

## Part 1 – Congressional Action

On December 30, 2005, nearly three months into the fiscal year, President Bush signed the last two fiscal year (FY) 2006 appropriations bills into law, bringing the FY 2006 appropriations process to a close. AAAS estimates that the federal R&D portfolio totals \$134.8 billion in 2006, a \$2.2 billion or 1.7 percent increase. But 97 percent of the increase goes to just two areas: defense weapons development and human space exploration technologies. Funding for all other federal R&D programs collectively will barely increase, and will fall nearly 2 percent after adjusting for inflation. Leaving out large federal investments in development, congressional appropriations for basic and applied research total \$57.0 billion, an increase of \$1.0 billion or 1.8 percent over 2005. But National Aeronautics and Space Administration (NASA) applied research on human space flight technologies accounts for a majority of the increase, leaving most agency research portfolios with modest increases falling short of inflation, or cuts. Many flagship federal science agencies have disappointing budgets in 2006: the National Institutes of Health (NIH) budget falls for the first time in 36 years; the National Science Foundation (NSF) wins a small increase but has less in real terms for its research portfolio than in any of the last three years; the Department of Energy (DOE) Office of Science budget declines, and despite big increases in development funding the Department of Defense (DOD)'s basic research funding declines.

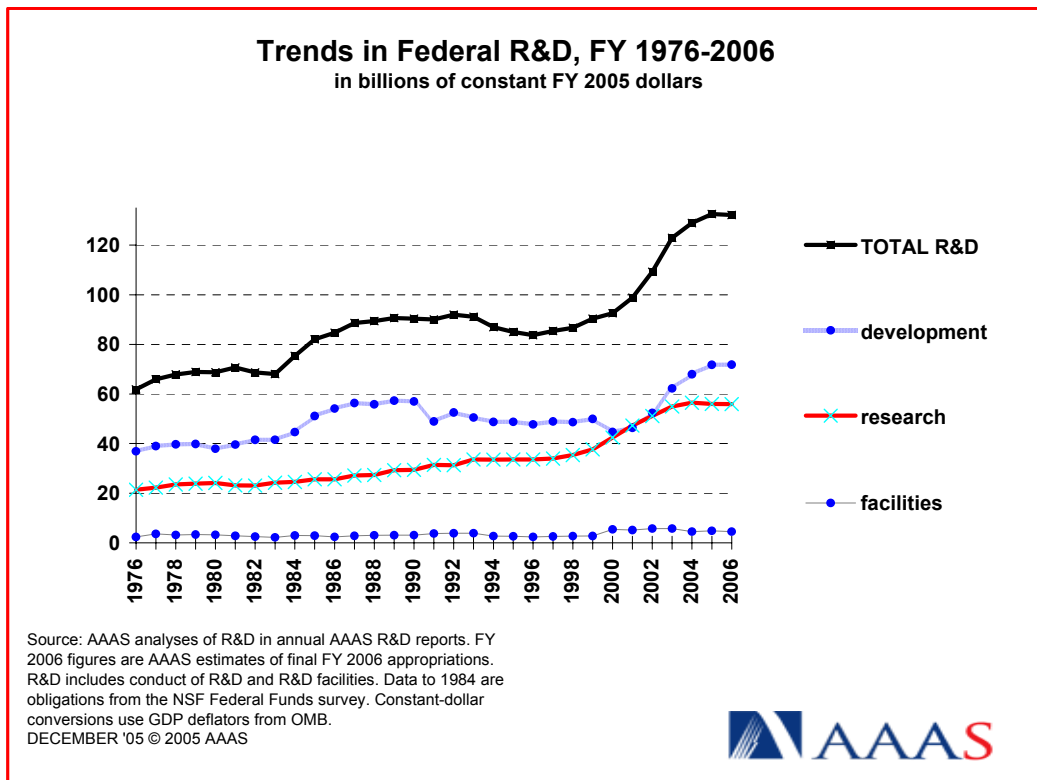


Figure 1.

In the customary year-end crush of legislation, Congress cleared the final Defense appropriations bill on December 22. In addition to regular funding for DOD, the Defense bill contained emergency supplemental appropriations for Gulf Coast reconstruction, avian flu preparedness, and Iraq and Afghanistan military operations, but to pay for some of these emergencies the bill also contained a 1 percent across-the-board cut for all discretionary programs, even those whose budgets had already been signed into law earlier. Even before the across-the-board cut appeared, the President and Congress had agreed to cut overall domestic discretionary spending by nearly 1 percent, but now it appears that domestic spending will fall almost 2

percent in 2006. In FY 2006, funding for domestic programs continues on a downward curve after several years of generous annual increases earlier in the decade, and the federal R&D investment lands on the same downward side of the slope in 2006.

### Highlights of Federal R&D in FY 2006

(All figures are adjusted to reflect an across-the-board cut of 1 percent in the Defense bill affecting all programs, rescissions and emergency supplementals in the Defense bill, and cuts in other bills.)

- **The federal investment in research and development (R&D) hits another record of \$134.8 billion in FY 2006**, a \$2.2 billion or 1.7 percent increase over 2005 (see Table 1 and Figure 1). But 97 percent of the increase goes just to the two areas of DOD weapons development and NASA next-generation space exploration vehicles. Funding for all other R&D programs collectively barely increases, and will fall nearly 2 percent after adjusting for inflation. Congress provided \$2.5 billion more than the Administration request, primarily for defense, to improve on an even gloomier 2006 proposal (see Figure 2). After 9 years in a row of increases, federal R&D dips slightly in real (inflation-adjusted) dollars (see Figure 1).

