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Historical Trends in Federal R&D

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Although high-priority investments in weapons development, human space exploration, and now physical sciences research help to keep the federal R&D outlook brighter than the bleak outlook for domestic programs overall, the FY 2007 budget would keep federal R&D on a downward slope from the highs of a few years ago. Even though some agencies and disciplines would do well in 2007, for trend after trend there were big increases leading up to 2003 or 2004 followed by real cuts that would continue into next year. (See Table I-11 for historical data. More historical data are available on the AAAS R&D web site.)

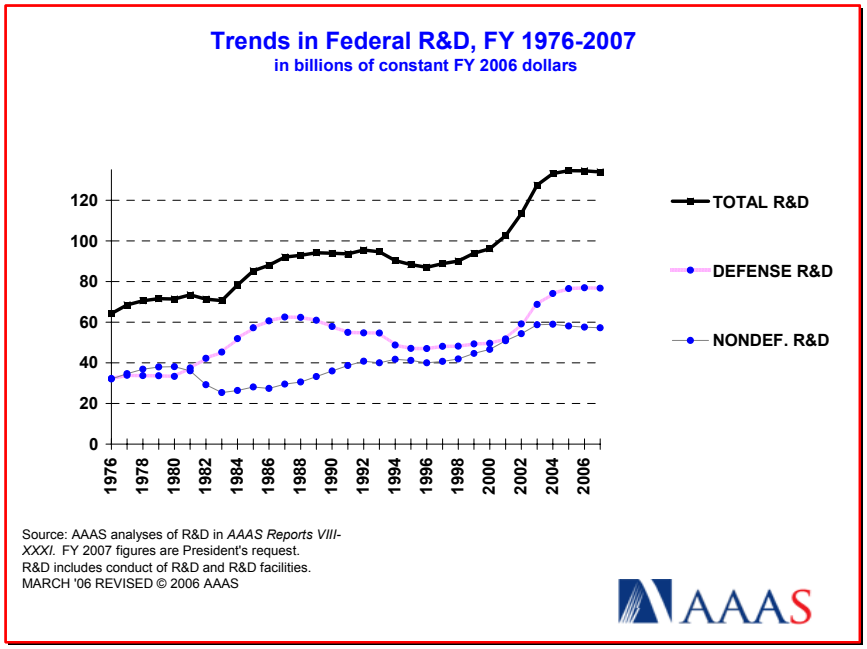

Figure 1

The total federal R&D request of $136.9 billion, a 1.8 percent increase, would fall short of the 2.2 percent increase needed to keep pace with

expected inflation (see Figure 1). In real terms, the federal R&D portfolio would decline for the first time since 1996 after flattening out the last few years.

