciplines (e.g. materials engineering and math) is supported by the S&T program (especially 6.1 programs).

S&T funding has followed a slightly different trend than overall RDT&E funding (see **Figure 3**). As total defense (and total RDT&E) spending started to decline in the late 1980s, efforts were made to maintain S&T spending levels, especially 6.1 and 6.2 activities. And, in fact, funding for S&T generally increased over the next 6 years. After FY1993, however, S&T funding began to decline. Over the next 6 years it fell back to FY1987 levels as measured in constant FY2004 dollars. The downward trend after FY1993 raised some concern within the S&T community (including universities), especially since the Clinton Administration's multi-year budgets continued to project declining funds for S&T in the out-years.

Figure 3. S&T Funding Trend

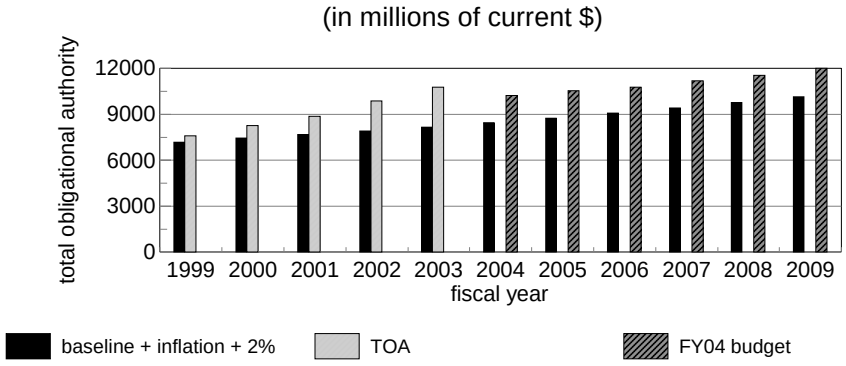


Beginning in FY2000, Congressional action essentially reversed the downward trend. Since then, Congress has added nearly $1 billion each year to the S&T budget requests. The Bush Administration has requested $10.2 billion in S&T for FY2004, nearly $500 million below the TOA available for S&T in FY2003. After this initial drop, the S&T budget would

again rise. However, it constant FY2004 dollars it is not scheduled to reach the FY2003 level again until FY2009.

Assuring adequate support for S&T activities is seen by some in the defense community as imperative to maintaining U.S. military superiority. But, because the time between specific S&T projects and successful new operational systems is long and unpredictable, and because it is difficult to calculate a return on investment for the S&T program as a whole, it is difficult to determine what is a sufficient investment. Those concerned viewed the decline in S&T funding after FY1993 as a sign that DOD was under-investing in S&T. The FY1999 defense authorization bill (P.L. 105-261, H.R. 3616, Section 214) expressed the sense of Congress that S&T funding between FY2000 and FY2008 should increase no less than 2% above inflation per year, using the FY1999 request as the baseline. The Clinton Administration's subsequent budgets made an effort to meet these goals in the budgets' current year, but were never able to sustain the commitment into the out-years. However, Congressional action has more than achieved that rate of increase over the last four years (see **Figure 4**). The F2004 Bush budget for S&T would also achieve this goal.

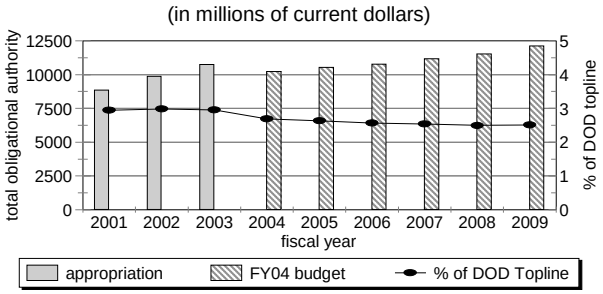
Figure 4. Inflation+2% vs Appropriations/Budgets



During the Bush Administration, however, the S&T goal has changed. In testimony before the Senate Armed Services Committee on June 5, 2001, Under Secretary of Defense for Acquisition, Technology, and Logistics Pete Aldridge suggested that S&T should receive between 2.5 percent and 3 percent of DOD's total budget, based on the percent of sales certain high technology sectors of private industry invest in research. This became official policy in the 2001 Quadrennial Review, released in September, 2001, which stated that DOD planned to stabilize S&T funding at 3% of overall DOD funding. A number of Members have embraced this objective. However, the Bush Administration's FY2004 S&T budget request does not make the 3% goal in any of the next 6 years (see **Figure 5**). Also, as the policy is stated, it would imply that should overall DOD budgets decline, S&T would decline as well.

How much should DOD spend on S&T? The 2% plus inflation goal established by Congress was essentially an arbitrary target. The goal of 3% of DOD's total budget is also arbitrary, but is based, in part, on a June 1998 report by the Defense Science Board (DSB—*Defense Science and Technology Base for the 21st Century*). The report reviewed how firms

Figure 5. S&T as a Share of Total DOD Spending



in several technologically sophisticated industries decide how much to spend on research. The Board found that firms do not typically go through an objective analytical process to determine how much to spend. Instead firms rely more on subjective "rules of thumb" that consider other investment needs, competitive pressures, etc. The metric is generally characterized in terms of investment as a percent of sales. The Board recommended drawing an analogy between sales revenue in the private sector and DOD's overall budget and using the pharmaceutical industry, which the DSB reported as having the highest commercial investment in research as percent of sales (3.4%), as a benchmark.