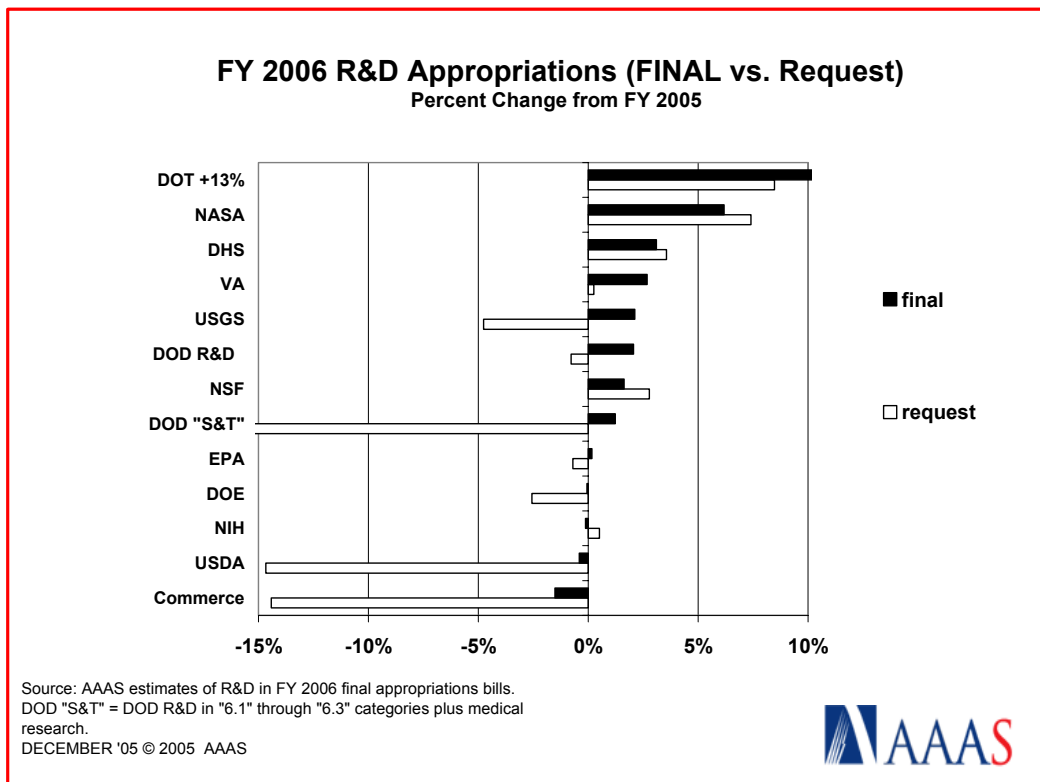


Figure 2.

- **The nondefense R&D investment rises by \$808 million or 1.4 percent to \$57.3 billion, better than the steep cut overall for domestic programs, but nearly the entire increase goes to NASA's ambitious efforts to develop new space exploration vehicles** (see Table 1). Excluding NASA, nondefense R&D increases only 0.3 percent, far short of expected inflation. Although many nondefense R&D programs win increases, two flagship civilian science agencies face outright cuts: the NIH budget falls for the first time since 1970, leading to budget cuts at all but two institutes; and the DOE Office of Science R&D portfolio falls 0.4 percent in 2006.

- Defense-related R&D in DOD, the Department of Homeland Security (DHS), and DOE wins a 1.8 percent or \$1.4 billion increase to \$77.4 billion, a slight cut from last year's record total in inflation-adjusted dollars (see Table 1 and Figure 4). Weapons development in DOD once again accounts for nearly all of the increase (up \$1.3 billion to \$59.2 billion), but Congress also rewarded DOD's "S&T" activities in research and early technology development with a 1.2 percent increase to \$13.8 billion, in sharp contrast to a requested cut of 22 percent. But the rapid defense build-up of recent years appears to be cresting: for the first time in a decade, the defense R&D portfolio fails to keep pace with inflation, and DOE's defense R&D actually falls 2.4 percent to \$4.0 billion.

- **The total federal research investment (basic and applied) totals \$57.0 billion in 2006, an increase of \$1.0 billion or 1.8 percent over 2005 (see Table 2 and Figure 1).** But NASA applied research on new spacecraft to carry out future moon-and-Mars missions accounts for a majority of the increase, leaving most agency research portfolios with modest increases falling short of inflation, or cuts. Even at NASA, the increase for new vehicles squeezes out funding for other research areas such as space science, earth science, aeronautics, and biological research, leaving those areas with budget cuts.

- **Because of the emphasis on applied research in the NASA portfolio and tight budgets in other agencies, the federal investment in basic research falls 0.5 percent to \$26.7 billion in 2006 (see Table 2).** More than 90 percent of the federal basic research investment comes from just five pieces of the federal budget: NIH, DOD's "6.1" programs, NSF's Research and Related Activities, DOE's Office of Science, and NASA's Science programs. Basic research in 4 out of these 5 accounts falls in 2006, with only NSF managing a small increase. NASA's support for basic research falls the most, by more than 8 percent to \$2.2 billion, as the agency siphons off resources from basic research in space science, earth science, and biological and physical research in order to bulk up on spacecraft research.

