

Senate Boosts NASA R&D, Funds Hubble Mission

AAAS R&D Funding Update on R&D in Senate FY 2006 NASA Appropriations

Highlights

- The National Aeronautics and Space Administration (NASA), expecting the Space Shuttle to return to flight this year, would shift its focus to its many R&D challenges next year. In the latest Senate plan, the total NASA budget of \$16.4 billion would be a \$200 million or 1.2 percent increase, but **NASA's R&D funding would climb 7.1 percent or \$759 million in FY 2006** as a decline in Shuttle costs frees up money for NASA's R&D programs (see Table).
- The large apparent increase in NASA's R&D is partly due to mid-year cuts imposed recently in the 2005 budget. In May, NASA shifted \$284 million from R&D accounts to the Space Shuttle program to give it a record \$5 billion budget in preparation for a safe July return to flight.
- While the agency would receive additional resources for its ambitious plans to finish construction of the International Space Station, explore the solar system, and develop the technologies needed for future moon and Mars missions, there would also be steep cuts in an R&D portfolio growing substantially, but not enough for NASA to fund everything on its full plate of missions. Even from a 2005 base reduced by mid-year cuts, **the Senate budget plan would make further cuts in NASA's aeronautics research portfolio (down 13 percent to \$838 million), the earth sciences portfolio (down 11 percent to \$2.0 billion), and biological and physical research (down 13 percent to \$800 million).**
- **The Senate would allocate \$250 million specifically for a Hubble Space Telescope servicing mission** in addition to regular Hubble funds.
- The Senate increases would agree with NASA and House plans to shift resources to solar system exploration and R&D for moon and Mars mission technologies. There would be large boosts for robotic moon and Mars exploration (up 17 percent to \$858 million) and development of a Crew Exploration Vehicle within a new Constellation Systems program (doubling to \$1.1 billion).
- The International Space Station would receive \$1.7 billion, up 2.8 percent, in anticipation of the Space Shuttle returning to its role of transporting Station components into space.

NASA R&D in FY 2006 Senate Appropriations

On June 23, the Senate Appropriations Committee approved its version of the FY 2006 Commerce, Justice, and Science appropriations bill (HR 2862), following full House approval of its version a week earlier. **The Senate bill would provide NASA with a total budget of \$16.4 billion in FY 2006, \$200 million or 1.2 percent above this year's budget.** (For details of R&D in the FY 2006 request, please see Chapter 10 of *AAAS Report XXX: R&D FY 2006* or the March 9 AAAS R&D Funding Update. For details of NASA R&D in House appropriations, see the June 14 R&D Funding Update.)

Because of an extensive reorganization of appropriations bill jurisdictions, in FY 2006 the National Science Foundation (NSF) and NASA will be funded for the first time with the Departments of Commerce and Justice. NSF and NASA were formerly funded in the now defunct VA-HUD appropriations bill alongside the Departments of Veterans Affairs and Housing and Urban Development. As a result, the former Commerce, Justice, and State appropriations bill in the House now has "Science" in its name. The Senate version of the bill, however, has a different group of agencies: although Commerce, Justice, NASA,

and NSF are still funded together in the Senate, the Senate bill excludes the Department of State. The differing jurisdictions in the House and the Senate bills will make agreeing on a final (conference) bill extremely difficult.

In an extremely tough budget environment of rising deficits, restraints on domestic spending, and cuts for many programs, the National Aeronautics and Space Administration (NASA) would escape the tight funding squeeze facing other domestic programs in the proposed FY 2006 budget. And because of mid-year reductions in the 2005 base along with an expected decline in Shuttle funding in 2006, **NASA's R&D funding would increase dramatically next year to make up for a cut this year.** The Senate would provide \$200 million more than this year for NASA's total budget to bring it to \$16.4 billion (see Table) after an \$820 million increase in 2005. Both the House and Senate bills should allow NASA to keep going on grand new plans for space exploration involving a return to the moon and a possible human flight to Mars in coming decades, after first returning the Space Shuttle to flight this summer and using the Shuttle to finish construction of the International Space Station.

NASA's R&D (two-thirds of the agency's budget) would total \$11.5 billion in the Senate plan, a 7.1 percent or \$759 million increase that is certain to be the largest percentage increase among the major R&D funding agencies (see Table and Figure 1). R&D funding would grow faster than the total NASA budget because the agency anticipates a reduction in the non-R&D Space Shuttle program from a record \$5.0 billion funding level this year down to \$4.5 billion next year after the Shuttle returns to flight, and also because NASA reduced the 2005 R&D portfolio mid year. The large Senate increase, matched in both the House plan and the NASA request, would come after a cut in 2005 (see Figure 1).

