

DOD Gets Record R&D Budget in 2005; “S&T” Tops \$13 Billion

AAAS R&D Funding Update on FY 2005 DOD Final Appropriations

- **Congress has come to a final agreement on a record-breaking \$70.3 billion for R&D in the Department of Defense (DOD) in FY 2005**, \$4.6 billion more than this year for a 7.1 percent increase (see Table A).
- **The big winner in DOD next year will be the missile defense program.** Funding for development in the Missile Defense Agency (MDA) jumps 16 percent to \$8.8 billion in preparation for initial deployment of national missile defenses later this year (see Table B).
- **Congress provides large increases for DOD support of basic and applied research.** Basic research (“6.1”) will gain 6.1 percent to \$1.5 billion, in contrast to steep cuts in the Pentagon request (see Table A). Applied research (“6.2”) gains 9.5 percent to \$4.8 billion, again in contrast to requested cuts.
- **DOD “Science and Technology” (S&T) increases by nearly \$1 billion or 7.9 percent to an all-time high of \$13.6 billion in FY 2005.** “S&T,” which includes research, medical research, and technology development, comfortably exceeds 3 percent of the total DOD budget of \$401 billion (see Table C).

On July 20, Congress came to an agreement on the conference report (final version) of a \$416 billion Defense appropriations bill (HR 4613) that will provide record-breaking sums for Department of Defense (DOD) R&D in fiscal year 2005, beginning October 1. By the end of this week (July 23), after final House and Senate approval, the Defense bill will become the first of the 13 FY 2005 appropriations bills to go to the President for his signature. (Some minor revisions to the Defense bill were made in November’s omnibus budget bill.) The bill funds nearly all of DOD’s FY 2005 budget and also provides \$25 billion immediately for costs associated with the continuing occupation of Iraq and Afghanistan. All told, DOD is expected to have \$401 billion in regular funds for FY 2005 and an additional \$25 billion in Iraq emergency funds in FY 2004, but even more emergency funds will be necessary next year to pay for further unbudgeted costs in Iraq and Afghanistan. The final Defense bill appears to provide nearly \$70 billion in FY 2005 for DOD’s “RDT&E” account containing nearly all of DOD’s R&D, but across-the-board reductions contained elsewhere in the bill reduce the total by \$1 billion. All figures in the tables and in this analysis have been reduced to reflect the across-the-board reductions, and minor reductions in the omnibus budget bill.

Priorities in DOD R&D

The final FY 2005 Defense bill gives DOD \$70.3 billion for its R&D programs, an increase of 7.1 percent or \$4.6 billion that gives DOD its largest R&D budget in history, following substantial increases in each of the past four years (see Figure 1). Within the same overall total of \$401 billion for DOD, the final Defense bill provides more for R&D than either the earlier House version (\$69.2 billion) or the Senate version (\$69.5 billion) of the bill. As in past years, nearly all of the increase (89 percent) will go to development programs.

DOD support of basic and applied research will increase substantially in FY 2005. In the DOD request released in February, DOD’s “6.1” (basic research) and “6.2” (applied research) activities combined would

have fallen 10.6 percent to \$5.2 billion. But the final appropriation adds funds to both categories to provide a total of \$6.3 billion for DOD “6.1” plus “6.2”, a boost of 8.7 percent over FY 2004.