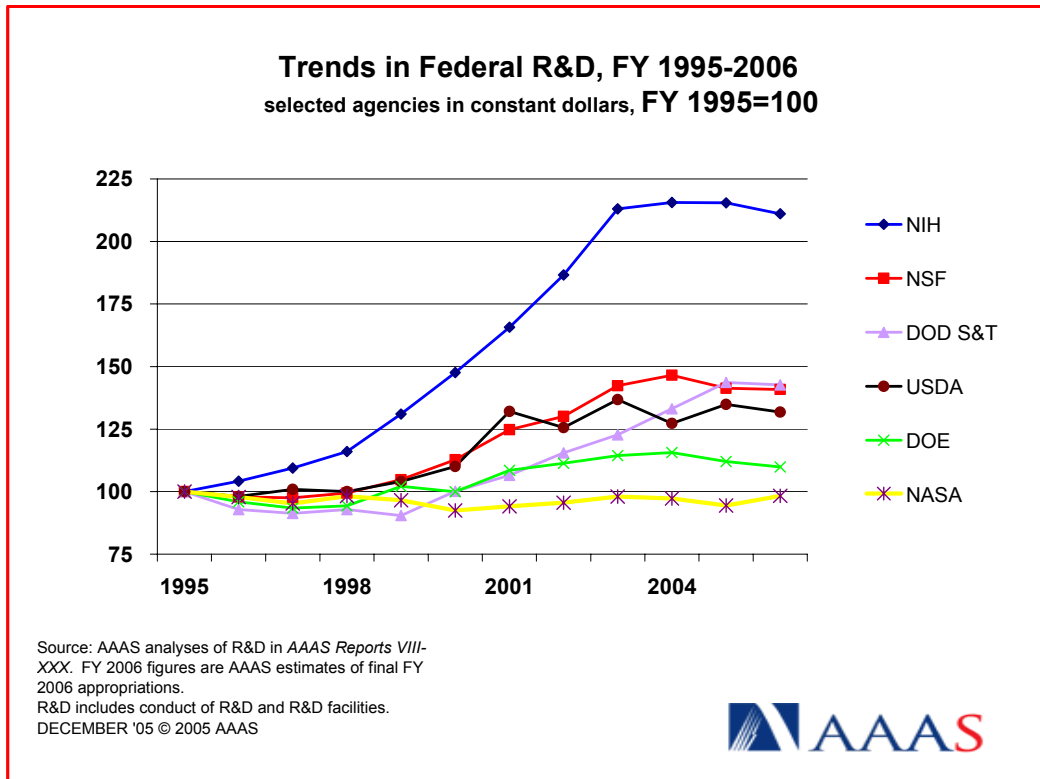


Figure 3.

- **The National Institutes of Health (NIH) budget falls in 2006 for the first time in 36 years** because of a modest appropriation combined with the 1 percent across-the-board cut (see Table 9 and Figure 2). After adjusting for inflation, NIH has a smaller budget in 2006 than it did in 2003, erasing the small gains of the last two years (see Figure 3). Other R&D funding agencies with falling budgets in 2006 include the U.S. Department of Agriculture (USDA), with a 0.4 percent cut to \$2.4 billion; and Commerce’s National Institute of Standards and Technology (NIST) with a 5.0 percent cut to \$438 million, due primarily to the Advanced Technology Program (ATP) budget falling to a little more than half the 2005 funding level.

- **The National Science Foundation (NSF) budget**, after declining in 2005, rebounds to \$5.6 billion in 2006. But inflation, the across-the-board cut, and new non-R&D costs for polar icebreakers leave NSF with less R&D funding in real terms than in each of the last three years (see Figure 3).

- **Most R&D funding agencies face budgets that are shrinking to levels of years past (see Figure 3).** While it has been 24 years since the NIH budget declined in inflation-adjusted terms, there is a clear division between the 15 percent annual increases from 1998 to 2003 and flat or declining budgets since then. Other agencies are also adjusting to flat and declining budgets, such as NSF and USDA, or have lived with stagnant R&D funding for years, such as DOE and NASA. But the downward trend is clear from the 2006 budget results: NIH, NSF, DOE, USDA, and NASA (excluding human space exploration) all have less R&D funding in real terms in 2006 than they had in 2003 (see Figure 3).

