

Manufacturing Development (“6.5”), Management Support (“6.6”), and Operational Systems Development (“6.7”). DOD also funds some R&D and support in non-RDT&E accounts, and funds applied research on medical topics in the Defense Health Program.

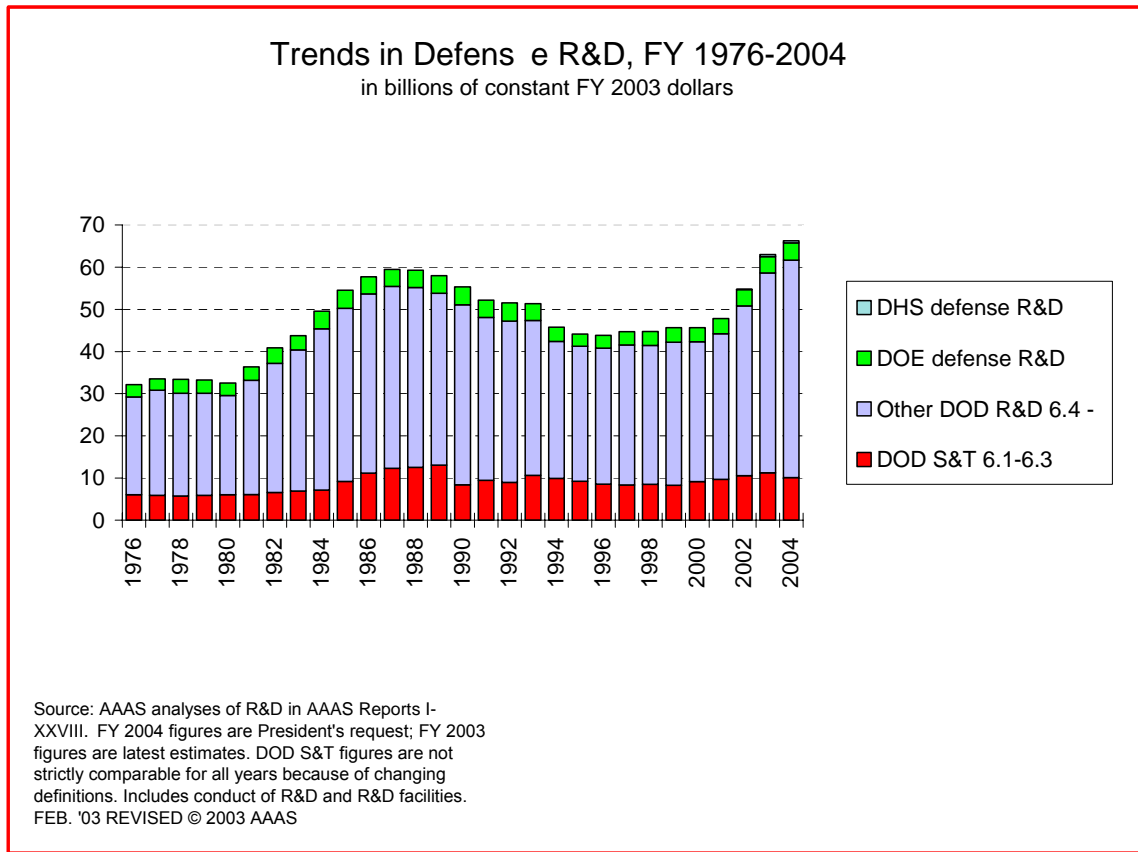


Figure 1. (click on the image to view or download a full-page color PDF version of the chart)

DOD is responsible for only 13 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. DOD supports 35 percent of all federal research in the computer sciences and 39 percent of all engineering research, as well as significant shares of research in mathematics, 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.

The “6.1,” “6.2,” and “6.3” categories are often grouped together as **“Science and Technology” (S&T; see Figure 1)**. This category includes basic research, applied research, and generic technology development. These programs 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. Nearly all DOD support for R&D at colleges and universities comes from the S&T accounts. AAAS estimates of DOD S&T (see Table 3) also include applied medical research in the Defense Health Program, which was formerly funded in the Army “6.2” accounts.

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") are performed by a diverse group of institutions. A third of DOD research is performed by DOD laboratories, while another third is performed by industry. 30 percent of DOD basic and applied research is performed by universities and colleges.

Priorities in DOD R&D

Tables 1 and 2 show DOD's R&D in detail. Table 1 shows DOD R&D by category, and Table 2 by agency and department. Table 3 shows details of the "S&T" portion of the R&D portfolio.