The DSB report argued that the pharmaceutical industry is an appropriate model for deciding how much DOD should spend on S&T because it is considered a high technology industry and that the competitiveness of firms depends on the ability to develop new products. But comparisons stopped there and the analogy may be inadequate. For example, the pharmaceutical industry is primarily manufacturing oriented and revenues are generated on the sale of products. A large part of DOD's mission and budget could be considered service oriented. If the pharmaceutical industry were also involved in delivery of services, would its investment in research as a percentage of sales still be as high? Perhaps only that part of DOD's budget devoted to acquisition should be used as an analog to pharmaceutical revenues. Also, the DSB report chose not to consider as part of DOD's current investment the amount DOD reimburses private contractors for independent research and development (IR&D). In 1997 (the last year for which figures were kept), DOD allowed defense contractors to claim $2.7 billion in IR&D expenses considered relevant to DOD's needs. The DSB report suggested that this should not be considered since the results of this research are not held solely by DOD. Nor did the DSB report make any allowance for the fact that the United States already significantly outspends its competitors (i.e. foreign governments) in defense research.

Ballistic Missile Defense

The Bush Administration has made major changes in the structure, funding, and acquisition strategy for ballistic missile defense, including changing the name of the organization from Ballistic Missile Defense Organization to Missile Defense Agency (MDA). The Administration has withdrawn from the Anti-Ballistic Missile (ABM) Treaty, which for decades had put constraints on the development of ballistic missile defenses as part

of the overall strategic arms control strategy between the United States and the former Soviet Union. For a more thorough discussion of missile defense policies and issues, see **For Additional Reading** for other CRS products on the topic.

In 2001, the Administration proposed, and Congress went along with, a reduction in the number of program elements associated with the program as well as doing away with programmatic distinctions between theater and national missile defenses (the Administration envisions that theater and national systems will be melded into an integrated global system). Consequently, RDT&E program elements are now divided along "functional" lines (boost, midcourse, and terminal segments, with system integration, etc.). The Administration also promised to increase greatly the amount of funding devoted to ballistic missile defense.

Also, rather than follow a tradition acquisition approach, where a program heads toward a definitive system architecture designed to meet specific performance criteria, the Administration is proposing a new evolutionary approach (being called evolutionary acquisition) where the final overall system architecture is not determined ahead of time but will evolve as new elements contributing to the global capabilities are brought on line. The Administration also has floated a concept called capabilities-based management that it intends to use with missile defense. Capabilities management is less well defined than evolutionary acquisition. However, it appears to suggest deploying systems as capability is demonstrated but without specifying ahead of time a rigid set of performance requirements that must be met before deployment can begin. Citing these conceptual models of development as the reason, the Administration suggests that it can no longer provide Congress with much of the programmatic projections that the program has provided in the past. The Administration claims these projections were too constraining of development and deployment and unreliable in any event. Some Members have expressed concerns that without this information there is no way for Congress to exercise its oversight responsibilities. The National Defense Authorization Act for FY2004 conference report (H. Rpt. 107-772, pp 564-565) required the budget justification documents include performance goals, development baselines, and funding profiles for each "block" of missile defense system being considered for deployment and which have been designated as being of special interest to Congress. In addition, the Joint Requirements Oversight Council (JROC) is to review the cost, schedule, and performance criteria for missile defense programs.

For FY2004, the Bush Administration requested $7.7 billion for the RDT&E part of the missile defense program. This is $1 billion more than the amount available for missile defense RDT&E in FY2003.

Other Issues

RDT&E Within the Office of the Secretary

Last year, the Administration proposed transferring a number of RDT&E programs (primarily S&T program) that have been managed by the Office of the Secretary (OSD) to the Services. The rationale for the proposal was to help meet staff and funding reductions within the Office. The programs ranged from the In-House Laboratory Independent Research program (a program directed at supporting basic research within DOD laboratories) to the

Foreign Comparative Test Program (a program aimed at testing operational military systems developed in other countries to determine their feasibility of meeting U.S. military needs).

OSD's RDT&E portfolio ranges between $1 billion and $2 billion per year and supports RDT&E programs across the full spectrum of activity (from 6.1 to 6.7). It typically supports programs whose technology could be applied across all of the Services or whose technology the Services are reluctant to support themselves or whose applications don't fit neatly into any of the Services' missions. In some cases, OSD initiates these programs itself. In other cases, Congress has initiated the programs.

Last year, Congress balked at the transfers (see Section National Defense Authorization Act for Fiscal Year 2003, Conference Report, H. Rpt. 107-772 , p.552-553) and directed the Secretary of Defense to stop the transfer of 10 specific programs. The report also requires the Secretary to notify and justify to Congress the transfers in a mandated report.