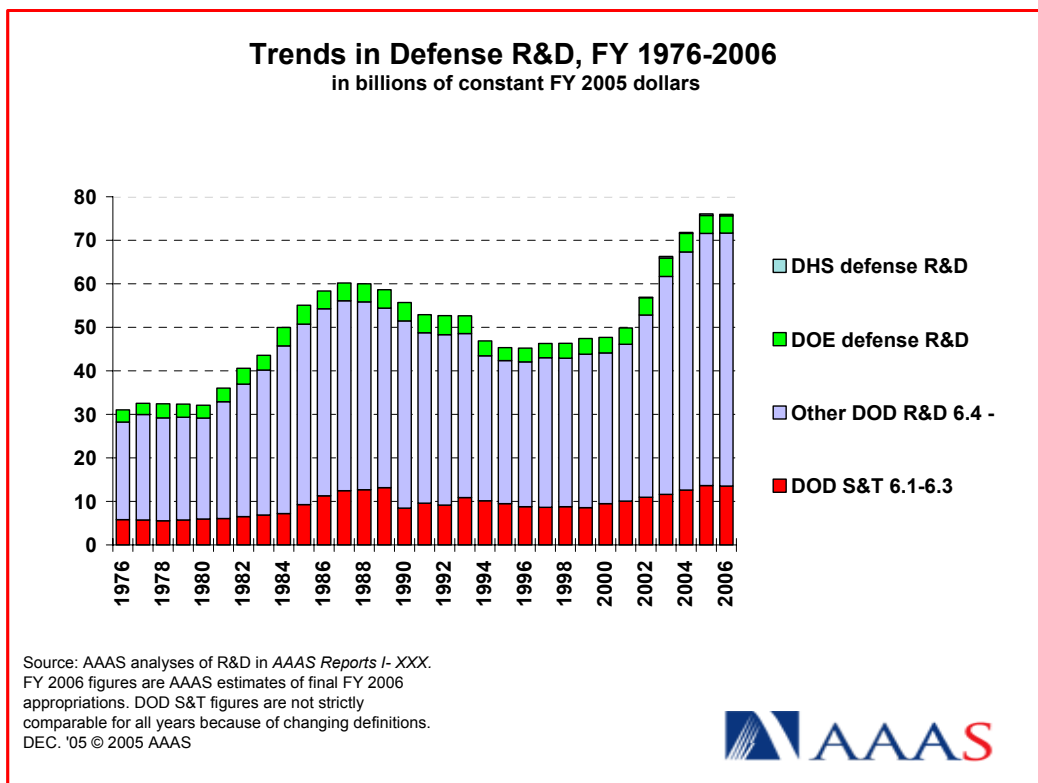


Figure 4.

- **There are some winners in the nondefense R&D portfolio (see Figure 2).** In addition to the large NASA increase, Department of Transportation (DOT) R&D gains substantially by 13.0 percent to \$841 million because of additional money dedicated to R&D in the August 2005 highway authorization bill, bringing the DOT R&D portfolio to a record high in real terms. DHS continues to expand its R&D portfolio because of continuing concerns over the nation’s preparedness against a terrorist attack, although the 3.1 percent increase to \$1.3 billion for 2006 is well off the double-digit percentage gains of previous

years. The Department of Veterans Affairs (VA) is the only agency exempt from the across-the-board cut and emerges with a 2.7 percent increase in its R&D portfolio to \$805 million. And Congress reverses a proposed cut for U.S. Geological Survey (USGS) R&D with a 2.1 percent increase to \$553 million.

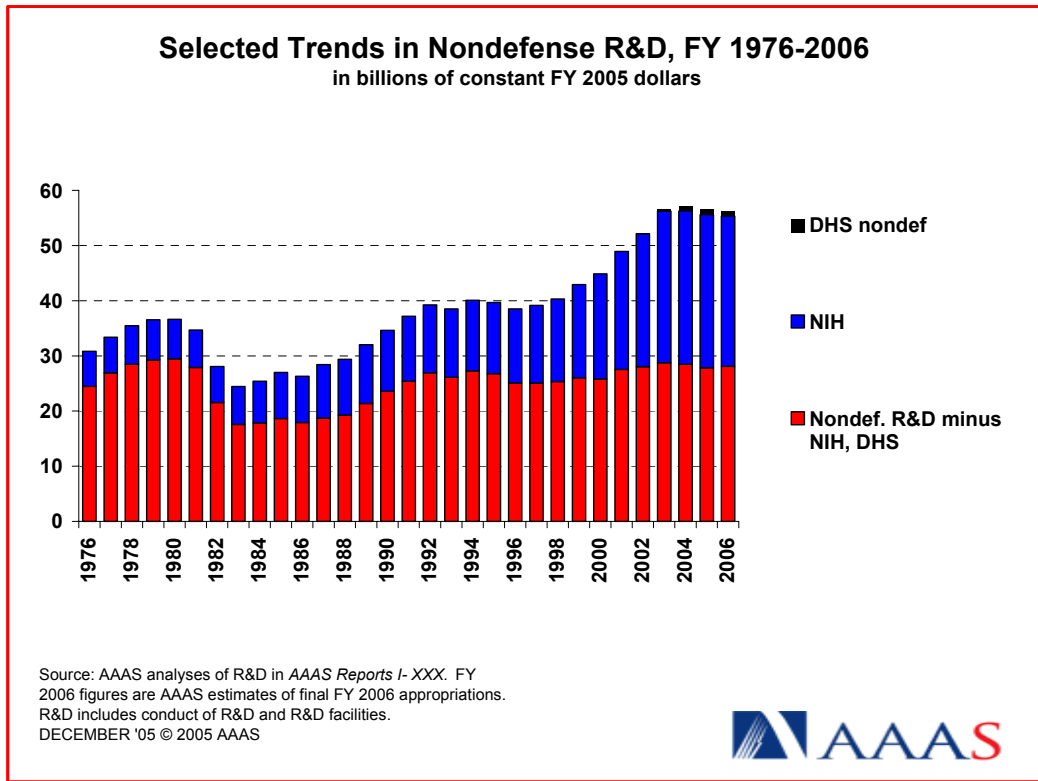


Figure 5.

- Despite tough times, **R&D earmarks set a new record in 2006, climbing to \$2.4 billion in 2006**, up 13 percent from last year’s previous record, according to the AAAS analysis of congressionally designated, performer-specific R&D projects in FY 2006 appropriations (see Table B). Although these projects amount to only 1.7 percent of total R&D, they remain concentrated in a few key agencies and programs. Five agencies (USDA, \$331 million; NASA, \$317 million; DOE, \$524 million; the National Oceanic and Atmospheric Administration (NOAA) in Commerce, \$184 million; and DOD, \$852 million) receive 94 percent of the total R&D earmarks, while NIH, NSF, and DHS remain earmark-free. In some programs, R&D earmarks make up more than 20 percent of total program funds.

- **R&D focused on several important national missions declines in 2006, and nearly all fail to keep pace with inflation** (see Table 3). Defense R&D (including DOD, DOE’s defense activities, and a large part of the DHS R&D portfolio) posts the smallest increase in a decade of 1.8 percent to \$77.4 billion, falling short of inflation but outpacing growth in nondefense R&D to bring the defense share of total R&D to 57.5 percent, the highest ratio since the end of the Cold War. But health-related R&D declines for the first time in more than three decades, by 0.1 percent to \$29.8 billion, because of NIH budget cuts. Agricultural R&D, transportation R&D, and commerce R&D also fall.