Last year, in the aftermath of the September 2001, terrorist attacks and a military campaign in Afghanistan, President Bush proposed a tremendous increase in the DOD budget to \$379 billion for FY 2003, nearly \$35 billion more than the FY 2002 funding level. Congress ended up appropriating \$365 billion in October, comprising most of what the President Bush requested minus \$20 billion in unallocated reserve funds for military operations plus additional funds for non-DOD accounts, for a final increase of nearly 6 percent over FY 2002. Then, in February, Congress appropriated an additional \$10 billion in supplemental appropriations as part of the FY 2003 omnibus appropriations bill. **President Bush proposed a FY 2004 DOD budget of \$380 billion** earlier this month, a \$5 billion or 1.4 percent increase over the new FY 2003 total (see the second half of Table 2).

The DOD budget leaves out the costs of the current military preparations in the Middle East, and also leaves out the operational costs of a war against Iraq. This month, U.S. soldiers and support staff are massing in the Middle East, with thousands of military personnel and reserve personnel deployed in preparation for war. Even if they return to the U.S. without firing a shot, DOD will need additional funds in FY 2003 above and beyond the budget to cover the costs of their deployment. If the U.S. does declare war, U.S. military expenditures in Iraq could exceed \$100 billion. These additional funds will have to be provided in emergency supplemental appropriations outside the regular DOD budget process.

There would be increases proposed in the FY 2004 budget, with the notable exception of DOD research (see below) and military construction. **Overall, DOD R&D would share in the increase with a boost of \$4.2 billion or 7.1 percent to \$62.8 billion** (see Table 1). In inflation-adjusted dollars, this would represent an all-time record funding level following substantial increases in each of the past three years (see Figure 1).

R&D in the Army, Navy, the Air Force, and the Defense Agencies would all increase, with particularly large increases of 21.5 percent and 8.4 percent for the Army and Air Force, respectively (see Table 2), almost entirely for development. There would be a \$1 billion increase for the Joint Strike Fighter, a next-generation fighter plane in development for future use by all the services and U.S. allies. The development phase ("6.5"), funded equally by the Navy and Air Force, would jump from \$3.4 billion in FY 2002 to \$4.4 billion in FY 2003, an increase of 28 percent.

R&D in the Defense Agencies would increase nearly \$1 billion or 5.7 percent to \$18.0 billion because of a \$1 billion increase to \$7.7 billion for development in the Missile Defense Agency (MDA; see Table 2). **The missile defense program is a high priority for the Bush Administration.** Including some missile defense development funded by the Army, the total missile defense development effort would jump 22 percent to \$8.3 billion in FY 2004, in preparation for deploying a test system as soon as possible. The MDA (formerly the Ballistic Missile Defense Organization) no longer funds research; there would be some funds for generic technology development (\$241 million in FY 2004) but now nearly all missile defense funds go to advanced development, testing, manufacturing, and evaluation of missile defense systems with an additional \$774 million elsewhere in the budget for procurement of completed systems.

The **Defense Advanced Research Projects Agency (DARPA) would see its R&D funding increase to \$3.0 billion** in FY 2004, an increase of \$264 million or 9.8 percent (see Table 2), after a similar increase in FY 2003. DARPA is mostly research-oriented, and its broad research portfolio is aimed at expanding the

frontiers of knowledge and military technology to provide future solutions to DOD's technology needs. While funding for applied research in Biological Warfare Defense would drop from \$162 million in FY 2003 to \$137 million in FY 2004 as the government's counterterrorism research effort continues its shift to the National Institutes of Health (NIH), DARPA's efforts in areas such as tactical technology, materials, aerospace systems, electronics, and sensors and guidance technologies would receive large increases. DARPA would also initiate a new program in network-centric warfare technology with an investment of \$96 million.

But in sharp contrast to the substantial increases in most areas of the DOD budget, **DOD support of basic and applied research would fall steeply in FY 2004.** DOD's "6.1" (basic research) and "6.2" (applied research) activities would fall 12.7 percent to \$510 million in FY 2004, below even the FY 2001 funding level.

Basic research funding (the "6.1" category) would fall 7.7 percent to \$1.3 billion after a 5 percent increase last year. Table 3 shows apparent increases in basic research in the Army, Navy, and Air Force, but these increases reflect major proposed shifts in funding from the Office of the Secretary of Defense (OSD) to the three services. DOD proposes to move funding for the University Research Initiatives program, which funds competitively awarded basic research grants to university performers, from OSD to the three services. DOD would also transfer some smaller, related programs such as the Defense Experimental Program to Stimulate Competitive Research (DEPSCoR), the High Energy Laser Research Initiative, the Force Health Protection program, and support to historically black colleges and universities. Overall, funding for University Research Initiatives would rise 7.8 percent to \$283 million. Funding for the Defense Research Sciences program, however, which funds basic research in DOD laboratories and universities, would fall 10.6 percent to \$853 million across the three services and DARPA. The DARPA program would be especially hard hit, falling 24 percent to \$151 million.