NASA has had a turbulent year as it prepares to return the Space Shuttle to flight this summer, two and a half years after the loss of the Columbia. After extensive investigations and safety overhauls, the Shuttle's return to flight is currently scheduled for July, as early as July 13. But in order to accomplish NASA's top priority, the agency has had to juggle its budget extensively to shift funds from R&D accounts to the Space Shuttle program. For FY 2005, Congress gave NASA almost unlimited flexibility to shift funds between programs in its \$16.2 billion budget; in exercising this flexibility, in May NASA released its latest FY 2005 operating plan showing that it had shifted \$284 million between R&D programs in Science, Aeronautics, and Exploration (SAE) to the non-R&D Space Shuttle and related programs in Exploration Capabilities (EC), along with numerous shifts between SAE programs to accommodate Hubble Space Telescope funding, changing mission requirements, and congressional earmarks. Although the total NASA budget remained unchanged, the shifts reduced NASA's R&D funding from \$11.0 billion from the February estimate down to \$10.7 billion now.

Looking forward to next year, the Senate would concur with NASA's plan to increase funding for the International Space Station. The Station is now essentially in maintenance mode until the Space Shuttle resumes its role of carrying Station components into orbit. After shrinking to \$1.4 billion last year, the Senate plan envisions Space Station construction resuming at \$1.7 billion after the Shuttle returns to flight. The Space Station and the Space Shuttle make up the Exploration Capabilities (EC) account, which totals \$6.6 billion in the Senate, a decline of 7.2 percent because of the expected fall-off in Shuttle costs (see Table).

With these two big-ticket current programs provided for in the EC account, **the Exploration, Science, and Aeronautics (ESA) account, which funds most of NASA's research, would rise 7.9 percent in the Senate bill for a gain of \$710 million to \$9.8 billion, following on a similar House-proposed increase. The Senate would confirm NASA plans for dramatic increases in moon-and-Mars programs, especially within the new Exploration Systems (ES) account.** In next year's budget, NASA would create the Constellation Systems program within ES as the focal point for R&D efforts in the space flight technologies needed to return humans to the moon and then onward to Mars. From \$527 million this year, Constellation Systems funding would double to \$1.1 billion, primarily for R&D on the Crew Exploration Vehicle (CEV), a project to develop a next-generation spacecraft capable of taking humans beyond low-Earth orbit. The first demonstration flights are currently planned for 2008. Exploration Systems R&T (research and technology) would surge more than 25 percent to approximately \$900 million in the Senate

plan for R&D to meet the technical challenges lying ahead for the moon and Mars missions. The Prometheus Nuclear Systems and Technology program to develop new power and propulsion technologies based on nuclear power for future NASA missions would receive \$320 million in a restructuring of program milestones, up from the current plan of \$270 million. Funding for the Mars and Lunar Exploration programs for robotic exploration would total \$858 million in combined funding, up 17 percent from this year to build on recent successes of the headline-grabbing Mars rovers and to gear up for a 2008 robotic mission to the moon.

