

DEPARTMENT OF THE AIR FORCE REVISES R&D DATA FOR FY 2000–07

by Michael Yamaner¹

This report provides summary revisions to FY 2000–07 research and development obligations for Air Force, Department of Defense, and federal government totals collected and published by the National Science Foundation (NSF) from its Survey of Federal Funds for Research and Development.

Beginning with the FY 2000–02 survey, the Department of the Air Force mistakenly began excluding funds for operational systems development from R&D totals it reported, because the agency misunderstood the reporting requirements.² This omission persisted until the publication of the FY 2007–09 data tables, at which time NSF requested that the Air Force revise these data back to FY 2000 to include the missing development

funds. The Air Force edited their FY 2000–07 data to include funds for operational systems development. As a result, the FY 2007 major systems development total for Department of the Air Force is revised from \$9.4 billion to \$23.0 billion (table 1), and, in turn, total federal R&D obligations are revised upward by 12%, from \$113.8 billion to \$127.3 billion (table 2).

In addition, the FY 2007 Air Force revisions resulted in higher federal obligations to all R&D performers in the same fiscal year. The revised FY 2007 percentage distributions by R&D performer were applied backward to make estimated revisions to FY 2000–06 R&D performer obligations.

TABLE 1. Original and revised federal obligations from the Department of the Air Force for research, development, and R&D plant: FY 2000–07 (Millions of current dollars)

Fiscal year	All R&D and R&D plant		Research		Total		Development		Major systems		R&D plant	
	Original	Revised	Original	Revised	Original	Revised	Original	Revised	Original	Revised	Original	Revised
2000	11,061	14,108	1,097	1,097	9,958	13,005	624	624	9,334	12,381	5.5	5.5
2001	10,025	14,584	2,191	2,191	7,802	12,361	949	949	6,853	11,412	31.9	31.9
2002	6,908	14,763	1,357	1,357	5,527	13,382	1,090	1,090	4,437	12,292	23.5	23.5
2003	8,400	18,266	1,329	1,329	7,064	16,930	1,643	1,643	5,421	15,287	6.8	6.8
2004	9,642	20,340	1,211	1,211	8,411	19,109	747	747	7,664	18,362	19.5	19.5
2005	10,453	20,077	1,246	1,246	9,100	18,724	632	632	8,468	18,092	107.0	107.0
2006	10,115	21,699	1,351	1,351	8,753	20,337	640	640	8,113	19,697	11.3	11.3
2007	11,783	25,292	1,540	1,540	10,215	23,724	773	773	9,442	22,951	28.0	28.0

NOTES: Because of rounding, detail may not add to total. Revisions resulted from increase in reported funding in U.S. Air Force major systems development totals.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Federal Funds for Research and Development: FY 2007–09.



TABLE 2. Original and revised federal obligations for research, development, and R&D plant; FY 2000–07

(Millions of current dollars)

Fiscal year	All R&D and R&D plant		Total R&D		Research				Development		R&D Plant	
	Original	Revised	Original	Revised	Basic		Applied		Original	Revised	Original	Revised
					Original	Revised	Original	Revised				
2000	77,357	80,404	72,864	75,911	19,570	19,570	18,901	18,901	34,393	37,440	4,493	4,493
2001	84,003	88,563	79,933	84,493	21,958	21,958	22,756	22,756	35,219	39,779	4,070	4,070
2002	90,157	98,013	85,852	93,708	23,668	23,668	24,338	24,338	37,846	45,702	4,305	4,305
2003	97,927	107,793	93,660	103,526	24,751	24,751	26,320	26,320	42,589	52,455	4,267	4,267
2004	105,371	116,069	101,377	112,075	26,121	26,121	27,237	27,237	48,019	58,717	3,994	3,994
2005	112,994	122,619	109,223	118,848	27,140	27,140	26,598	26,598	55,485	65,110	3,771	3,771
2006	112,271	123,855	110,146	121,730	26,585	26,585	26,951	26,951	56,610	68,194	2,125	2,125
2007	115,923	129,431	113,755	127,263	26,866	26,866	27,228	27,228	59,661	73,169	2,168	2,168

NOTES: Because of rounding, detail may not add to total. Revisions resulted from increase in reported funding in U.S. Air Force major systems development totals.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Federal Funds for Research and Development: FY 2007–09.

Reporting of Department of Defense R&D Data

Seven budget activities (6.1 to 6.7) are defined within the U.S. Department of Defense (DOD) as part of its Research, Development, Test, and Evaluation (RDT&E) budget: basic research, applied research, advanced technology development, demonstration and validation, engineering and manufacturing development, management support, and operational systems development. Funds for all of these activities are allocated to R&D in DOD responses to the survey.