Applied research funding (the "6.2" category) would plummet by 14.4 percent or \$619 million to \$3.7 billion in FY 2004 after a 5 percent increase last year. There would be steep cuts to applied research programs in the three services, including drops of 25 percent in the Army, 34 percent in the Navy, and 9 percent in the Air Force. Applied research in the Defense Agencies would fall 3.4 percent, representing a continuing concentration of applied research in Defense Agencies that would run counter to the proposed shift of basic research back to the services.

DOD funding of "S&T" (the "6.1" through "6.3" categories plus medical research) would fall to \$10.3 billion, down 8.3 percent from FY 2003 (see Table 3). For the past several years, Congress has tended to be more supportive of S&T funding than the Pentagon. Last year's budget, DOD also requested a cut in S&T funding, but Congress ended up appropriating a nearly \$1 billion increase. 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, and in September 2001 the Quadrennial Defense Review endorsed the goal of investing 3 percent of the DOD budget in S&T, and the last two budgets have met that goal. The request, however, would cut S&T funding while increasing overall DOD spending, lowering the S&T/budget ratio to 2.7 percent.

Beginning in the early 1990s, Congress has appropriated funding 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 a majority of them outside the RDT&E accounts in the Defense Health Program (see Table 1). The 2003 total of \$459 million for medical research includes \$150 million for breast cancer research and \$85 million for prostate cancer research in peer-reviewed, competitively awarded grants. The FY 2003 budget also contains \$100 million for ovarian cancer research, \$50 million for peer-reviewed research on other medical topics, and miscellaneous amounts for other medical research topics. These programs award grants on a peer-reviewed basis and are managed by the Army. Additional congressionally designated programs for specific medical research programs are funded

in the Army "6.2" and "6.3" accounts. DOD's policy is not to request continuing funds for most congressionally designated projects; the FY 2004 request is only \$66 million for information technology development to support military medical readiness, Congress is sure to add on funds for the above programs.

Outlook for Defense R&D

Congress has received the DOD budget, and likelihood Congress will only add to the request, especially for areas such as S&T that Congress feels are underfunded in the request. It is nearly impossible to predict the fate of the defense budget, however, because of the uncertainty regarding a possible war against Iraq. Both the FY 2003 and FY 2004 budgets could end up tens of billions of dollars higher than the present and requested levels in the event of military action, and could constrain DOD resources for years to come.

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(More materials on R&D in the FY 2004 budget, historical data and charts, and more information on *AAAS Report XXVIII: Research and Development FY 2004*, can be found on the AAAS R&D Web site at <http://www.aaas.org/spp/rd>.)

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Table 1. R&D in the Department of Defense
(budget authority in millions of dollars)

	FY 2002	FY 2003	FY 2004	Change FY 03-04	
	Actual	Estimate	Budget	Amount	Percent
Research, Development, Test, and Evaluation (RDT&E)					
Basic Research ("6.1")	1,350	1,417	1,309	-109	-7.7%
Applied Research ("6.2")	4,094	4,289	3,670	-619	-14.4%
Total Research	5,443	5,706	4,979	-727	-12.7%
Adv. Tech. Development ("6.3")	4,430	5,067	5,253	186	3.7%
Total Science & Technology	9,874	10,773	10,231	-541	-5.0%
Demons. and Valid. ("6.4")	10,125	10,754	13,197	2,443	22.7%
Eng. & Manufacturing Dev. ("6.5")	10,676	14,425	15,913	1,488	10.3%
Management Support ("6.6")	3,646	3,106	3,028	-78	-2.5%
Operational Sys. Dev. ("6.7")	14,303	18,656	19,458	802	4.3%
BA Adjustment	90	-227	0	227	-100.2%
Total RDT&E	48,713	57,486	61,827	4,341	7.6%
Medical Research ¹	464	459	66	-393	-85.7%
Other Appropriations ²	700	701	928	227	32.4%
Total DOD R&D	49,877	58,646	62,821	4,175	7.1%
Total Conduct of R&D	49,658	58,531	62,672	4,141	7.1%
Total R&D Facilities & Equip.	219	115	149	34	29.6%

Source: OMB data for R&D for FY 2004, Budget of the United States Government FY 2004, DOD "RDT&E Programs" (R-1).

¹ Medical research appropriated in Defense Health Programs, not RDT&E.

These funds are not included in "6.2" (applied research).

² R&D support in military personnel, O&M, and other appropriations. Includes R&D on chemical agents and munition destruction.

Character of work ("6.x" categories) are expressed in total obligational authority (TOA).

BA Adjustment converts TOA into budget authority.