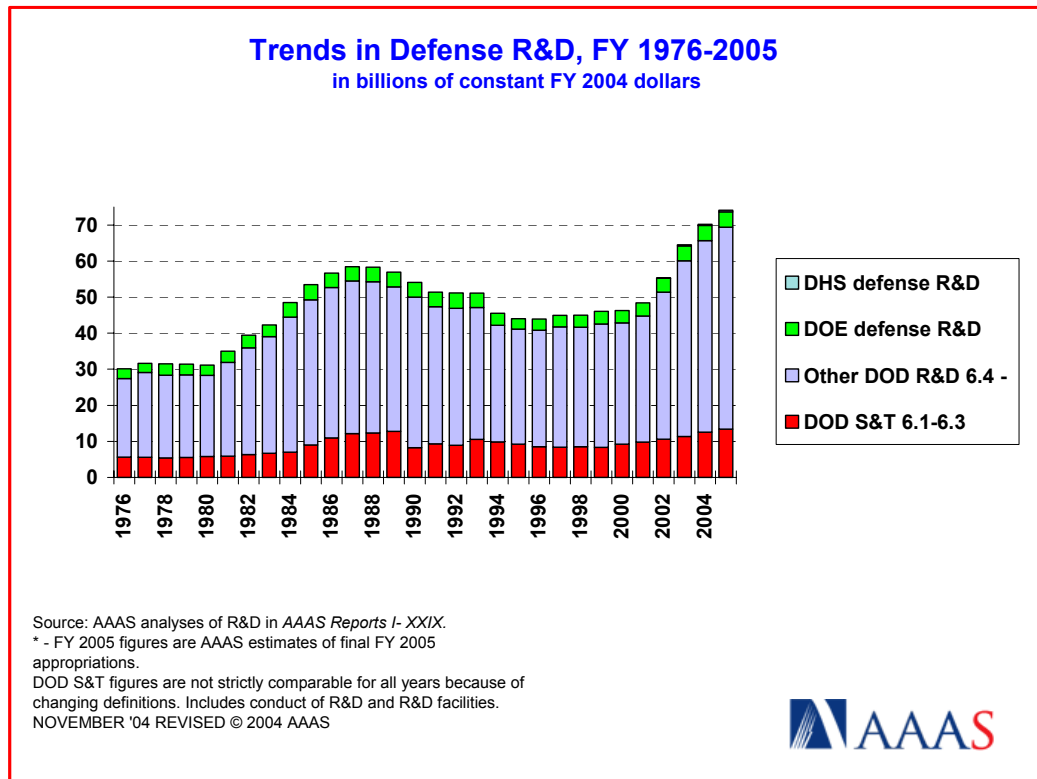


Figure 1. (click on the image to view or download a full-page color PDF version of the chart)

Basic research funding (the “6.1” category) will rise \$85 million to \$1.5 billion next year, in contrast to a steep requested cut. Most of the increase will go to congressionally designated research projects (earmarks), but core DOD research funding will also increase. This year, funding for the University Research Initiatives (URI) program switched from the Office of the Secretary of Defense (OSD) to the three services. URI competitively awards basic research grants to university performers; in FY 2005, DOD will continue URI in the three services at a combined level of \$302 million, up \$19 million from this year. The broader Defense Research Sciences programs, which fund research at DOD laboratories, universities, and other performers, will collectively total \$952 million, up substantially from \$884 million in FY 2004. “6.1” funding in each of the three services (Army, Navy, and Air Force) as well as the Defense Agencies will increase (see Table C).

Applied research funding (the “6.2” category) will climb 9.5 percent or \$420 million to \$4.8 billion in FY 2005, instead of a requested cut. Again, applied research in each of the three services and the Defense Agencies will increase, with much of the increase going to earmarks. Applied research in the Defense Agencies will increase 10.0 percent because of jumps in Defense Advanced Research Projects Agency (DARPA) funding (see DARPA, below).

Applied research on medical topics would also increase, to a new high of \$507 million in FY 2005. Since the early 1990s, Congress has appropriated funds for **congressionally designated medical research** programs in the DOD budget. In the past, nearly all of these funds were appropriated in the Army, but in FY 2000 Congress began to appropriate the majority of them outside the RDT&E accounts in the Defense Health Program (see Table A). The FY 2005 total of \$507 million for medical research includes \$150 million for breast cancer research, \$85 million for prostate cancer research, and \$10 million for ovarian cancer research in peer-reviewed, competitively awarded grants, the same as this year. There is also \$50 million for peer-reviewed research on other medical topics. Earmarked medical research projects make up

most of the remaining medical research appropriation.

