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## R&D in the FY 2003 Department of Defense Budget

*Kei Koizumi, AAAS*

### HIGHLIGHTS

- The Department of Defense (DOD), the largest federal sponsor of R&D, would receive its second-largest dollar increase in history for its R&D to \$54.8 billion in FY 2003, an increase of \$5.2 billion or 10.5 percent after a record increase of \$7 billion last year (see Table II-2). Most of the increase would go to the development of weapons systems in the services (the Air Force and Navy in particular) rather than research.
- Basic and applied research in DOD would decline despite the record \$45 billion (or 13.4 percent) increase in the overall DOD budget to \$379 billion. Basic research (“6.1”) would fall 0.8 percent to \$1.4 billion, while applied research (“6.2”) would fall 7.5 percent to \$3.8 billion in FY 2003, partially because FY 2002 congressional earmarks would not be renewed (see Table II-3). DOD “Science and Technology” (S&T), which includes research, medical research, and technology development, would fall 3.7 percent to \$10.0 billion (see Table II-1), falling well short of the DOD goal of 3 percent of the total DOD budget.
- After nearly doubling its budget in FY 2002, the Ballistic Missile Defense Organization (BMDO) would see its R&D budget decline slightly to \$6.7 billion (down 4.0 percent), which would still be 60 percent above the FY 2001 funding level. The Defense Advanced Research Projects Agency (DARPA) and the Chemical and Biological Defense Program (CBDP) would be big winners in FY 2003 with proposed increases of 19.2 percent and 69.7 percent, respectively.

## **DEFENSE R&D: AN OVERVIEW**

The Department of Defense (DOD) is by far the largest supporter of R&D in the federal government, accounting for nearly half the total. 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 since its peak in FY 1987 but has increased dramatically in the past few years.

While most agencies break out R&D into the three categories of basic research, applied research, and development, DOD divides its RDT&E (Research, Development, Test, and Evaluation) account into seven categories, each with a numerical code: Basic Research (known as "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"). DOD also funds some R&D and support costs in non-RDT&E accounts, and funds applied research on medical topics in the Defense Health Program.

DOD is responsible for a little over 10 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 (see Chapter 23) and nearly a third of all engineering research, as well as significant shares of research in mathematics (see Chapter 22) and oceanography (see Chapter 16). DOD's impact is even greater in several engineering sub-disciplines such as electrical engineering (see Chapter 25) and mechanical engineering (see Chapter 26). 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 (please see Chapter 20).

The "6.1," "6.2," and "6.3" categories are often grouped together as "**Science and Technology**" (S&T). 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

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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 S&T 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. A quarter of DOD basic and applied research is performed by universities and colleges.

### **PRIORITIES IN DOD R&D**

Tables II-2 through II-6 show DOD’s R&D in detail. Table II-2 shows DOD R&D by “6.x” category, Table II-3 by agency and department, and II-4 by character of work. Table II-5 shows DOD basic research, and Table II-6 looks at historical trends in DOD R&D.

Last year, with the Bush Administration new to office, DOD did not submit a full FY 2002 budget with the other federal agencies; instead, the agency conducted a review of defense spending priorities led by Secretary of Defense Donald Rumsfeld that resulted in a full FY 2002 request in late June. But the request was quickly overtaken by the September 11 terrorist attacks and subsequent military actions in Afghanistan. The FY 2002 DOD budget ballooned in size to accommodate increased security requirements, reconstruction of the Pentagon, operational costs for the war in Afghanistan, and heightened military readiness throughout the world. Including emergency spending, the FY 2002 DOD budget hit \$334 billion, well above the \$310 billion FY 2001 level. In September, the Pentagon completed its Quadrennial Defense Review, a major strategic review of military policy and spending, but in light of changing events U.S. defense policy has been made on the fly in recent months. The only certainty going into the FY 2003 budget season was the bipartisan consensus that the DOD budget

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would have to increase substantially in FY 2003 to respond to the changed post-September 11 world.