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

Please see Chapter 6 for a discussion of DOD R&D.

Table 2. DOD R&D by Military Departments and Agencies
(budget authority in millions of dollars)

	FY 2002 Actual	FY 2003 Estimate	FY 2004 Budget	Change FY 03-04 Amount	Percent
Research, Development, Test, and Evaluation (RDT&E)					
Army	7,030	7,510	9,123	1,613	21.5%
Navy	11,387	13,599	14,107	508	3.7%
Air Force	14,520	18,763	20,336	1,573	8.4%
Defense Agencies	15,546	17,377	17,974	597	3.4%
Missile Defense Agency	6,910	6,682	7,729	1,047	15.7%
Def. Adv. Res. Projects Agency	2,260	2,690	2,954	264	9.8%
Secretary of Defense	1,704	2,198	1,551	-648	-29.5%
Chem. And Bio. Defense	595	634	599	-35	-5.5%
Classified Agencies	2,601	3,737	3,748	12	0.3%
Other	1,477	1,437	1,393	-43	-3.0%
Director of Operational Test & Eval.	230	237	287	50	21.1%
Total RDT&E	48,713	57,486	61,827	4,341	7.6%
Medical Research ¹	464	459	66	-393	-85.7%
Other Appropriations ²	700	701	928	227	32.4%
Total DOD R&D	49,877	58,646	62,821	4,175	7.1%

Source: OMB data for R&D for FY 2004, Budget of the United States Government FY 2004, DOD "RDT&E Programs" (R-1).

¹ Medical research appropriated in Defense Health Programs, not RDT&E.

² R&D support in military personnel, O&M, and other appropriations.

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

DOD Military Budget (in BILLIONS of dollars discretionary budget authority)

	FY 2002 Actual	FY 2003 Estimate	FY 2004 Budget	Change FY 03-04 Amount	Percent
RDT&E (see above)	48.7	57.5	61.8	4.3	7.6%
Military Personnel	86.9	95.1	98.6	3.5	3.7%
Operations and Maintenance	132.7	134.6	133.2	-1.3	-1.0%
Procurement	62.7	73.9	74.4	0.5	0.7%
Military Construction	6.6	6.3	5.0	-1.3	-20.2%
Family Housing	4.0	4.2	4.0	-0.2	-4.5%
Revolving and Management Funds	2.6	3.1	2.8	-0.3	-9.4%
Allowances, Offsets, Other	0.0	0.0	0.0	0.0	--
Total DOD Discret. Budget	344.4	374.6	379.9	5.3	1.4%

DOD military budget only (excludes civilian activities of the Corps of Engineers).

Table 3. Department of Defense S&T by Agency
(budget authority in millions of dollars)

	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Budget	Chg. FY 03-04	
				Amount	Percent
"Science and Technology" (S&T; "6.1" through "6.3")					
Army	1,993	2,143	1,790	-353	-16.5%
- Basic Research ("6.1") *	221	244	343	99	40.4%
- Applied Research ("6.2")	865	858	641	-217	-25.2%
- Advanced Tech. Dev. ("6.3")	907	1,040	806	-235	-22.6%
Navy	1,998	2,031	1,714	-317	-15.6%
- Basic Research ("6.1") *	395	412	457	44	10.7%
- Applied Research ("6.2")	755	806	536	-270	-33.5%
- Advanced Tech. Dev. ("6.3")	847	813	722	-91	-11.2%
Air Force	1,517	1,751	2,226	475	27.2%
- Basic Research ("6.1") *	222	218	322	104	47.8%
- Applied Research ("6.2")	749	829	758	-71	-8.6%
- Advanced Tech. Dev. ("6.3")	546	704	1,146	442	62.9%
Defense Agencies	4,358	4,839	4,488	-352	-7.3%
- Basic Research ("6.1") *	512	542	187	-356	-65.6%
- Applied Research ("6.2")	1,724	1,796	1,735	-61	-3.4%
- Advanced Tech. Dev. ("6.3")	2,122	2,501	2,566	65	2.6%
Operational Test & Evaluation	8	9	13	4	49.4%
- Advanced Tech. Dev. ("6.3")	8	9	13	4	49.4%
TOTAL "6.1" through "6.3"	9,874	10,773	10,231	-541	-5.0%
Medical research ¹	464	459	66	-393	-85.7%
DOD S&T ("6.1" - "6.3" & medical)	10,337	11,232	10,297	-935	-8.3%

Source: OMB R&D data, Budget of the U.S. Government FY 2004, DOD R-1.

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

* FY 2004 budget proposes to transfer URI & FHP funds from Defense-Wide "6.1" to Army, Navy, and Air Force "6.1" accounts.

¹ Medical research appropriated in Defense Health Programs, not RDT&E.