- The “FS&T” budget does relatively well in 2006 with a 2.1 percent or \$1.3 billion increase to \$62.6 billion, but as with the federal R&D portfolio nearly the entire increase goes to NASA space vehicles research and to DOD (see Table A). FS&T is a collection of selected R&D and non-R&D programs that emphasize basic and applied research and the creation of new knowledge or technologies. It also includes some S&T education and training activities but excludes most development, and is designed to be an

alternative measure for the federal investment in science and technology and an alternative way to track federal S&T investments in the budget process.

### The FY 2006 R&D Budget in Historical Context

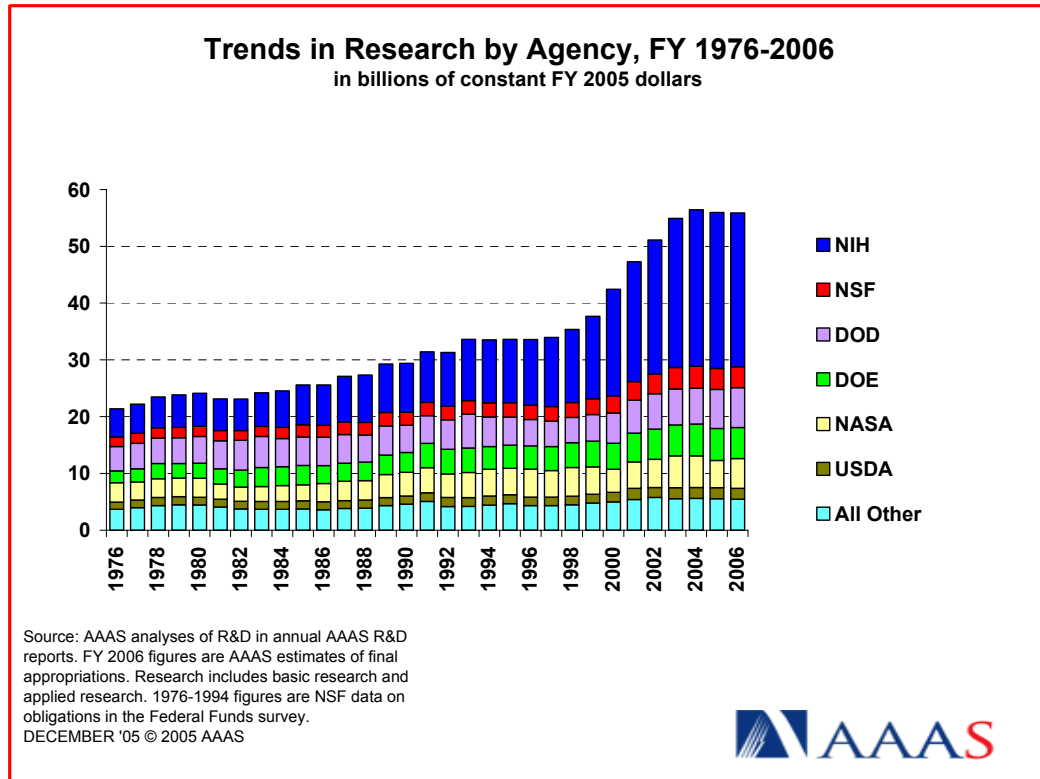


Figure 6.

For several measures of the federal R&D investment, final FY 2006 appropriations represent another year on a downward slope from the highs of a few years ago. For trend after trend, big increases leading up to 2003 flattened out more recently, and now funding is headed down in real terms. As Figure 4 and Figure 5 show, both the defense and nondefense R&D investments decline in real terms from recent highs.

For defense R&D, nearly all of the increases in the past few years to defense R&D have been in weapons systems development, “6.4” or higher in the DOD classification system (see Figure 4). DOD’s S&T investments (“6.1” through “6.3”), comprising basic and applied research and technology development, took nearly 20 years to recover from post-Cold War cuts to narrowly reach an all-time high in FY 2005, but fall in real terms again in 2006. The S&T accounts fund all of DOD’s investments in research, including key federal contributions to the support of the physical sciences, engineering, and other research fields. Even the overall S&T trend masks a shift in DOD investments: most of the recent growth has been in “6.3” technology development programs while DOD “6.1” basic research programs have steadily declined to just 11 percent of the S&T portfolio and have declined steeply in dollar terms.

**Nondefense R&D peaked in FY 2004 and is now headed down, but for most programs funding has been stagnant for nearly two decades.** Nondefense R&D did very well between 1998 and 2003 because of the campaign to double the NIH budget (see Figure 5). The creation of the DHS also helped to boost nondefense R&D investments by creating a new area for investment. But all the other nondefense R&D funding agencies collectively have seen their budgets remain flat for nearly two decades (see the red bars in Figure 5), even as the U.S. economy, the federal budget, and the U.S. population have all boomed during

that time. These non-NIH agencies, combined with DOD's research investments, fund nearly all of the federal investment in non-biomedical research, including the physical sciences, non-medical life sciences, environmental sciences, engineering, mathematics, computer sciences, and social sciences.