Few were prepared, however, for the magnitude of the increase that President Bush proposed. The FY 2003 DOD request is \$379 billion, a substantial 13.4 percent or \$45 billion over the FY 2002 funding level, and the largest percentage boost since the height of the Reagan-era Cold War defense buildup. Although DOD observers were predicting last year that the Pentagon would have to make hard choices on how to modernize the military while phasing out obsolete weapons systems or military bases, the magnitude of the proposed increase would essentially fund all current activities while boosting funding for new priorities and also funding the costs of military operations in the Middle East, with a \$20 billion emergency reserve fund thrown in for possible future military operations. There would be substantial increases across the board, with the notable exception of DOD research (see below) and military construction. Procurement funding would rise almost \$8 billion to reach \$69 billion, while operations and maintenance funding would jump 16.0 percent to \$150 billion (including FY 2002 funding for military operations, and the FY 2003 emergency response fund). **Overall, DOD R&D would share in the increase with a boost of \$5.2 billion or 10.5 percent to \$54.8 billion** (see Table II-2).

While R&D in the Army would decline, the Navy and the Air Force would receive substantial increases of 9.9 and 21.3 percent, respectively, in their R&D budgets (see Table II-3), almost entirely for development. Nearly all of the Navy increase and much of the Air Force increase would come from the Joint Strike Fighter (JSF), a next-generation fighter 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 \$1.5 billion in FY 2002 to \$3.5 billion in FY 2003. These funds will go to newly-selected prime contractor Lockheed Martin and its engine subcontractor Pratt and Whitney. The JSF is responsible for nearly all of the 23 percent proposed increase in the "6.5" accounts to \$13.6 billion (see Table II-2).

After many years of flat requests, a big winner in the DOD R&D budget would be the **Defense Advanced Research Projects Agency (DARPA)** with a \$432 million or 19.2 percent increase to \$2.7 billion after many years of hovering around the \$2 billion mark. DARPA is mostly research-oriented, and its broad research portfolio is aimed at expanding

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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 \$147 million in FY 2002 to \$133 million in FY 2003 as the government's counter-bioterrorism research effort shifts to the National Institutes of Health (NIH), most of DARPA's efforts in areas such as computing systems, communications technology, software, materials, electronics, aerospace systems, sensors and guidance technologies, and land warfare technology would receive large increases.

Last year's big winner in the FY 2002 budget was the **Ballistic Missile Defense Organization (BMDO)**. Despite the attention devoted to terrorist attacks and conventional warfare last year, BMDO received a substantial boost from \$4.2 billion in FY 2001 to \$7.0 billion in FY 2002 for its work on developing battlefield and national missile defense systems, nearly doubling its budget in just two years. The FY 2003 request of \$6.7 billion (see Table II-3) would be a decline from the lofty FY 2002 level but would continue to be one of the top priorities of the Bush Administration. BMDO no longer funds research; there would be some funds for generic technology development (\$122 million in FY 2003), but now nearly all BMDO funds go to advanced development, testing, manufacturing development, and evaluation of missile defense systems.

The largest increase among the Defense Agencies, in the aftermath of the September 11 terrorist attacks, would go to **DOD's Chemical and Biological Defense Program (CBDP)** whose R&D portfolio would jump 70 percent to \$933 million, more than double the FY 2001 funding level. The agency funds basic and applied research as well as all forms of development to develop new technologies to keep U.S. troops safe from biological and chemical attack on the battlefield.

In sharp contrast to the substantial increases in most areas of the DOD budget, **DOD support of basic and applied research** would actually decline in FY 2003. Basic research funding (the "6.1" category) would fall 0.8 percent to \$1.4 billion after a 7 percent increase last year. Table II-5 shows that there would be increases for **basic research** in the Army (up 2.4 percent) and Navy (up 1.3 percent) but there would be a cut in the Air Force investment (down 3.2 percent) and a drop in basic research sponsored by the Defense Agencies (down 2.8 percent). There would be a \$34 million cut in University Research Initiatives in the Office of the

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Secretary of Defense (OSD); although much of this cut is due to the deletion of FY 2002 congressionally designated projects, there would be cuts to core funding for many research areas. The largest basic research increase would go to Defense Research Sciences, the basic research program of the Defense Advanced Research Projects Agency (DARPA), which would increase by 23.4 percent or \$33 million to \$176 million.