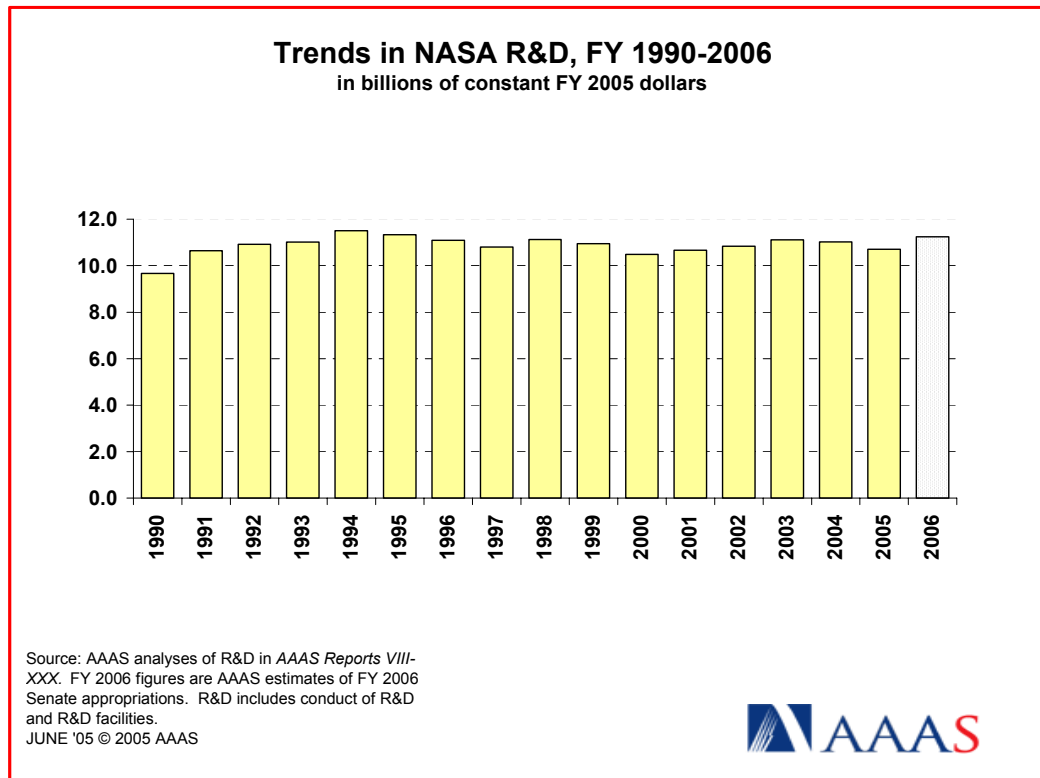


Figure 1. (click on image for PDF)

The Senate would provide \$250 million specifically for a shuttle servicing mission to the Hubble Space Telescope, to follow on \$291 million provided this year. In an unusual move, the \$250 million is written into the bill itself instead of in the accompanying bill report, thereby giving the allocation the force of law. The \$291 million for FY 2005 was in the bill report, so initially NASA allocated far less for Hubble until congressional pressure led NASA to allot the full \$291 million in its May operating plan. The Senate language follows on a recent decision by new NASA Administrator Michael Griffin to reassess the possibility of a servicing mission to the telescope. NASA attracted strong criticism last year for canceling a planned shuttle servicing mission to extend the life of the Hubble, instead focusing on robotic servicing. The FY 2006 budget proposal in February, prepared under the watch of the previous administrator, would have canceled any servicing mission, but the specific Senate appropriation would put a mission back on the agenda. The Senate funds would be in addition to funds for regular Hubble operations.

The Senate would delete funding for the Centennial Challenges program to award competitive prizes for new technologies. The request of \$34 million would have funded NASA attempts to replicate the X-Prize program, but the Senate bill criticizes NASA for requesting the funds but leaving the technology challenges, prize levels, and other milestones unidentified in a program that has yet to be authorized in law.

The Senate would agree to NASA proposals to dramatically cut NASA investments in earth sciences, aeronautics, and biological and physical sciences. Funding for the Earth-Sun System program, restructured from the former Earth Science program, would decline 11 percent to \$2.0 billion. This NASA

program is a key part of the interagency Climate Change Science Program and is responsible for space-based observations of the earth environment. While the House would provide \$906 million, the Senate would make a steep 13 percent cut in the aeronautics research portfolio down to \$838 million (see Table). Language accompanying the NASA appropriation makes clear both the House and Senate Appropriations Committees' support for sustaining NASA's investment in aeronautics research, especially at a time when other industrial nations are increasing their investments, but funding would lag behind the language. The Senate appropriation would leave the aeronautics portfolio at just half the size of a decade ago.

Both the House and the Senate would endorse NASA's proposal to dramatically restructure and downsize its biological and physical research portfolio into a Human Systems Research and Technology program more narrowly focused on research topics relevant to human space flight. Human Systems would receive roughly \$800 million in the Senate bill, compared to \$925 million in the current year.

Elsewhere in the bill, both the House and the Senate would make the unusual move of adding \$50 million in R&D earmarks to the NASA budget, but without itemizing them. The actual projects are expected to be named in the final (conference) version of the bill.

Impacts and Next Steps

The Senate increase to NASA's R&D portfolio in FY 2006 would continue a modest upward trend for the last few years, as shown in Figure 1, except for the drop in the 2005 budget. NASA's R&D funding has just kept pace with inflation going back to FY 1991, and recent increases have been just barely ahead of inflation. NASA has committed to carrying out its ambitious plans with a budget plan that would just keep pace with expected inflation over the next decade. Although inflationary increases are more than most R&D funding agencies are likely to get in the next few years, NASA's big plans for the next few years will still require NASA to reshuffle its resources and to meet ambitious targets for deployment, construction, and then phase-out of the Space Shuttle and Space Station programs to make room for moon and Mars programs.