In its FY2004 budget request, the Administration again is proposing the transfer of OSD RDT&E programs, including some of those Congress did not allow to be transferred last year, such as the High Energy Lasers (proposed transfer to the Air Force), and University Research Initiative (proposed transfer to the Navy). OSD has not yet provided the mandated report required by last year's authorization report. Below is a list of programs OSD proposes transferring in FY2004.

List of Programs OSD Proposes to Transfer

Program	Activity	Receiving Service/Agency
University Research Initiative	6.1	Army, Navy, Air Force
Historically Black Colleges/Universities& Minority Institutions	6.1	Army
Force Health Protection	6.1	Army
Defense Experimental Program to Stimulate Competitive Research	6.1	
Explosives Demil Technology	6.3	Army
Unexploded Ordnance	6.3	Army
In-House Laboratory Independent Research	6.1	Navy
High Performance Computing	6.3	Air Force
High Energy Lasers	6.1-6.3	Air Force
Physical Security Equipment Advanced Development	6.3	Air Force, DTRA

Funding Tables

Table 1. Department of Defense RDT&E

($ millions)

	FY2001	FY2002	FY2003 estimate	FY2004 request
Accounts				
Army	6,263	7,018	7,535	9,123
Navy	9,596	11,379	13,631	14,107
Air Force	14,313	14,479	18,561	20,336
Defense Agencies	11,316	15,518	17,061	17,974
(DARPA)	(2,977)	(2,260)	(2,690)	(2,954)
(MDA[a])	(6,208)	(6,910)	(6,719)	(7,729)
Dir. Test & Eval	225	229	238	287
Dir. Op.Test/Eval	35			
Total Ob. Auth.	**$41,748**	**$48,623**	**$57,026**	**$61,827**
Budget Activity				
Basic Research	1,287	1,350	1,417	1,309
Applied Res.	3,674	4,094	4,289	3,670
Advanced Dev.	3,972	4,430	5,067	5,253
Demonstr./Valid.	8,052	10,125	10,754	13,197
Engrg/Mftg. Dev.	8,441	10,676	13,737	15,913
Mgmt. Support[b]	3,342	3,646	3,106	3,028
Op. Systems Dev.	12,980	14,303	18,656	19,458
Total Ob. Auth.	**$41,748**	**$48,624**	**$57,026**	**$61,828**
Other Defense Programs				
Defense Health Program	432	457	457	66
Chemical Agents and Munitions Destruction	105	202	294	252

Source: FY2002 to FY2004 figures based on Department of Defense Budget, Fiscal Year 2004 RDT&E Programs (R-1), February 2003. FY2002 to FY2004 figures for Defense Health Program and Chemical Agents and Munitions Destruction Program come from OMB's FY2004 Budget Appendix, Department of Defense–Military, RDT&E. All other figures come from prior year R-1s and OMB budgets. Totals may not add due to rounding.

a. Includes only MDA RDT&E. Does not include procurement and military construction or missile defense RDT&E in other accounts.

b. Includes funds for Developmental and Operational Test and Evaluation.

Table 2. Department of Defense RDT&E

($ millions)

	FY2004 request	House Auth.	Senate Auth.	Auth. Conf.	House Apprn.	Senate Apprn.	Apprn. Conf.
Accounts							
Army	9,123						
Navy	14,107						
Air Force	20,336						
Defense Agencies	17,974						
(DARPA)	(2,954)						
(MDA[a])	(7,729)						
Dir. Test & Eval	287						
Dir. Op.Test/Eval							
Total Ob. Auth.	**$61,827**						
Budget Activity							
Basic Research (6.1)	1,309						
Applied Res. (6.2)	3,670						
Advanced Dev. (6.3)	5,253						
Demonstr./Valid. (6.4)	13,197						
Engrg/Mftg. Dev. (6.5)	15,913						
Mgmt. Support[b] (6.6)	3,028						
Op. Systems Dev. (6.7)	19,458						
Adjustments							
Total Ob. Auth.	**$61,828**						
Other Defense Programs							
Defense Health Program	66						
Chemical Agents and Munitions Destruction	252						

Source: Department of Defense Budget, Fiscal Year 2004 RDT&E Programs (R-1). Figures for Other Programs come from OMB's FY2004 Budget Appendix. Remaining figures come from associated Committee reports.

a. Includes only MDA RDT&E. Does not include procurement and military construction or ballistic missile defense RDT&E in other accounts.

b. Includes funds for Operational Test and Evaluation.

107th Congress Legislation

No bills have been introduced at the time of this edition.

For Additional Reading

CRS Report 97-316 SPR, *The Department of Defense's Research, Development, Test, and Evaluation (RDT&E) Program: A Primer*, by John Moteff.

CRS Report RL31305, *Appropriations and Authorizations for FY2002: Defense*, by Amy Belasco, and Stephen Daggett.

CRS Report RS21195, *Evolutionary Acquisition and Spiral Development in DOD Programs: Policy Issues for Congress*, by Gary Pagliano and Ronald O'Rourke.

CRS Report RL31111, *Missile defense: the current debate*, coordinated by Steven A. Hildreth and Amy F. Woolf.

CRS Info Pack IP496B, *Ballistic Missile Defense*.