

DOD R&D Up 17 Percent in Final Bill; S&T Exceeds \$10 Billion

(This analysis is part of a series of AAAS R&D Funding Updates on the FY 2002 congressional appropriations process. This analysis includes information on R&D in final FY 2002 appropriations for DOD. The complete series of AAAS R&D Funding Updates, including continually updated analyses of R&D by agency in FY 2002 appropriations, is available on the AAAS R&D Web Site (<http://www.aaas.org/spp/R&D>) in the “FY 2002 R&D” or the “What’s New” sections.)

(This update is nearly identical to the December 21 update on DOD appropriations, with some minor revisions.)

On December 20, hours before bringing to a close to the first session of the 107th Congress, the House and Senate gave final approval to an FY 2002 appropriations bill (HR 3338) that provides \$317 billion in funding for the Department of Defense (DOD). The final Defense bill also contains \$20 billion for DOD and other agencies in emergency appropriations to respond to the September 11 terrorist attacks. **Under the bill, total research and development (R&D) at DOD rises to \$50.1 billion – an increase of 17.3 percent or \$7.4 billion from the FY 2001 level of \$42.7 billion, the largest dollar increase in history.** In comparison with the request of the Bush Administration, this total represents a 3.9 percent increase, or an additional \$1.7 billion for DOD R&D (see Table A).

Perhaps most prominent in the final Defense bill is a 66.4 percent rise in funding for the Ballistic Missile Defense Organization (BMDO), which places the BMDO R&D budget at \$7.0 billion (see Table B). Though less than the \$7.6 billion requested by the Bush Administration, the final level still represents a significant jump in the BMDO R&D budget. Combined with procurement funds in other sections of the bill, the total BMDO budget is \$7.8 billion. Operating in partnership with each of the military services, other federal agencies, the private sector, and major research institutions, BMDO is charged with developing defensive systems to counter perceived theater and strategic ballistic missile threats. BMDO has received strong vocal and (requested) budgetary support from the Bush Administration. In fact, in a speech earlier this year at the National Defense University, President Bush stated that the development of a national missile defense would be one of the top priorities of his administration. Furthermore, he asserted that the 1972 Anti-Ballistic Missile (ABM) treaty with the Soviet Union (now Russian Federation) – which explicitly precludes the development of a national missile defense system by either party – should not stand in the way of efforts by the United States to develop and deploy such a system; earlier this month, he formally announced U.S. withdrawal from the treaty.

The final Defense bill does not follow the House version of the bill in placing funding for BMDO in a new appropriations title – “Counter-Terrorism and Defense Against Weapons of Mass Destruction” – along with funding for defenses against chemical and biological weapons. Although the final Defense bill includes this new title, BMDO funding is included in the traditional Research, Development, Test, and Evaluation (RDT&E) title. Included in the new title, however, are some R&D appropriations for the Chemical and Biological Defense Program and the Defense Threat Reduction Agency (DTRA), two of the cross-service defense agencies. Included in another section of the Defense bill are miscellaneous rescissions of previously appropriated funds, as well as a general reduction to all defense accounts. (The figures in the tables are adjusted to reflect rescissions and general reductions.)

In terms of the functional accounts that comprise the DOD R&D budget, the final Defense bill funds each well above its FY 2001 level, often with substantial increases (see Table A). While most agencies break out R&D in the three categories of basic research, applied research, and development, DOD divides its RDT&E (Research, Development, Test, and Evaluation) into seven categories, each with a numerical code: Basic

Research (“6.1”); Applied Research (“6.2”); Advanced Technology Development (“6.3”); Demonstration and Validation (“6.4”); Engineering and Manufacturing Development (“6.5”); Management Support (“6.6”); and Operational Systems Development (“6.7”). Under the final bill, **Demonstration and Validation (“6.4”) and Engineering and Manufacturing Development (EMD; “6.5”) receive the largest increases.** Demonstration and Validation rises by 30.1 percent or \$2.4 billion to \$10.4 billion while EMD rises by 23.9 percent or \$2.1 billion to \$11.0 billion. The majority of these increases stem from the increases in funding to BMDO described above. These categories cover advanced development work, mostly performed by industrial firms as defense contractors, on specific weapons systems.