Operational systems development (budget activity 6.7) includes those development projects in support of development acquisition programs or upgrades still in engineering and manufacturing development, but which have received approval for production. This area also includes major system testing and research into upgrades of existing weapon systems. (See “Definitions,” below, for explanation of all seven budget activities.)

Table 3 translates RDT&E budget activities of the DOD into character of work categories for the Survey of Federal Funds for Research and Development. This mapping was created by the Office of the Director of Defense Research and Engineering and has been the long standing policy for how all DOD agencies are to report their R&D outlays and obligations.

Impact of Air Force Revisions

The Air Force’s revisions to FY 2000 data caused their reported major systems development funding to rise by \$3.0 billion, or 33%. This in turn caused FY 2000 reported All R&D and R&D plant funding to increase by 28% (table 1). These revisions did not have an impact on any other component of R&D (research, advanced technology development, or R&D plant data).

In dollar amounts, the magnitude of the Air Force’s data revisions rapidly increases when viewed over time. Revisions to numbers for FY 2003 major systems development funding, up by \$9.9 billion, caused reported All R&D and R&D plant to increase by 118%. The increase to FY 2007 Air Force major systems development funding due to revision, \$13.5 billion, resulted in a 115% revision in their reported All R&D and R&D plant funding.

In percentage terms, the impact of the Air Force’s revisions at the federal level is substantial. The revisions to FY 2000 data caused federal development funding to rise by 9% and total federal R&D funding to rise by 4% over the originally reported figures (table 2). The revision to federal funding of development for FY 2003 resulted in a rise of 23%, with revised total federal R&D up by 11%. In FY 2007 the revision caused a 23%

increase in reported federal development funding and a 12% change in total federal R&D.

The revisions have the most direct impact on industry and intramural performance totals. For example, the revisions caused reported FY 2000 federal funding of industrial performers to go up by an estimated 6% (\$1.7 billion), FY 2003 by an estimated 20% (\$6.8 billion), and FY 2007 by 17% (\$8.1 billion) (table 4). Federal

funding of intramural R&D for FY 2000 is revised by an estimated 7% (\$1.2 billion), an estimated 10% (\$2.3 billion) for FY 2003, and by 17% (\$4.4 billion) for FY 2007. In comparison, federal funding of R&D at universities and colleges is only slightly affected by the Air Force’s revisions: Total federal R&D support to universities is revised by an estimated 0.4% (\$70 million) for FY 2000, an estimated 1% (\$312 million) for FY 2003, and by 1% (\$296 million) for FY 2007.

TABLE 3. Crosswalk between Department of Defense RDT&E budget activities and Survey of Federal R&D character of work categories

Department of Defense	Survey of Federal Funds for R&D
RDT&E budget activity	Character of work category
6.1, basic research	Basic research
6.2, applied research	Applied research
6.3, advanced technology development	Advanced technology development
6.4, demonstration and validation	Major systems development
6.5, engineering and manufacturing development	Major systems development
6.6, RDT&E management support	Major systems development
6.7, operational systems development	Major systems development
Other than RDT&E (e.g., procurement, operations and maintenance)	Not reported

RDT&E = research, development, test, and evaluation.

SOURCE: Memorandum from the Office of the Director of Defense Research and Engineering, 22 July 2004.

TABLE 4. Original and revised federal obligations for research and development, by performer: FY 2000–07 (Millions of current dollars)

R&D performer	2000		2001		2002		2003		2004		2005		2006		2007	
	Original	Revised														
Intramural ^a	17,150	18,313	20,220	22,047	21,045	23,357	22,862	25,119	22,423	24,573	24,125	25,871	25,563	27,675	25,535	29,933
Industry	27,735	29,409	27,006	28,237	29,538	34,569	33,853	40,695	39,215	43,759	44,113	48,868	44,153	52,754	47,259	55,342
Industry FFRDCs	1,101	1,104	1,187	1,382	1,351	1,364	1,508	1,522	1,543	1,572	1,612	1,705	1,422	1,441	2,642	2,692
Universities and colleges	16,821	16,891	19,588	20,065	21,290	21,620	22,694	23,006	24,170	24,947	24,842	25,688	24,336	24,670	25,252	25,548
University and college FFRDCs	4,053	4,083	4,618	4,840	4,641	4,663	4,754	4,845	5,401	6,494	5,686	6,506	5,439	5,550	4,042	4,171
Other nonprofit institutions	4,211	4,228	5,139	5,390	5,739	5,782	5,707	5,766	5,624	6,481	5,910	6,705	6,000	6,063	5,966	5,984
Nonprofit FFRDCs	1,232	1,313	1,269	1,603	1,405	1,490	1,353	1,614	1,443	2,308	1,649	2,164	1,816	2,128	2,028	2,520
State and local governments	224	226	451	453	452	454	400	405	880	1,236	661	690	620	625	355	362
Foreign	337	344	457	476	392	410	532	557	678	706	626	651	797	824	674	711

FFRDC = federally funded research and development center.