Not surprisingly, **the federal research investment is now on the downward slope** after hitting new highs from the NIH doubling campaign. Federal support of research (excluding development) peaked in 2004 (see Figure 6), driven primarily by big boosts to NIH research. But the research portfolio declines in 2005 and 2006, except for the narrowly focused area of research on new space exploration vehicles. For non-biomedical research, 2006 will be the third straight year of decline in real terms if one excludes the NASA space exploration increase. And even biomedical research falls in 2006 because of budget cuts at NIH.

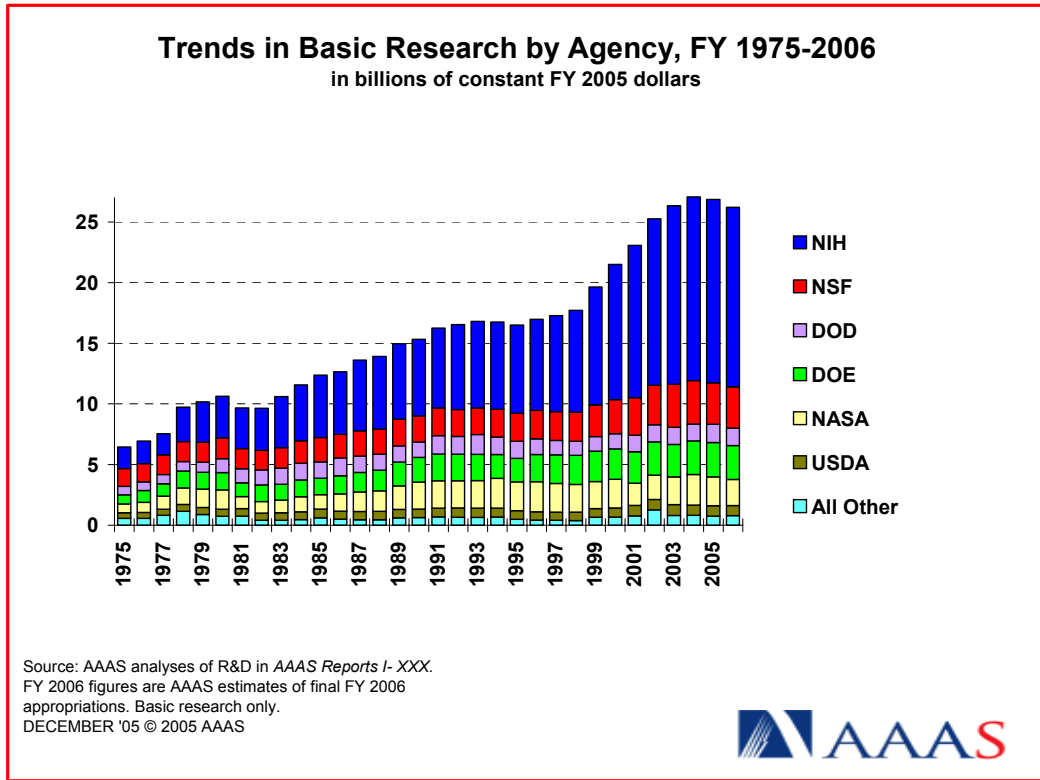


Figure 7.

Because of the recent emphasis on applied research in NASA on space exploration, NIH on biodefense, and DOD, **the federal investment in basic research is now falling faster than the total research investment.** Despite a growing consensus among policymakers that the federal government needs to step up its basic research investments, federal funding for basic research peaked two years ago and has declined since then by 3 percent in real dollars (see Figure 7).

**When measured against a growing U.S. economy, the funding trends look even worse. Federal research investments are shrinking as a share of the U.S. economy, just as other nations are increasing their investments.** As shown in Figure 8, the federal R&D investment has plateaued at about 1.1 percent of U.S. Gross Domestic Product (GDP) in recent years, buoyed by big increases in weapons development, but is projected to decline sharply in 2006. But the federal research/GDP ratio is already falling and falls further in 2006 down to the historical average of 0.4 percent after briefly increasing during the NIH doubling campaign. Despite an increasingly technology-based economy and a growing recognition among policymakers that federal research investments are the seed corn for future technology-based innovations, the U.S. government research investment has failed to match the new realities and has

also failed to match the competition. While the European Union goal of boosting its government research investments by 2010 may or may not be met, Asian nations are dramatically increasing their government research investments: both China and South Korea, for example, are boosting government research by 10 percent or more annually.