Basic Research (“6.1”) and Applied Research (“6.2”) also receive substantial increases in funding. Basic Research rises by 5.0 percent from \$1.3 billion to \$1.4 billion, while Applied Research rises by 14.6 percent from \$3.7 billion to \$4.2 billion. The “6.1” and “6.2” research accounts provide a significant share of federal support for several key science and engineering disciplines (see below).

The “6.1,” “6.2,” and “6.3” categories are often grouped together as **“Science and Technology” (S&T).** This category encompasses basic research, applied research, and advanced technology development, which contribute to a broad knowledge base with potential applications to a wide variety of military as well as civilian uses. S&T is separate from the “6.4” and higher categories, which are focused on the development and testing of specific weapons systems. In the final Defense bill, **DOD S&T, including medical research appropriations outside the RDT&E account (see below), exceeds \$10 billion for the first time to reach \$10.5 billion,** an 11.8 percent increase. Advocates for DOD S&T pushed last year for FY 2001 S&T funding of at least \$9 billion, and reached that goal. For FY 2002, they advocated \$10 billion, and although the Bush Administration fell far short with a request of \$8.8 billion, the final Defense bill reaches that goal. Advocates of DOD S&T in the science and engineering community argue that DOD S&T funding is essential for building the knowledge and technology base for future DOD needs, and have successfully argued that post-Cold War cutbacks over the past decade eroded this base. In the past year, there has been growing support inside and outside the Pentagon for setting 3 percent of the DOD budget as a goal for the proper level of S&T investment, a goal reaffirmed in September’s Quadrennial Defense Review of defense strategy; the FY 2002 DOD S&T appropriation meets that goal.

The Defense bill contains a separate \$461 million appropriation, outside the regular R&D accounts, for **medical R&D** (see Table A). Included in this total is \$150 million for breast cancer research and \$85 million for prostate cancer research (down from \$175 million and \$100 million, respectively, in FY 2001) in peer-reviewed, competitively awarded grants. The bill also contains \$10 million for ovarian cancer research and \$50 million for research on various medical topics. These programs were congressionally initiated in the early 1990s and DOD has never requested funding for them, but Congress has annually provided funding. The final bill also contains \$43 million for a Senate-initiated national prion research project. Prions are modified forms of normal proteins that have been linked to variant Creutzfeldt-Jakob Disease (vCJD) and Bovine Spongiform Encephalopathy (BSE). The bill instructs the Army to set up a new prion research program modeled along the lines of the existing peer-reviewed cancer programs. The final Defense bill also contains numerous congressionally designated appropriations for medical research in DOD’s regular accounts, mostly in the Army and Navy, totaling nearly \$265 million. Counting these appropriations, the Defense bill provides nearly \$750 million for congressionally designated medical research projects.

Among the service branches, Army, Navy, and Air Force R&D budgets all receive large increases. Army R&D rises from \$6.2 billion to \$7.1 billion (a 13.1 percent increase). Navy R&D rises from \$9.6 billion to \$11.4 billion (a 19.5 percent increase). And Air Force R&D rises from \$14.2 billion to \$14.5 billion (a 2.4 percent increase). **Included in the Army’s R&D appropriation is a provision, initiated by the House, of \$50 million for the establishment of a new “Non-Profit Army Venture Capital Corporation.”** According to the committee report that accompanies the bill, “The purpose of this corporation shall be to make equity investments in early-stage companies developing technologies that are important to the Army but also have potential to find commercial markets in the longer term.” The corporation would be modeled after the Central Intelligence Agency’s (CIA) In-Q-Tel Corporation, which was established to develop key technologies important to CIA operations. Though the \$50 million appropriation for the corporation

constitutes less than 1 percent of the Army's overall R&D, it does signal an increased emphasis on alternatives to traditional contracting mechanisms vis-à-vis the defense RDT&E process.

The **Defense Advanced Research Projects Agency (DARPA)**, one of the Defense Agencies, receives \$2.3 billion in the final bill, 14.1 percent more than FY 2001 (see Table B). The Biological Warfare Defense program receives \$147 million, down from \$167 million in FY 2001. Defense Research Sciences, DARPA's basic research program, rises from \$109 million to \$145 million (up 33 percent).