^a Includes costs associated with administration of intramural and extramural programs by federal personnel and actual intramural performance.

NOTES: Because of rounding, detail may not add to total. Revisions resulted from increases in reported funding for U.S. Air Force major systems development totals. Revised FY 2007 % distributions by R&D performer were applied backward to make estimated revisions to FY 2000–06 R&D performer obligations.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Federal Funds for Research and Development: FY 2007–09.

Agencies' Funding for Development

The Air Force's FY 2007 revision increased reported DOD obligations for major systems development projects by 30%, or \$13.5 billion. This in turn increased the DOD share of development originally published for FY 2007 from 88% to 90%. The National Aeronautics and Space Administration is the next largest funder of development with 5.5%, followed by the Department of Energy with 3% (table 5).

TABLE 5. Original and revised federal obligations for development, largest agency funders: FY 2007
(Millions of current dollars)

Agency	FY 2007	
	Original	Revised
All agencies	59,661	73,169
Department of Defense	52,309	65,818
Major systems	45,785	59,294
Advanced technology	6,524	6,524
All other federal agencies	13,876	13,876
National Aeronautics and Space Administration	3,994	3,994
Department of Energy	2,021	2,021
Department of Homeland Security	321	321
Department of Transportation	202	202
Other	814	814

NOTES: Agencies reported actual obligations for FY 2007. Detail may not sum to total due to rounding.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Federal Funds for Research and Development: FY 2007–09.

Definitions

Budget activity 6.1, basic research. *Basic research* is defined as systematic study directed toward greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications towards processes or products in mind. It includes activities directed toward increasing fundamental knowledge and understanding in those fields of the physical, engineering, environmental, and life sciences related to long-term national security needs. It forms the base for subsequent applied research and advanced technology developments in defense-related technologies, and new and improved military functional capabilities.

Budget activity 6.2, applied research. *Applied research* is defined as systematic study to gain knowledge or understanding necessary to determine the means by which a recognized and specific need may be met. This activity translates promising basic research into solutions for broadly defined military needs, short of development projects. The dominant characteristic of this category is that it be pointed toward specific military needs with a view toward developing and evaluating the feasibility and practicability of proposed solutions and determining their parameters.

Budget activity 6.3, advanced technology development. *Advanced technology development* includes all efforts that have moved into the development and integration of hardware for field experiments and tests. The results are proof of technological feasibility and assessment of operability and producibility rather than the development of hardware for service use. Projects in this category have a direct relevance to identified military needs.

Budget activity 6.4, demonstration and validation. *Demonstration and validation* includes all efforts necessary to evaluate integrated technologies in as realistic an operating environment as possible to assess the performance or cost reduction potential of advanced technology.

Budget activity 6.5, engineering and manufacturing development. *Engineering and manufacturing development* includes those projects in engineering and manufacturing development for service use but which have not received approval for full-rate production. This area is characterized by major line-item projects.

Budget activity 6.6, RDT&E management support. *Management support* includes support of installations or operations required for general R&D use. Included would be test ranges, military construction, maintenance support of laboratories, operation and maintenance of test aircraft and ships, and studies and analyses in support of the R&D program. Costs of laboratory personnel, either in-house or contractor operated, would be assigned as a line item in the basic research, applied research, or advanced technology development program areas, as appropriate.

Budget activity 6.7, operational systems development. *Operational systems development* includes those

development projects in support of development acquisition programs or upgrades still in engineering and manufacturing development, but which have received approval for production. This area also includes major system testing and research into upgrades of existing weapon systems.

Data Availability

The full set of detailed tables from this survey will be available in the revised report *Federal Funds for Research and Development: Fiscal Years 2007, 2008, and 2009* at <http://www.nsf.gov/statistics/fedfunds/>.

Revised tables for the years FY 2000 to FY 2006 are being prepared. For more information, please contact the author.

Notes

1. Michael Yamaner, Research and Development Statistics Program, Division of Science Resources Statistics, NSF, 4201 Wilson Boulevard, Suite 965, Arlington, VA 22230 (myamaner@nsf.gov; 703-292-7815).
2. Official communication from the Department of the Air Force's Office of the Assistant Secretary (Budget).

NATIONAL SCIENCE FOUNDATION
ARLINGTON, VA 22230
OFFICIAL BUSINESS

RETURN THIS COVER SHEET TO ROOM P35 IF YOU DO NOT WISH TO RECEIVE THIS MATERIAL , OR IF CHANGE OF ADDRESS IS NEEDED , INDICATE CHANGE INCLUDING ZIP CODE ON THE LABEL (DO NOT REMOVE LABEL).

PRESORTED STANDARD
U.S. POSTAGE PAID
National Science Foundation

NSF 11-304