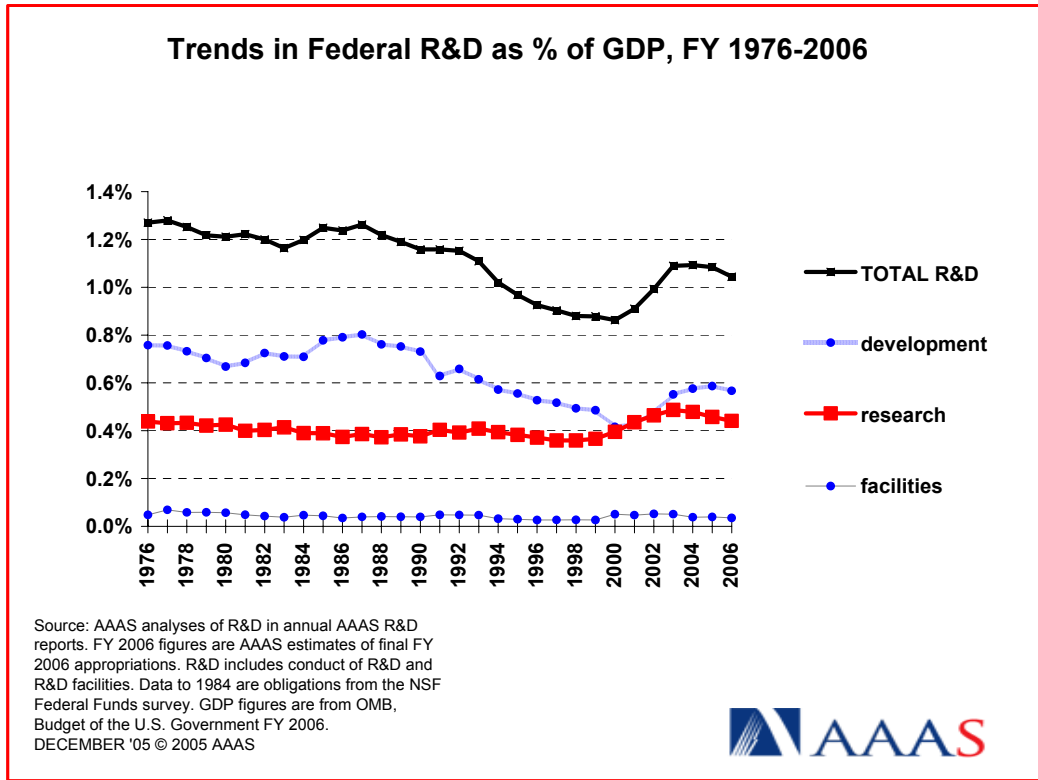


Figure 8.

### R&D Issues: Earmarks

Although the Bush Administration made restraining congressional earmarks a high priority in its first term, this earmark-fighting zeal has dwindled to zero in the second term. President Bush has never used his veto power, and has signaled his willingness to accept whatever appropriations bills come his way as long as they meet his overall budget targets. It now seems clear that when budgets get tight, as they have because of the return of record-breaking budget deficits, congressional appropriators make it their first priority to secure earmarked funds to ensure that at least some money goes to their districts, at the cost of dramatically reducing competitively awarded funds. Although earmarked funds have been increasing steadily over the past several decades by all accounts, the dramatic explosions in R&D earmarks in 2005 and 2006 coincide with flattening and even declining R&D budgets, meaning that earmarks cut into competitive programs instead of adding to them.

Despite tough times in the federal budget, R&D earmarks set a new record in 2006, climbing to \$2.4 billion in final FY 2006 appropriations, up 13 percent from last year's previous record (see Table B and Figure 9). Even as the overall federal R&D investment stagnates, R&D earmarks show remarkable growth, up 63 percent since 2003. Although these congressionally earmarked projects amount to only 1.7 percent of total R&D, they are concentrated in a few key agencies and programs. Five agencies (USDA, \$331 million; NASA, \$317 million; DOE, \$524 million; NOAA in Commerce, \$184 million; and DOD, \$852

million) receive 94 percent of the total R&D earmarks, while NIH, NSF, and DHS remain earmark-free. In some programs, earmarks make up more than 1 out of every 5 dollars.

The **USDA** earmarks total \$331 million, up 38 percent from last year, and include \$165 million, up dramatically, for nearly 250 itemized extramural research projects, mostly in the Special Research Grants program, with another \$86 million allocated in the Agricultural Research Service (ARS) for intramural research projects. R&D earmarks total 26 percent of all extramural R&D in the Cooperative State Research, Education, and Extension Service (CSREES), making these a significant drain on resources that might have gone to competitively awarded research grants or formula funding. The **NASA** projects totaling \$317 million are up nearly 50 percent from last year for a new record. The **DOD** budget contains \$852 million in R&D earmarks, down slightly from \$1 billion last year but still well above other years. The earmarks are mostly small, but many are for research rather than development, squeezing basic and applied research budgets. Earmarks for “6.1” (basic research) programs total \$57 million, or 4 percent of the total; “6.2” (applied research) earmarks are \$228 million, also 4 percent of the total because of a large number of medical research projects; and “6.3” earmarks are \$319 million or 5 percent of the total. Earmarks in the “6.4” or higher categories of DOD R&D are only \$248 million, a large dollar total but only 0.4 percent of the total portfolio. Earmarks have an especially large impact on basic research because overall “6.1” funding declines 2.9 percent in 2006 even as earmarks nearly double, squeezing funding for core programs.