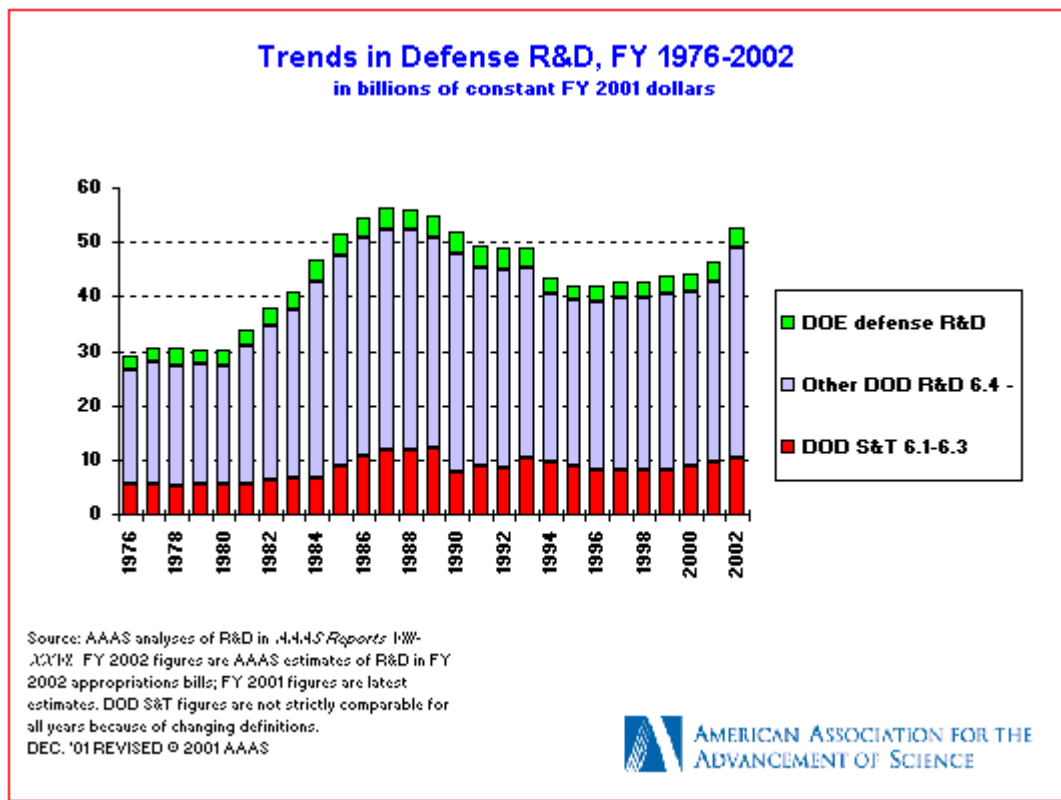


Figure 1. (click on the image to view or download a color, full-page PDF version of the chart)

The FY 2002 R&D appropriation is a record dollar increase for DOD, even in inflation-adjusted terms, as shown in Figure 1. After nearly a decade of post-Cold War cuts, DOD R&D had been increasing slightly for the past few years, but this year's increase represents a decisive step back to Cold War funding levels because of the new war in which the United States is now engaged. Although the Bush Administration had requested substantial increases in DOD R&D spending even before September 11, the entry of the U.S. into war in Afghanistan made approval of these proposed increases much more likely in Congress, even for controversial items such as national missile defense. The regular DOD budget as a whole receives a large increase in FY 2002, and DOD's budget receives an additional boost out of the \$40 billion in emergency funds appropriated in the immediate aftermath of the September 11 terrorist attacks. President Bush has stated that he may request additional FY 2002 emergency funds early next year to pay for the ongoing war in Afghanistan and other DOD needs.

DOD's total research portfolio by science and engineering discipline is shown in Figure 2. Because of DOD's national security mission, the portfolio is weighted toward disciplines such as mathematics, physics, computer sciences, and especially engineering which have relevance to developing future weapons systems, but DOD also supports research in other fields for national security reasons, including the life sciences to combat bioterrorism threats and to ensure healthy soldiers, and environmental sciences (chiefly oceanography) to assist the Navy in operating its ships.