DOD Funding of "S&T"

DOD funding of "S&T" (the "6.1" through "6.3" categories plus medical research) **will climb to \$13.6 billion in FY 2005, an increase of \$993 million or 7.9 percent** (see Table C). For the past several years, Congress has been more supportive of S&T funding than the Pentagon, and the pattern holds true again in the FY 2005 budget. The final congressional appropriation is nearly \$3 billion more than the \$10.6 billion DOD request, and is itself higher than the earlier House and Senate versions of the bill. 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 few years, 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. The last three budgets, including this year's, have met that goal after taking out Iraq and Afghanistan war spending. The FY 2005 request would have cut S&T funding steeply, lowering the S&T/budget ratio to 2.64 percent; the House Defense bill boosted the ratio to 3.24 percent and the Senate provided 3.10 percent, but the final Defense bill tops them all with an S&T/budget ratio of 3.38 percent.

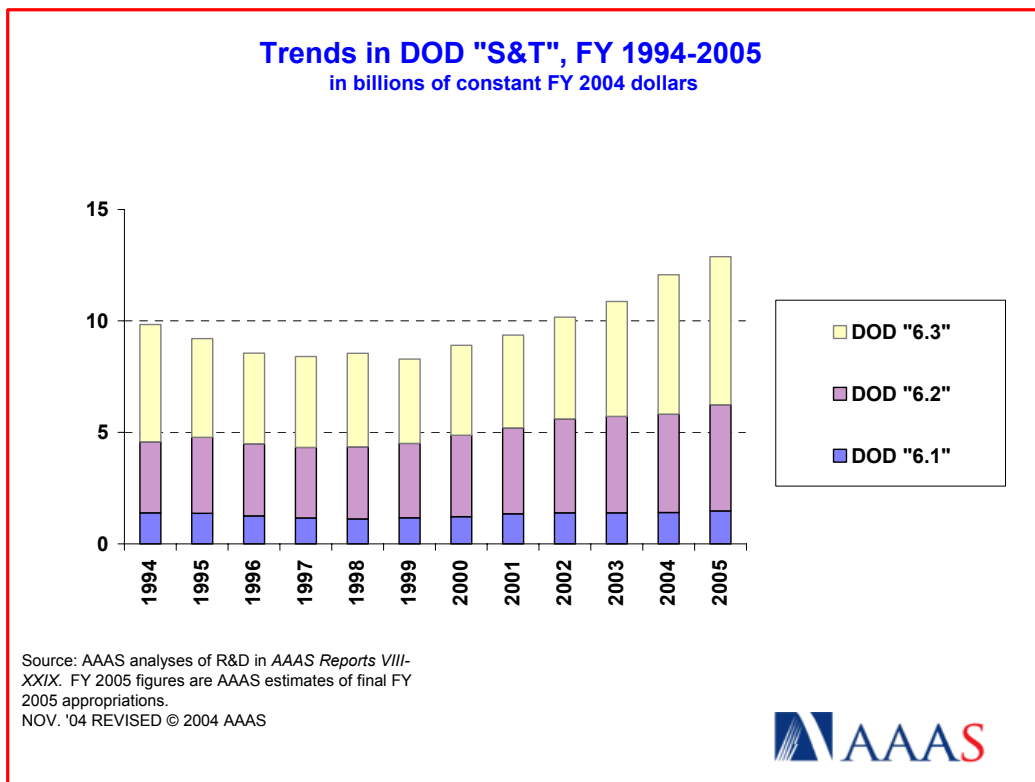


Figure 2. (click on the image to view or download a full-page color PDF version of the chart)

DOD S&T will reach its highest funding level ever in FY 2005. Although DOD S&T approached \$13 billion in today's dollars during the height of the Cold War in the late 1980s, DOD S&T hit post-Cold War lows of just above \$8 billion in today's dollars in the late 1990s (see Figure 2). But in recent years, congressional appropriators have provided steady increases, and the FY 2005 budget carries DOD S&T investments above \$13 billion for the first time. While this is a relief for DOD S&T advocates, Figure 2 shows that the composition of the DOD S&T portfolio has been changing. DOD support of basic research has increased relatively little, and is a shrinking proportion of the DOD S&T portfolio. While "6.2" funding has increased a little more, recent growth in DOD S&T has come predominantly from growth in "6.3" funding of advanced technology development rather than from research.