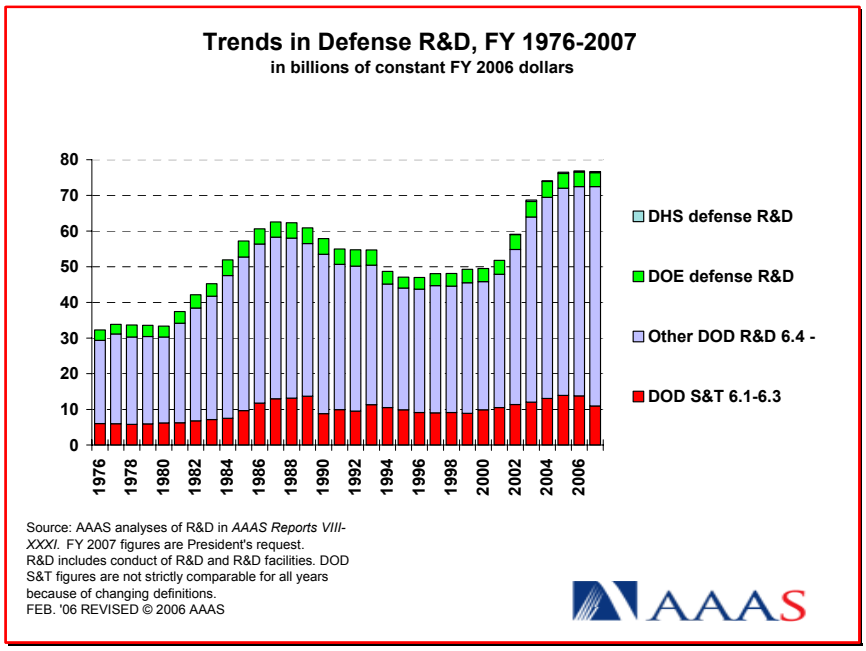

Figure 2

For defense R&D, Figure 2 shows that nearly all of the increases in the past few years have been in weapons systems development, "6.4" or higher in the Department of Defense (DOD) classification system. DOD's S&T investments ("6.1" through "6.3"), comprising basic and applied research and technology development, barely hit record highs in 2005 and 2006 after taking 16 years to return to Cold War funding levels. But the FY 2007 budget proposes to cut these S&T investments nearly 20 percent in just one year, and reverse increases so far this decade. 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. A 7.1 percent boost for DOD weapons development ("6.4" and higher) would take up the slack.

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, as shown in Figure 3. 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 3), even as the U.S. economy, the federal budget, and the U.S. population have all boomed during that time. The 2007 proposed increases for NASA, DOE Office of Science, NSF, and NIST would recover the lost ground of the past few years, but would be offset by cuts in other agencies. These non-NIH agencies, combined with DOD's research investments (also flat or declining in recent years), 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. Federal support of biomedical research was on a growth path until 2003, especially during the NIH doubling campaign, but in recent years growth has leveled off and federal support has begun to decline in real terms.

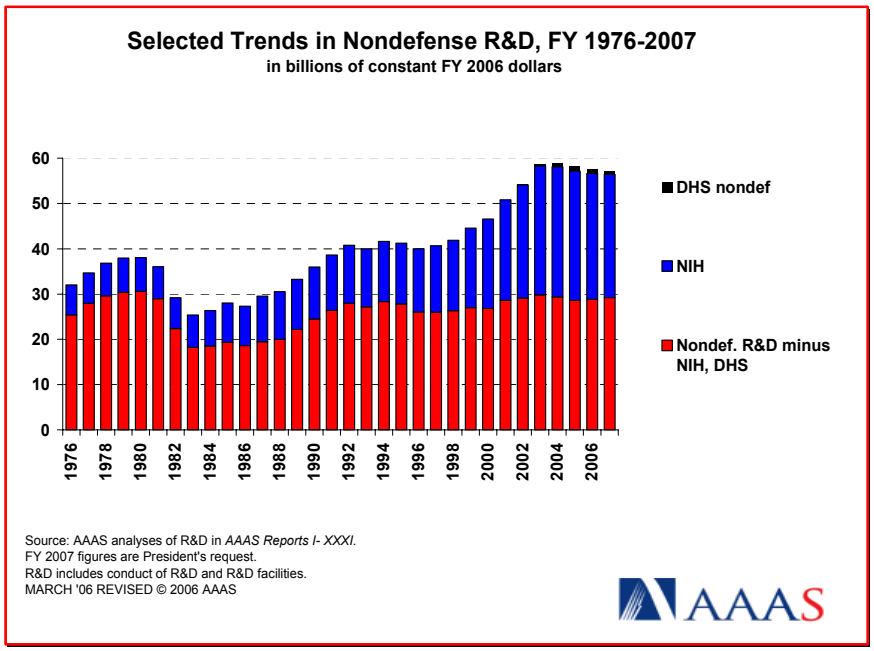

Figure 3.