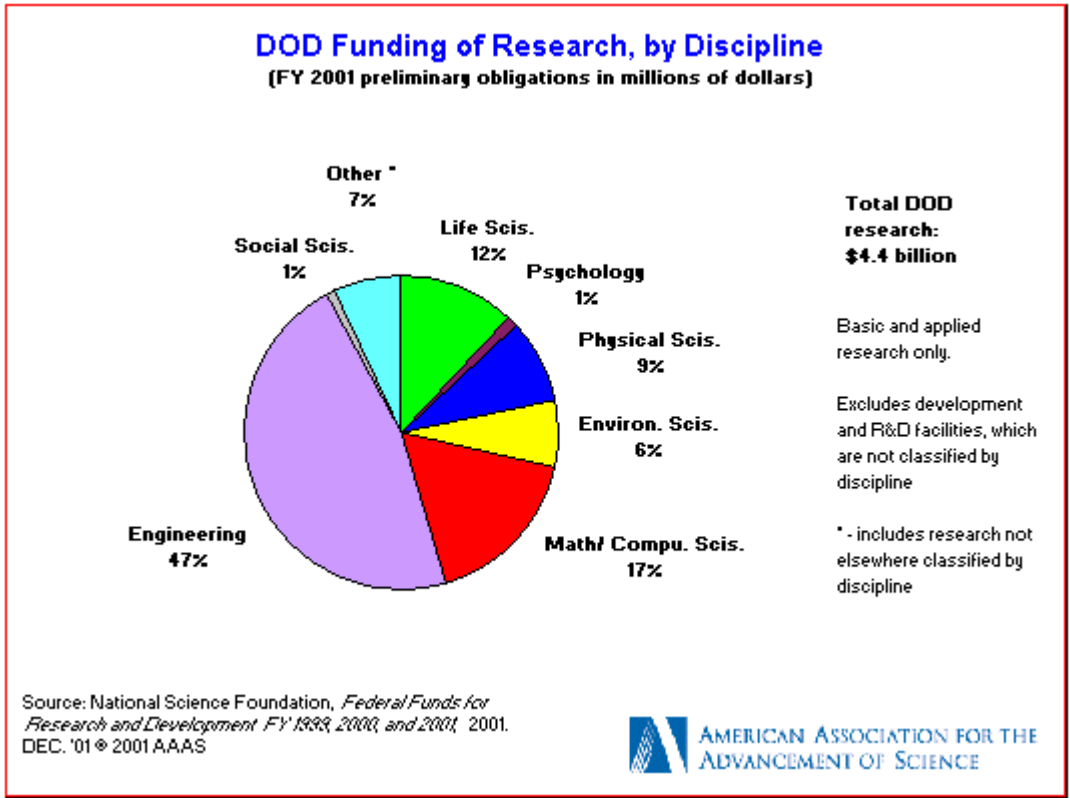


Figure 2. (click on the image to view or download a color, full-page PDF version of the chart)