R&D in the Services and Defense Agencies

R&D in the Army, Navy, the Air Force, and the Defense Agencies will all increase next year (see Table B), with most of the increases going to weapons development activities for big-ticket weapons systems such as the Joint Strike Fighter (\$4.3 billion in the Navy and Air Force) and armored systems modernization in the Army (\$2.3 billion).

R&D in the Defense Agencies will increase \$1.6 billion to \$20.5 billion, primarily because of a \$1.2 billion increase to \$8.8 billion for development in the Missile Defense Agency (MDA; see Table B). **The missile defense program is a high priority for the Bush Administration and Congress.** While Congress ends up providing less than the \$9.1 billion MDA requested, the appropriation will still be a substantial 15.8 percent increase over FY 2004. The MDA (formerly the Ballistic Missile Defense Organization) no longer funds research; there would be some funds for technology development but now nearly all missile defense funds go to advanced development, testing, manufacturing development, and evaluation of missile defense systems. Including procurement and development funds in other parts of the DOD budget, Congress provides \$9.8 billion for ballistic missile defense programs, divided into theater missile defenses (battlefield defense) and national missile defenses (defense of U.S. territory). MDA is gearing up for initial deployment this fall of national missile defense systems.

The **Defense Advanced Research Projects Agency (DARPA) sees its R&D funding increase by 4.9 percent** to \$3.0 billion, slightly off the \$3.1 billion request. The final Defense bill follows the Senate lead in criticizing several DARPA programs for being too large to manage effectively. But instead of cutting funding, the Defense bill splits four large programs making up half the DARPA budget (in computing systems and communications, materials and electronics, aerospace and space, and sensor and guidance systems) into eight smaller ones to give each new program a smaller research focus area; the combined budgets of the eight new programs are well above current-year funding for the four larger programs. The biggest boost to DARPA will be for its basic research “6.1” program in Defense Research Sciences, which will climb 23 percent to \$171 million.

Impacts of Defense R&D

The Department of Defense (DOD) is by far the largest supporter of R&D in the federal government, accounting for more than half the total federal R&D portfolio. In the 1980s, DOD supported nearly two-thirds of total federal R&D. Because of defense cutbacks following the end of the Cold War, however, DOD’s support for R&D declined by a third after FY 1987, bottoming out in the mid-1990s, but has increased dramatically in the past few years to new highs. Defense-related R&D is also funded by the Department of Energy (DOE), which is responsible for maintaining the U.S. nuclear weapons stockpile, and the new Department of Homeland Security (DHS), whose primary mission is homeland defense but also performs R&D related to military security (see Figure 1).

DOD is responsible for only 15 percent of all federal support of basic and applied research (“6.1” and “6.2”), but is a key sponsor for several science and engineering (S&E) disciplines (see Figure 3). DOD supports 37 percent of all federal research in the computer sciences and a similar proportion of all engineering research, as well as significant shares of research in mathematics and oceanography. DOD’s impact is even greater in several engineering sub-disciplines such as electrical engineering and mechanical engineering. DOD funds research in these disciplines for their contributions to national defense, but this research is also a key source for major innovations in the civilian economy, most evident in DOD’s early support for research that led to the now-ubiquitous Internet. DOD is also a key supporter of social sciences research.

A majority of DOD’s R&D (and nearly all the work in categories “6.4” and higher) is performed by industrial firms such as the large defense contractors Lockheed Martin and Boeing. FFRDCs (federally funded research and development centers), defense laboratories, and colleges and universities also perform R&D. If one excludes DOD development, which is nearly exclusively performed by industry, DOD basic and applied research (“6.1” and “6.2”) is performed by a diverse group of institutions. 39 percent of DOD

research is performed by DOD laboratories, while 32 percent is performed by industry. A quarter (25 percent) of DOD basic and applied research is performed by universities and colleges. All performers should benefit from the large increases in “6.1” and “6.2” funding in the FY 2005 DOD budget; the development increases will go almost entirely to defense contractors.