The Senate is expected to debate and approve the Commerce, Justice, and Science appropriations bill in July. Because the House-approved version of the bill includes the Department of State, which the Senate would fund in another appropriations bill entirely, the House-Senate conference to resolve differences is expected to be extremely difficult and may not conclude until the fall.

(This analysis is one of a series of AAAS R&D Funding Updates on FY 2006 congressional appropriations. The complete series of AAAS R&D Funding Updates, including continually updated analyses of R&D in FY 2006 appropriations, is available on the AAAS R&D Web Site (<http://www.aaas.org/spp/rd>) in the "FY 2006 R&D" or the "What's New" sections.)

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AAAS R&D Budget and Policy Program
1200 New York Ave, NW
Washington, DC 20005
(202) 326-6607; -6600
www.aaas.org/spp/rd



Table. NASA R&D in FY 2006 Senate Appropriations

**Table. National Aeronautics and Space Administration
Senate Appropriations Committee Action on R&D in the FY 2006 Budget
(budget authority in millions of dollars)**

	FY 2005 Est. **	FY 2006 Request	FY 2006 House	Senate Action				
				FY 2006 Senate	Chg. from Request Amount	Percent	Chg. from FY 2005 Amount	Percent
Summary of R&D by Appropriation:								
1. Exploration Capabilities (EC) *								
International Space Station	1,676	1,857	1,837	1,724	-133	-7.2%	47	2.8%
Space Shuttle	4,964	4,531	4,531	4,531	0	0.0%	-434	-8.7%
Space and Flight Support	474	376	346	349	-27	-7.2%	-125	-26.4%
Total Exploration Capabilities	7,114	6,763	6,713	6,603	-160	-2.4%	-511	-7.2%
2. Science, Aeronautics and Exploration (SAE) *								
Solar System Exploration	1,787	1,901	1,905	1,869	-32	-1.7%	82	4.6%
The Universe	1,475	1,512	1,526	1,737	225	14.9%	262	17.8%
Earth-Sun System	2,291	2,064	2,098	2,044	-19	-0.9%	-247	-10.8%
Exploration Systems	2,356	3,165	3,122	3,108	-57	-1.8%	752	31.9%
Aeronautics Research	962	852	906	838	-14	-1.7%	-124	-12.9%
Education Programs	179	167	169	164	-3	-1.7%	-15	-8.3%
Total ESA	9,051	9,661	9,726	9,761	100	1.0%	710	7.9%
3. Inspector General	31	32	32	32	0	0.0%	1	3.5%
Total NASA Budget	16,196	16,456	16,471	16,396	-60	-0.4%	200	1.2%
<i>minus non-R&D Activities:</i>								
Space Shuttle	-4,964	-4,531	-4,531	-4,531	0	0.0%	434	-8.7%
Other non-R&D	-474	-376	-346	-349	27	-7.2%	125	-26.4%
Inspector General	-31	-32	-32	-32	0	0.0%	-1	3.5%
Education and Training	-22	-21	-21	-21	0	0.0%	1	-4.1%
Total NASA Non-R&D Activities	-5,491	-4,959	-4,929	-4,932	27	-0.5%	559	-10.2%
TOTAL NASA R&D	10,705	11,497	11,542	11,464	-33	-0.3%	759	7.1%

AAAS estimates based on FY 2006 appropriations bills. Includes conduct of R&D and R&D facilities.

FY 2005 and FY 2006 request figures based on OMB R&D data and supplemental agency budget data.

FY 2005 figures include emergency supplemental for hurricane damages.

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

NASA proposes an extensive restructuring of its budget in FY 2006.

Figures for all years have been adjusted to reflect the proposed budget structure.

* NASA funds are not appropriated by program. The FY 2006 program-level figures are AAAS estimates based on report language in FY 2006 appropriations bills; NASA has broad flexibility to shift funds between programs.

** FY 2005 figures have been adjusted to reflect the May 2005 FY 2005 Operating Plan.

These figures differ from those presented in AAAS Report XXX: R&D FY 2006.

June 28, 2005 - AAAS estimates of Senate Appropriations Committee-approved bills.

These figures may be amended or rejected by the full Senate.