The federal research investment would continue to decline in the 2007 budget, despite gains for the physical sciences. Federal support

of research (excluding development) peaked in 2004 (see Figure 4), driven primarily by big boosts to NIH research. But the research portfolio declines in 2005 and 2006, and would fall even further in 2007 as steep cuts in NASA, DOD, and other agencies' research, and inflation-adjusted cuts for NIH research more than offset proposed gains in NSF and DOE research. The 2007 budget would leave the federal research portfolio 8 percent below the 2004 level in inflation-adjusted dollars.

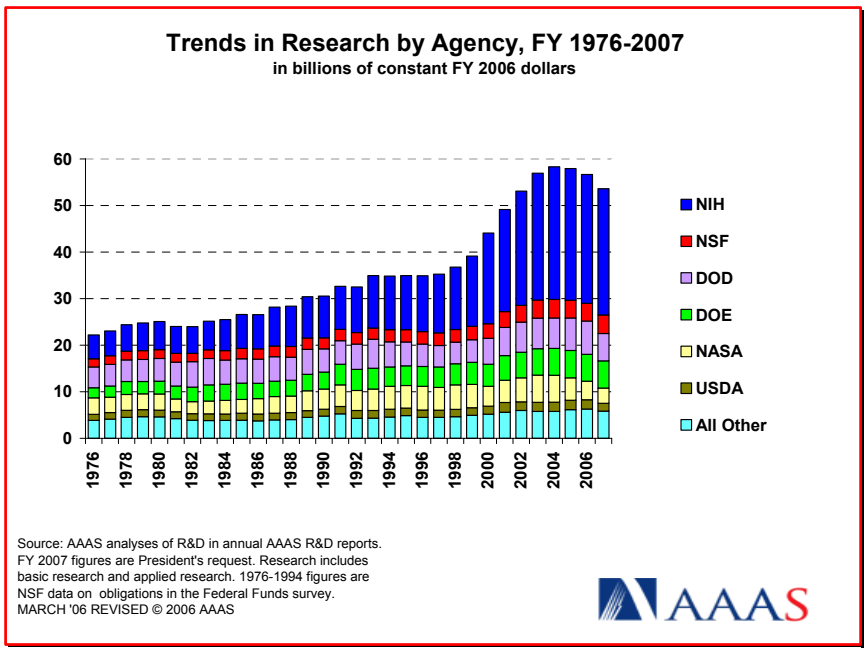

Figure 4.

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 5, the federal R&D investment has exceeded 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 and 2007. Federal investments in development, mostly in DOD, have held steady as a share of the economy, but the federal research/GDP ratio is in free fall down to a projected 0.40 percent in 2007, back down to the long-term historical average after gains during the NIH doubling period. 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 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.

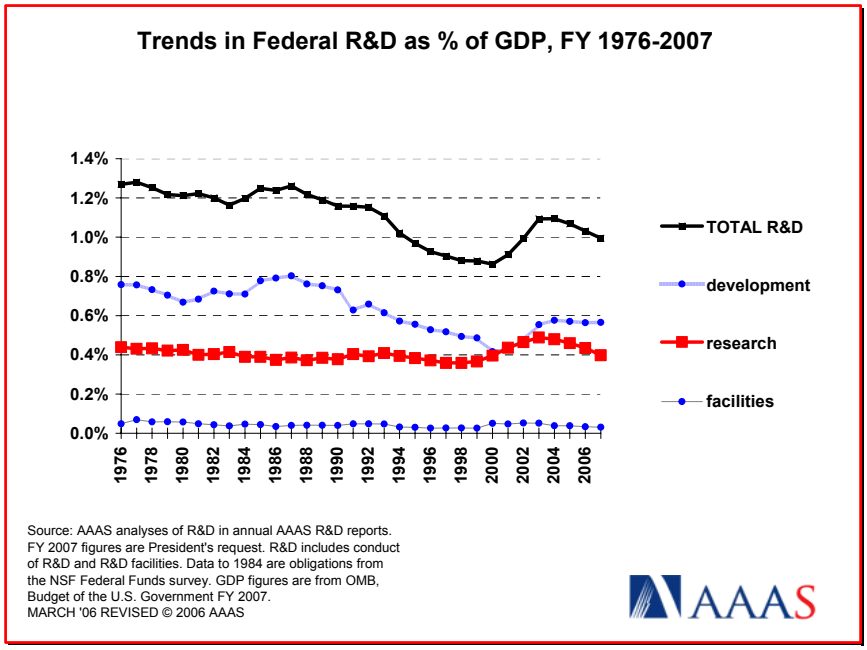

Figure 5.