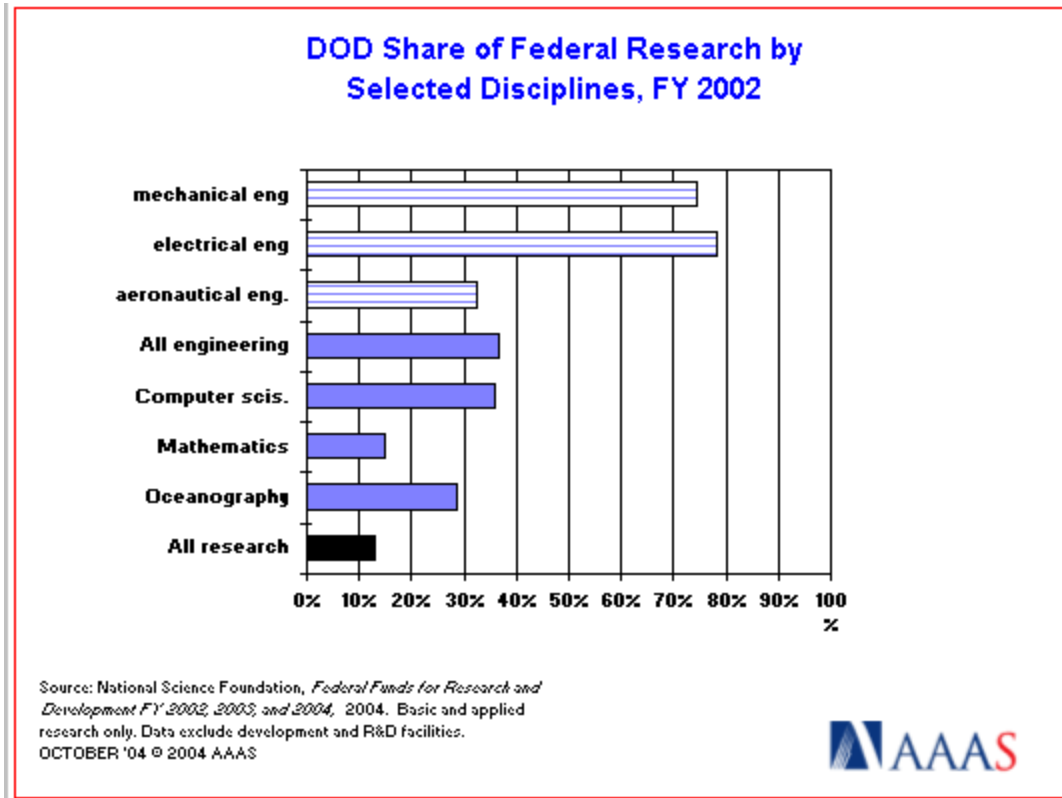


Figure 3. (click on the image to view or download a full-page color PDF version of the chart)

Outlook for Defense R&D

The final Defense bill adds substantially to the Pentagon’s FY 2005 request, but there remain questions over the long-term outlook for DOD’s research programs. The Pentagon’s five-year budget plan calls for the total DOD budget to increase from \$402 billion in FY 2005 up to \$488 billion in FY 2009, though these budgets exclude any costs associated with the occupation of Iraq. As noted above, Congress provided \$1 billion less for DOD overall but \$1.6 billion more within the total for R&D.

The AAAS analysis of the Pentagon projections show that total DOD R&D would increase in line with inflation and end up at \$71.1 billion by FY 2009. But the Pentagon’s five-year budget projections call for sharp cuts in DOD’s support of S&T, including DOD support of basic and applied research. Total DOD S&T would fall from \$12.6 billion this year down to \$10.5 billion in FY 2006 before edging up slightly to \$11.2 billion by FY 2009, for a cut of 17.9 percent after inflation between FY 2004 and 2009. DOD S&T would fall further and further away from the 3 percent goal and end up at 2.3 percent of the total DOD budget by FY 2009 in the DOD projections. DOD support of basic research would fall 17 percent after inflation over the next five years, while DOD applied research would fall by 11 percent. The steepest cuts are projected to take place over the next two years, with some recovery after that. While the cuts would still leave “6.2” and “6.3” funding somewhat above recent historical levels, they would leave “6.1” funding on a steady downward trend from the past decade. (For more on the five-year projections for federal R&D, see the April 22 (revised May 7) AAAS Analysis of the Outyear Projections for R&D in the FY 2005 Budget.)