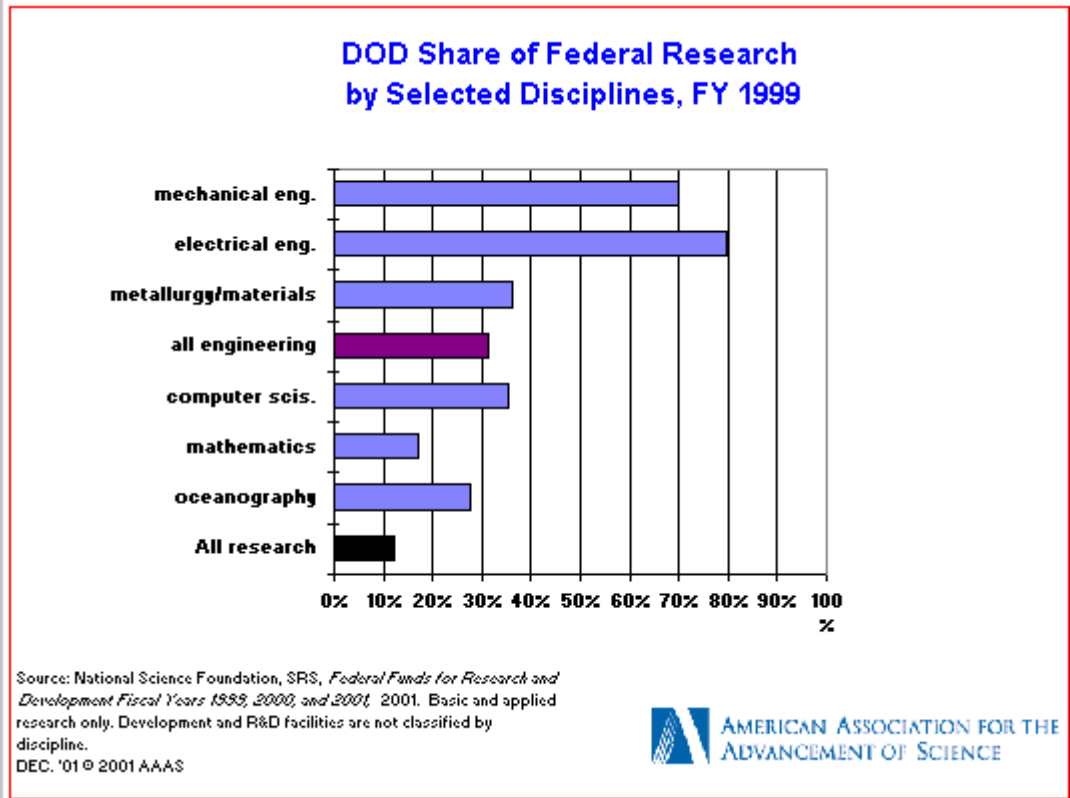


Figure 3. (click on the image to view or download a color, full-page PDF version of the chart)

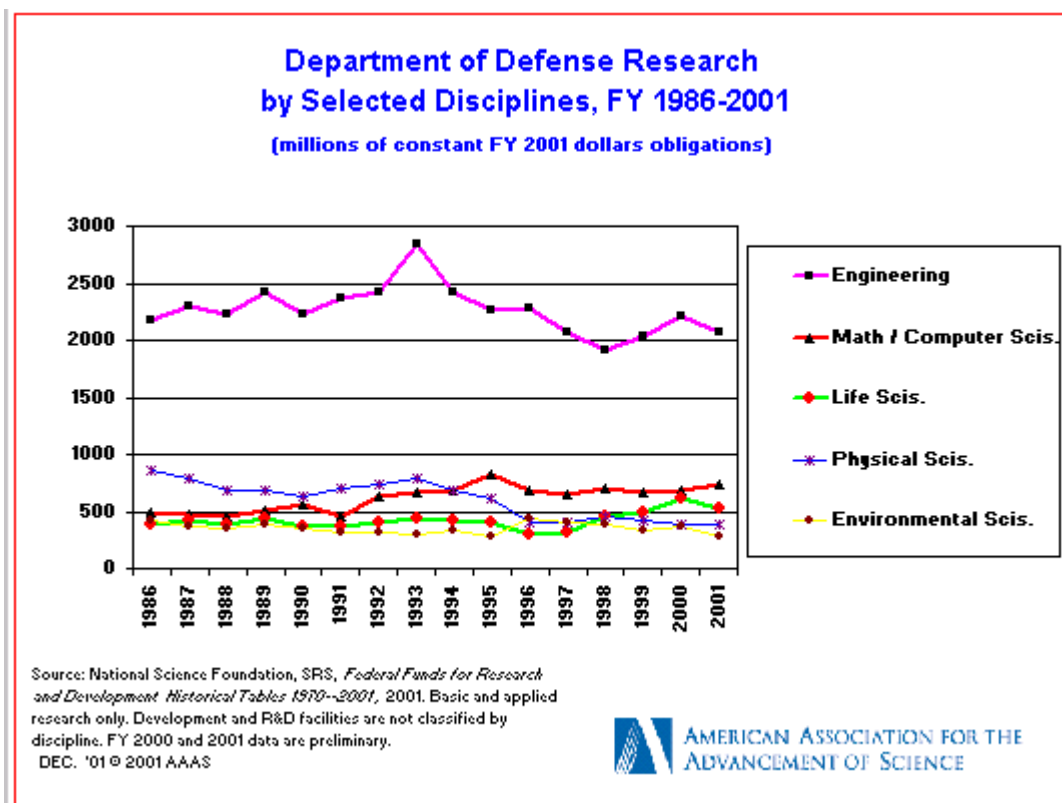


Figure 4. (click on the image to view or download a color, full-page PDF version of the chart)