Looking over the longer term, the mission-oriented U.S. R&D funding system means that federal R&D investments can shift dramatically to respond to changing national needs. Spending on defense R&D has exceeded all other R&D spending (grouped together as "nondefense R&D") for most of the past four decades, although the relative size of the two sectors has varied considerably over the years (see Figure 1). Figure 6 shows how priorities in nondefense R&D have shifted over the same period. Civilian R&D expenditures reached a high point in the mid-1960s, declining for several years thereafter. After several years of significant growth in the late 1980s and the late 1990s, they have only in this decade returned to the levels of the 1960s in real (*i.e.*, inflation-adjusted) terms.

Priorities, however, are different now than they were in the 1960s. Indeed, they changed significantly after September 11, 2001. Space exploration was the dominant function in the 1960s, driven mainly by the Apollo Program. It lost priority after we succeeded in landing on the moon in 1969, however, and has never regained its lead despite the recent presidential announcement of plans for a human return to the Moon and then human space flight to Mars. Energy R&D gained priority following the oil shortages of the 1970s, then retreated as national attention turned elsewhere. Health R&D, meanwhile, has shown practically uninterrupted growth over these years and now represents the largest single share of the civilian R&D portfolio. Homeland security-related R&D has increased in importance since September 11 with the creation last year of a new cabinet-level department devoted to homeland security; its work is divided among several national priorities, including defense, transportation, and health. (See Chapter 1 and Table I-4 for details of national priorities in the FY 2007 budget.)

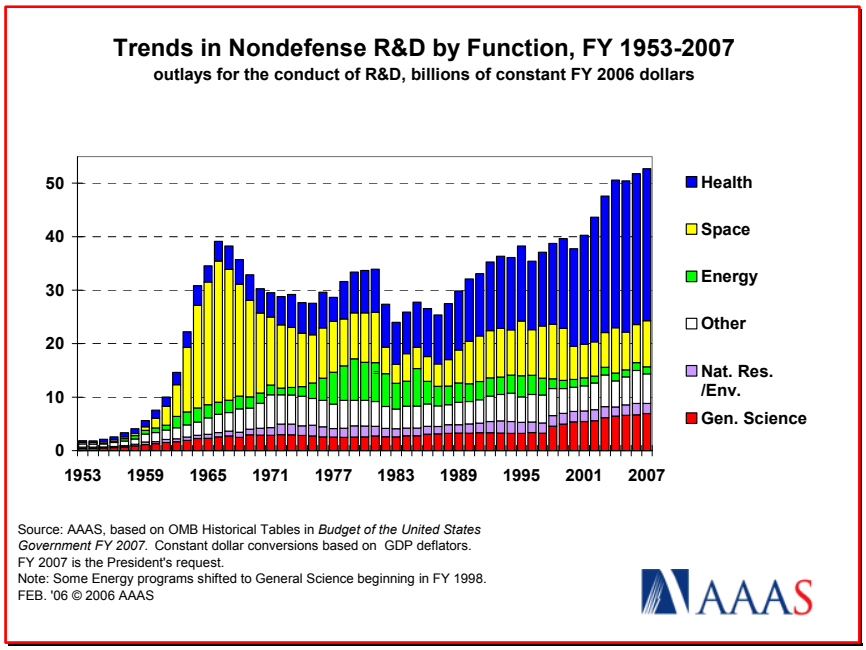

Figure 6.