The final FY 2005 appropriation, of course, alters the Pentagon projections for FY 2005 dramatically by turning requested cuts in “6.1” and “6.2” to appropriated increases. It remains to be seen whether future Congresses will continue to find the dollars to alter the Pentagon’s projected course for research funding. And the Pentagon itself will continually revise its budget plans to reflect changing defense needs, budget outlooks, and future war and occupation costs.

President Bush signed the Defense bill into law on August 5, making the Defense bill the first of the 13 FY 2005 appropriations bills to be signed into law. Congress and President Bush put the bill on a fast track because the \$25 billion in emergency funds for Iraq became available immediately after the President signs; the regular FY 2005 funds, of course, became available on October 1.

(For details of R&D in the FY 2005 DOD request, see the February 20 AAAS R&D Funding Update; for details of House and Senate authorizations for DOD, see the June 2 AAAS R&D Funding Update; for details of House appropriations for DOD, see the June 23 AAAS R&D Funding Update; and for details of Senate appropriations for DOD, see the June 29 AAAS R&D Funding Update.)

(This analysis is one of a series of AAAS R&D Funding Updates on the FY 2005 congressional appropriations process. This analysis includes information on R&D in final appropriations for the Department of Defense. The complete series of AAAS R&D Funding Updates, including continually updated analyses of R&D by agency in FY 2005 appropriations, is available on the AAAS R&D Web Site (<http://www.aaas.org/spp/rd>) in the “FY 2005 R&D” or the “What’s New” sections.)

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Table A. DOD R&D by Program in FY 2005 Final Appropriations

**Table A. Department of Defense by Program
Final Congressional Action on R&D in the FY 2005 Budget
(budget authority in millions of dollars)**

	FY 2004 Estimate	FY 2005 Request*	FY 2005 Approved	House-Senate Conference			
				Chg. from Request Amount	Chg. from Request Percent	Chg. from FY 2004 Amount	Chg. from FY 2004 Percent
Research, Development, Test, and Evaluation:							
Basic Research ("6.1")	1,404	1,330	1,489	159	11.9%	85	6.1%
Applied Research ("6.2")	4,415	3,878	4,836	958	24.7%	420	9.5%
Total Research, or Tech. Base	5,819	5,208	6,325	1,117	21.4%	505	8.7%
Advanced Tech. Dev. ("6.3")	6,252	5,343	6,719	1,376	25.8%	467	7.5%
Total Science and Technology	12,071	10,550	13,043	2,493	23.6%	972	8.1%
Adv. Component Dev. ("6.4")	13,199	15,355	14,701	-654	-4.3%	1,502	11.4%
System Dev. And Demon. ("6.5")	15,889	18,061	17,290	-771	-4.3%	1,400	8.8%
Management Support ("6.6")	3,275	3,261	3,465	204	6.3%	190	5.8%
Operational Systems Dev. ("6.7")	19,944	20,545	20,365	-180	-0.9%	421	2.1%
BA Adjustment	-28	0	0	0	--	--	--
TOTAL RDT&E	64,350	67,773	68,864	1,092	1.6%	4,514	7.0%
Other appropriations ¹	819	914	914	0	0.0%	95	11.6%
Medical research ²	486	72	507	435	600.2%	21	4.2%
Total DOD R&D	65,656	68,759	70,285	1,526	2.2%	4,630	7.1%
DOD S&T ("6.1" - "6.3" & medical)	12,558	10,623	13,550	2,928	27.6%	993	7.9%

AAAS estimates based on FY 2005 appropriations bills. Includes conduct of R&D and R&D facilities.

FY 2004 and FY 2005 request figures based on OMB R&D data and supplemental agency budget data.

* FY 2005 Army request modified in March 2004.

FY 2004 figures adjusted to reflect FY 2004 rescissions in the FY 2005 final Defense bill.

FY 2005 Conference figures adjusted to reflect general reductions in the final Defense bill and omnibus bill.

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."

November 24, 2004 - AAAS estimates of final FY 2005 appropriations bills.