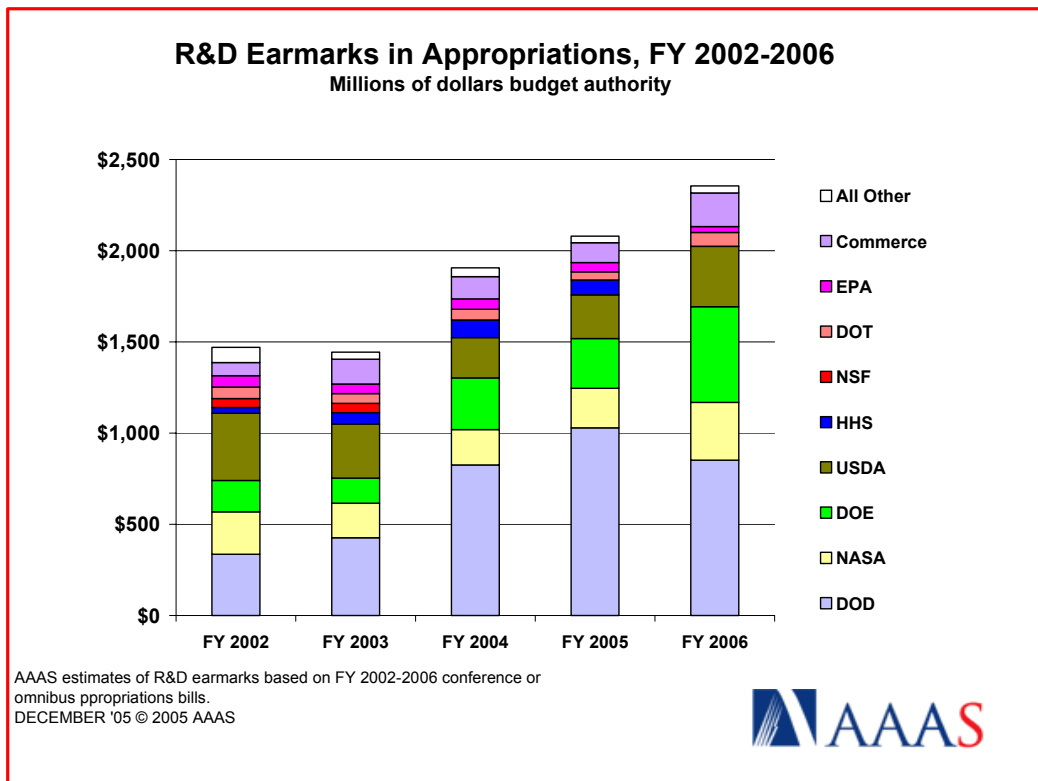


Figure 9.

**DOE** R&D earmarks nearly double to \$524 million. The Office of Science (OS) budget contains \$130 million in R&D earmarks in FY 2006, up dramatically from \$78 million last year even though the total OS budget shrinks in 2006. Energy R&D earmarks total \$266 million in 2006, more than double the previous record of last year, and make up 1 out of every 5 R&D dollars but more in some energy areas such as biomass (53 percent), hydrogen (27 percent), and wind energy (33 percent), ratios far higher than in previous years. As a result, there will be enormous cuts to competitively awarded R&D grants in these areas. And the **NOAA** budget is heavily earmarked in 2006, with 28 percent of the R&D portfolio

earmarked for a total of \$184 million, a \$76 million increase that dwarfs the meager \$11 million increase to the total NOAA R&D portfolio and therefore squeezes core R&D program funding drastically.

Some agencies remain earmark-free. The National Science Foundation (NSF), the National Institutes of Health (NIH), and the Department of Homeland Security (DHS) all remain earmark-free in FY 2006.

With the fiscal situation unlikely to get better in the FY 2007 budget, congressional appropriators will have to square constituent demands for earmarked funds against tight spending targets once again. The push for earmarking R&D funds will not abate in the FY 2007 budget; the only constraint appears to be the balance between earmarks and other spending, which appears not to be much of a constraint at all. (For more agency details of R&D earmarks, please see the special R&D Earmarks in the FY 2006 Budget analysis on the AAAS R&D web site.)

### **Budget Outlook: On the Downward Slope**

The federal fiscal outlook remains bleak, and the FY 2006 budget results are likely to be just a preview of what lies ahead. Although the U.S. Treasury reported that last year's (FY 2005) federal budget deficit was \$319 billion, down from a record \$413 billion the year before, the good news is only a temporary reprieve from record-breaking levels of indebtedness. Much of the decline in the deficit was due to a one-time surge in tax receipts, while in FY 2006 a large chunk of the billions of dollars for Gulf Coast reconstruction and relief approved in September will be paid out. Combined with later emergency appropriations for avian flu, heating assistance, veterans medical care, and military operations, the FY 2006 deficit could easily approach \$500 billion. Although political leaders have made a mantra of restraining the deficit, they have focused their energies solely on reducing the discretionary one-third of the spending side of the federal budget: in 2005, their only budget-cutting success was enacting a 1 percent across-the-board cut for all discretionary programs and a 1 percent cut for regular domestic discretionary. Meanwhile, billions of dollars in emergency spending were approved in 2005, and lawmakers could not agree on a relatively modest \$40 billion (over 5 years) reduction in projected entitlements spending even as a new Medicare prescription drug benefit is poised to dramatically increase such spending in 2006. Lawmakers continue to refuse to look on the revenue side of the federal budget: indeed, early in 2006 they are poised to give final approval to \$70-\$100 billion (over 5 years) in tax cuts which would, of course, *increase* future deficits.

In this budget-cutting environment in which only domestic discretionary programs are cut, it is no surprise that federal R&D programs find themselves on the downward slope of funding trends. For trend after trend, whether it is federal R&D, nondefense R&D, research funding, basic research, or individual agency budgets, funding climbed between 1998 and 2003 in the years when the federal government ran budget surpluses and had the wherewithal to boost spending, crested in 2004 after deficits returned, and are now headed down in 2005 and 2006, mirroring trends in overall discretionary funding. R&D programs have done slightly better than overall domestic spending in recent years, but overall the R&D portfolio has moved in lockstep with larger budget trends.

There seems little hope of R&D funding breaking free, as long as the larger budget strategy prevails. Although many lawmakers of both parties have called on the U.S. to dramatically boost its investments in basic research in order to ensure U.S. innovative capacity and therefore future economic competitiveness, these proposals have run into a brick wall of tight budgets. Looking back on 2005, there finally appeared to be bipartisan and widespread recognition that the U.S. leadership in science and technology, innovation, and technology-based competitiveness were under threat from emerging economic competitors, especially India and China, but instead of boosting R&D investments policymakers cut them to meet restrictive budget targets. And things could get worse before they get better: the Bush Administration's FY 2007 budget proposal, due in February, is primed to continue the same combination of tax cuts, declining discretionary spending, and modest entitlements reforms that have characterized past budgets, resulting in what is likely to be another year on the downward slope for most parts of the federal R&D portfolio.