Out of this varied portfolio, DOD provides nearly one-third of all federal support for engineering research and a majority of federal support for some key engineering subfields (see Figure 3). DOD also provides more than a third of total federal support for computer science research and plays a prominent funding role in other disciplines such as mathematics, oceanography, medical sciences, chemistry, physics, and environmental sciences.

As Figure 4 shows, DOD support for research suffered in the mid-1990s as a result of post-Cold War cuts in DOD R&D; DOD support of engineering research and physical sciences research were especially hard hit. DOD support of life sciences, meanwhile, has increased in recent years because of the expansion of DOD's medical research programs and the growing importance of bioterrorism defense. The large increases for the "6.1" and "6.2" accounts in FY 2002 should boost DOD funding for research in all of these disciplines.

The final Defense bill now goes to President Bush, who is expected to sign it into law shortly. The Defense bill is the last of the 13 appropriations bills to go to the President; when he signs the bill, the FY 2002 appropriations process will be complete.

- January 4, 2002

AAAS R&D Budget and Policy Program
1200 New York Ave, NW
Washington, DC 20005
(202) 326-6607; -6600
fax (202) 289 4950
science_policy@aaas.org
www.aaas.org/spp/R&D

**Table A. Department of Defense by Program
Congressional Action on R&D in the FY 2002 Budget
(budget authority in millions of dollars)**

	FY 2001 Estimate	FY 2002 Request	FY 2002 Approved	Action by Congress			
				Chg. from Request Amount	Chg. from Request Percent	Chg. from FY 2001 Amount	Chg. from FY 2001 Percent
Research, Development, Test, and Evaluation:							
Basic Research ("6.1")	1,317	1,304	1,383	79	6.0%	65	5.0%
Applied Research ("6.2")	3,676	3,659	4,212	553	15.1%	536	14.6%
Total Research, or Tech. Base	4,993	4,963	5,595	632	12.7%	601	12.0%
Advanced Tech. Dev. ("6.3")	4,015	3,799	4,471	672	17.7%	457	11.4%
Total Science and Technology	9,008	8,762	10,066	1,304	14.9%	1,058	11.7%
Demonstration/Validation ("6.4")	7,993	11,381	10,401	-981	-8.6%	2,407	30.1%
Engineering and Manuf. Dev. ("6.5")	8,893	10,249	11,022	772	7.5%	2,129	23.9%
RDT&E Management Support ("6.6")	2,639	2,802	2,847	45	1.6%	207	7.9%
Operational Systems Dev. ("6.7")	12,961	14,235	14,385	150	1.1%	1,424	11.0%
BA Adjustment	-180	0	0	0	--	--	--
TOTAL RDT&E	41,315	47,429	48,720	1,290	2.7%	7,405	17.9%
Other appropriations ¹	1,017	959	953	-7	-0.7%	-64	-6.3%
Medical research ²	412	65	461	396	606.7%	49	12.0%
Total DOD R&D	42,743	48,454	50,134	1,680	3.5%	7,390	17.3%

AAAS estimates based on FY 2002 appropriations bills. Includes conduct of R&D and R&D facilities.

FY 2001 and FY 2002 request figures based on OMB R&D data and supplemental agency budget data.

FY 2002 request figures based on amended DOD budget request of June 2001. FY 2001 figures adjusted to reflect supplemental appropriations. FY 2002 Approved figures adjusted to reflect general reductions, emergency supplementals, and rescissions.

Figures are rounded to the nearest million. Changes calculated from unrounded figures.

¹ R&D support in military personnel, military construction, and other DOD appropriations.

Includes chemical agents and munitions destruction R&D funded outside RDT&E.

² Medical research appropriated in Defense Health Programs, not RDT&E. These funds are not included in "6.2."