Table B. DOD R&D by Agency in FY 2005 Final Appropriations

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Final Congressional Action on R&D in the FY 2005 Budget
(budget authority in millions of dollars)**

	FY 2004 Estimate	FY 2005 Request*	FY 2005 Approved	House-Senate Conference			
				Chg. from Request Amount	Chg. from Request Percent	Chg. from FY 2004 Amount	Chg. from FY 2004 Percent
Research, development, test, and evaluation:							
Army *	10,168	9,266	10,536	1,270	13.7%	368	3.6%
Navy	14,821	16,346	16,865	519	3.2%	2,045	13.8%
Air Force	20,236	21,115	20,682	-433	-2.1%	445	2.2%
Defense Agencies	18,823	20,740	20,473	-268	-1.3%	1,649	8.8%
<i>Defense Adv. Res. Projects Agcy.</i>	2,821	3,090	2,960	-130	-4.2%	139	4.9%
<i>Missile Defense Agency</i>	7,559	9,147	8,756	-391	-4.3%	1,197	15.8%
<i>Chem. And Bio. Defense Program</i>	706	560	713	153	27.3%	7	1.0%
<i>Defense Threat Reduction Agency</i>	398	442	450	8	1.7%	52	13.0%
<i>Office of Secretary of Defense</i>	1,943	2,333	2,375	42	1.8%	432	22.2%
<i>Other **</i>	5,396	5,168	5,219	51	1.0%	-176	-3.3%
Director of Operational Test & Eval.	302	305	308	3	1.0%	6	2.1%
TOTAL RDT&E	64,350	67,773	68,864	1,092	1.6%	4,514	7.0%
Other appropriations ¹	819	914	914	0	0.0%	95	11.6%
Medical research ²	486	72	507	435	600.2%	21	4.2%
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Table C. DOD S&T by Agency in FY 2005 Final Appropriations

**Table C. Department of Defense S&T by Agency
Final Congressional Action on R&D in the FY 2005 Budget
(budget authority in millions of dollars)**

	FY 2004 Estimate	FY 2005 Request*	FY 2005 Approved	House-Senate Conference			
				Chg. from Request		Chg. from FY 2004	
				Amount	Percent	Amount	Percent
"Science and Technology" (S&T; "6.1" through "6.3" plus medical research)							
Army	2,626	1,783	2,964	1,181	66.2%	339	12.9%
- Basic Research ("6.1")	382	318	402	85	26.6%	20	5.4%
- Applied Research ("6.2")	1,039	651	1,140	489	75.1%	101	9.7%
- Advanced Tech. Dev. ("6.3")	1,205	815	1,422	608	74.6%	217	18.0%
Navy	2,217	1,718	2,283	565	32.9%	66	3.0%
- Basic Research ("6.1")	484	477	491	14	2.9%	7	1.4%
- Applied Research ("6.2")	724	564	817	253	44.9%	93	12.9%
- Advanced Tech. Dev. ("6.3")	1,009	677	975	298	44.0%	-34	-3.4%
Air Force	2,321	1,919	2,331	412	21.5%	10	0.4%
- Basic Research ("6.1")	331	346	359	13	3.8%	28	8.3%
- Applied Research ("6.2")	897	786	948	162	20.6%	52	5.8%
- Advanced Tech. Dev. ("6.3")	1,093	787	1,024	237	30.1%	-69	-6.3%
Defense Agencies	4,895	5,114	5,450	337	6.6%	556	11.3%
- Basic Research ("6.1")	207	190	237	47	24.9%	30	14.6%
- Applied Research ("6.2")	1,756	1,876	1,930	54	2.9%	174	9.9%
- Advanced Tech. Dev. ("6.3")	2,932	3,047	3,283	235	7.7%	351	12.0%
Operational Test & Evaluation ("6.3")	13	16	14	-2	-11.1%	2	13.2%
TOTAL "6.1" through "6.3"	12,071	10,550	13,043	2,493	23.6%	972	8.1%
Medical research ¹	486	72	507	435	600.2%	21	4.2%
DOD S&T ("6.1" - "6.3" + medical)	12,558	10,623	13,550	2,928	27.6%	993	7.9%

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