**Applied research** funding (the “6.2” category) would decline by 7.5 percent or \$306 million to \$3.8 billion in FY 2003 after an 11 percent increase last year. There would be steep cuts to applied research programs in the services, including drops of 25 percent in the Navy, 9 percent in the Air Force, and 7.5 percent in the Army. Applied research in the Defense Agencies would increase 14 percent, representing a profound shift in the DOD research portfolio. DARPA’s applied research would increase by 15 percent, mostly in computing systems, communications, electronics, and materials. The largest increase would go to the Chemical and Biological Defense Program, whose applied research portfolio would jump 79 percent to \$262 million after a similar increase last year.

**DOD funding of “S&T”** (the “6.1” through “6.3” categories) would stall at \$9.9 billion, up just 0.1 percent from FY 2002 (see Table II-2). Adding in medical research outside the RDT&E account (see next paragraph), S&T would total \$10.0 billion, and the decline would be 3.7 percent. There is some confusion as to the real S&T total for FY 2003; the S&T totals include \$213 million outside the regular RDT&E request, from a \$20 billion FY 2003 emergency response fund for counter-terrorism “6.3” activities. On the other hand, two new Air Force “6.3” programs totaling \$292 million for which few details are available appear to have been misclassified as S&T rather than procurement but are kept in the S&T totals pending further clarification.

Advocates of DOD S&T investments pushed last year for \$10 billion in FY 2002 S&T funds, a goal Congress granted, and will push for increases to \$11 billion in FY 2003, rather than cuts. The requested decline will make this goal much harder to reach, although Congress has tended to be more supportive of S&T funding than the Pentagon. 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

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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 last September the Quadrennial Defense Review endorsed the goal of investing 3 percent of the DOD budget in S&T. The request, however, would cut S&T funding while increasing overall DOD spending, lowering the S&T/budget ratio to 2.6 percent.

Beginning in 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 II-2). The FY 2002 total of \$464 million for medical research includes \$146 million for breast cancer research, \$83 million for prostate cancer, \$10 million for ovarian cancer, \$62 million for general medical research, and \$41 million for a new prion research program (see *Congressional Action on R&D in the FY 2002 Budget* for details). These programs award grants on a peer-reviewed basis and are managed by the Army. Additional congressionally designated performer-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 2003 request is only \$67 million for information technology development to support military medical readiness, but Congress is sure to add on funds for the cancer programs and the prion research project.

Looking to the future, in contrast to the declining budget projections of past years the DOD R&D budget is projected to trend upward under current plans (see Table I-11). The DOD R&D budget is now projected to peak in FY 2004 at \$61.8 billion before trending down again. There would be a shift in funding toward procurement after that, as major projects such as the JSF make the transition from development to production. Procurement is projected to climb from \$61 billion in FY 2002 to \$99 billion by FY 2007 as the Pentagon stocks up on all the weapons systems it has committed to develop.

### **OUTLOOK FOR DEFENSE R&D**

Congress has received the DOD budget, but even congressional “hawks” have expressed some doubts about it because of its staggering price tag.

*Kei Koizumi*

Although it will be politically difficult to oppose a large defense increase in these times of war and counter-terrorism, the proposed Bush Administration's discretionary spending request of \$767 billion (up \$49 billion from FY 2002) would direct all of the proposed increase to DOD and NIH, leaving all other discretionary programs overall with flat funding. In an election year, Congress will feel strong pressure to increase funding for domestic programs, and there will be two major ways to pay for it: take money out of DOD, or add to the federal deficit. Congress will also tackle the criticism that the request is too much money for DOD because, by funding everything, it delays the necessary task of shifting DOD's resources toward 21st century warfighting and away from outdated weapons systems, an outdated force structure, and obsolete military bases. Many DOD observers fear that more money could actually leave the military less prepared to fight future wars by saddling the entire U.S. military structure with forces and weapons for the last war rather than the next one, and that even with the additional money the Pentagon would find itself committed to developing and buying so many weapons systems that its resources will eventually be stretched thin if the current sense of threat wanes.