December 26, 2001 - based on enacted appropriations bills.

**Table B. Department of Defense by Agency
Congressional Action on R&D in the FY 2002 Budget
(budget authority in millions of dollars)**

	FY 2001 Estimate	FY 2002 Request	FY 2002 Approved	Action by Congress			
				Chg. from Request Amount	Chg. from Request Percent	Chg. from FY 2001 Amount	Chg. from FY 2001 Percent
Research, development, test, and evaluation:							
Army	6,247	6,513	7,064	551	8.5%	817	13.1%
Navy	9,555	10,735	11,422	687	6.4%	1,867	19.5%
Air Force	14,190	14,344	14,528	184	1.3%	338	2.4%
Defense Agencies	11,098	15,620	15,475	-145	-0.9%	4,377	39.4%
<i>Defense Adv. Res. Projects Agcy.</i>	2,010	2,281	2,293	11	0.5%	283	14.1%
<i>Ballistic Missile Defense Org.</i>	4,204	7,606	6,995	-610	-8.0%	2,791	66.4%
<i>Other</i>	4,884	5,733	6,187	454	7.9%	1,303	26.7%
Director of Test and Evaluation	0	0	0	0	--	0	--
Director of Operational Test & Eval.	223	217	231	13	6.1%	8	3.5%
TOTAL RDT&E	41,315	47,429	48,720	1,290	2.7%	7,405	17.9%
Other appropriations ¹	1,017	959	953	-7	-0.7%	-64	-6.3%
Medical research ²	412	65	461	396	606.7%	49	12.0%
Total DOD R&D	42,743	48,454	50,134	1,680	3.5%	7,390	17.3%

AAAS estimates based on FY 2002 appropriations bills. Includes conduct of R&D and R&D facilities.

FY 2001 and FY 2002 request figures based on OMB R&D data and supplemental agency budget data.

FY 2002 request figures based on amended DOD budget request of June 2001. FY 2001 figures adjusted to reflect supplemental appropriations. FY 2002 Approved figures adjusted to reflect general reductions, emergency supplementals, and rescissions.

¹ R&D support in military personnel, military construction, and other DOD appropriations.

Includes chemical agents and munitions destruction R&D funded outside RDT&E.

² Medical research appropriated in Defense Health Programs, not RDT&E.

December 26, 2001 - based on enacted appropriations bills.

Table C. DOE Atomic Energy Defense Activities (enacted appropriations)

	FY 2001 Estimate	FY 2002 Request	FY 2002 Approved	Action by Congress			
				Chg. from Request Amount	Chg. from Request Percent	Chg. from FY 2001 Amount	Chg. from FY 2001 Percent
National Nuclear Security Administration (NNSA)							
Naval Reactors	669	667	665	-2	-0.3%	-3	-0.5%
Weapons Activities	2,357	2,449	2,569	120	4.9%	212	9.0%
<i>Stockpile R&D</i>	246	306	349	44	14.2%	104	42.2%
<i>Adv. Simulation and Computing</i>	747	738	730	-8	-1.1%	-17	-2.3%
<i>ICF Ignition and High Yield</i>	234	223	261	39	17.3%	28	11.9%
<i>Nat'l Ignition Facility Construction</i>	197	245	245	0	0.0%	48	24.2%
<i>All Other Weapons Acts. R&D</i>	934	938	984	46	4.9%	50	5.4%
Nonproliferation & Verification R&D	204	195	309	114	58.5%	105	51.2%
Fissile Materials Disposition	62	67	67	0	0.0%	6	9.6%
Total NNSA R&D	3,292	3,379	3,611	232	6.9%	319	9.7%
Environmental Management	176	131	151	20	15.2%	-25	-14.0%
Nuclear Safeguards & Security	26	26	26	0	0.0%	0	0.0%
Intelligence	5	5	5	0	0.0%	0	0.0%
TOTAL Atomic Defense	3,499	3,542	3,794	252	7.1%	295	8.4%
Total Defense R&D (DOD+DOE)	46,243	51,996	53,928	1,932	3.7%	7,685	16.6%

AAAS estimates. Includes conduct of R&D and R&D facilities.