



December 6, 2004 –
Final FY 2005 NASA Appropriations

NASA Embarks on New Plans in 2005

Highlights

- **The National Aeronautics and Space Administration (NASA) emerged as one of the winners in the FY 2005 budget process with a \$16.1 billion total budget in FY 2005, 4.5 percent more than last year.** The budget allows NASA to embark on an ambitious plan to send humans back to the Moon and onward to Mars (see Table).

- Most of NASA's budget increase goes to returning the Space Shuttle to flight in spring 2005 and to use the Shuttle to resume construction of the International Space Station. NASA R&D, which excludes the Shuttle, rises at a more modest 2.0 percent rate to \$11.1 billion (see Table). The R&D increases allow NASA to initiate development of new technologies for the moon-and-Mars missions, to plan for a repair mission to the Hubble Space Telescope, and to resume construction of the International Space Station.

- **These higher priorities will require NASA to make deep cuts in its research programs, which fall 5.5 percent to an estimated \$5.3 billion for basic and applied research in astronomy, earth sciences, and aeronautics.**

NASA R&D in FY 2005 Final Appropriations

On November 20, Congress came to an agreement on an FY 2005 omnibus appropriations bill (HR 4818), which incorporates the final version of the FY 2005 VA-HUD appropriations bill. The House is expected to give final approval on December 6, and President Bush is expected to sign the bill into law on December 8. The omnibus bill keeps funding for domestic programs flat in FY 2005, but the National Aeronautics and Space Administration (NASA) escaped the tight funding squeeze facing other domestic programs. In fact, an across-the-board cut of 0.80 percent to all domestic programs was added to the omnibus bill at the last minute partially to boost funding for NASA accounts. (All figures in this analysis reflect the across-the-board cuts, which also apply to NASA.) The omnibus bill gives NASA a total budget of \$16.1 billion in FY 2005, \$693 million more than FY 2004 for a 4.5 percent increase at a time when most domestic agencies are held to flat funding (see Table). The additional funds from across-the-board cuts allow the agency to avoid the steep budget cuts contained in an earlier House budget plan, which would have cut \$1 billion from the NASA budget, and to avoid emergency spending designations that the Senate used to fund its proposed NASA increases. The additional funds allow NASA to embark on grand new plans for space exploration involving a return to the moon and a possible human flight to Mars in coming decades.

NASA's R&D (two-thirds of the agency's budget) totals an estimated \$11.1 billion, a 2.0 percent increase, less than the request but an improvement over the House-proposed 6.2 percent hit to R&D programs. Exact figures for NASA's programs are provisional estimates, because the omnibus bill allows NASA almost unlimited flexibility to transfer funds between accounts in order to address NASA's many competing needs in the coming year. (For details of NASA R&D in FY 2005 House appropriations, see the July 28 AAAS R&D Funding Update. For details of R&D in the FY 2005 request, please see Chapter 10 of *AAAS Report XXIX: R&D FY 2005*.)

With the January presidential announcement of plans to send humans to the moon again on the way to Mars, the **National Aeronautics and Space Administration (NASA)** was supposed to embark on a new era in its history, with a major commitment of new resources to enable the agency to begin preparing for a

new lunar mission. The February release of the FY 2005 budget request of \$16.2 billion for NASA made the agency one of the few domestic agencies favored with a proposed increase (5.6 percent) in tough budgetary times even as other R&D funding agencies faced cuts or flat budgets. But on closer examination, nearly all of the increase would have gone to returning the non-R&D Space Shuttle to flight (up 9.5 percent to \$4.3 billion) and resuming construction of the Space Station (up 24.3 percent to \$1.9 billion).

After rough sledding for most of 2004 before a skeptical Congress, the final FY 2005 budget surprised observers by keeping NASA's plans on track, though with some modifications. Congress fully funded the requested increase to \$4.3 billion for the non-R&D Space Shuttle, now NASA's highest priority in preparation for a return to flight scheduled for late spring 2005, more than two years after being grounded in the aftermath of the Challenger disaster.

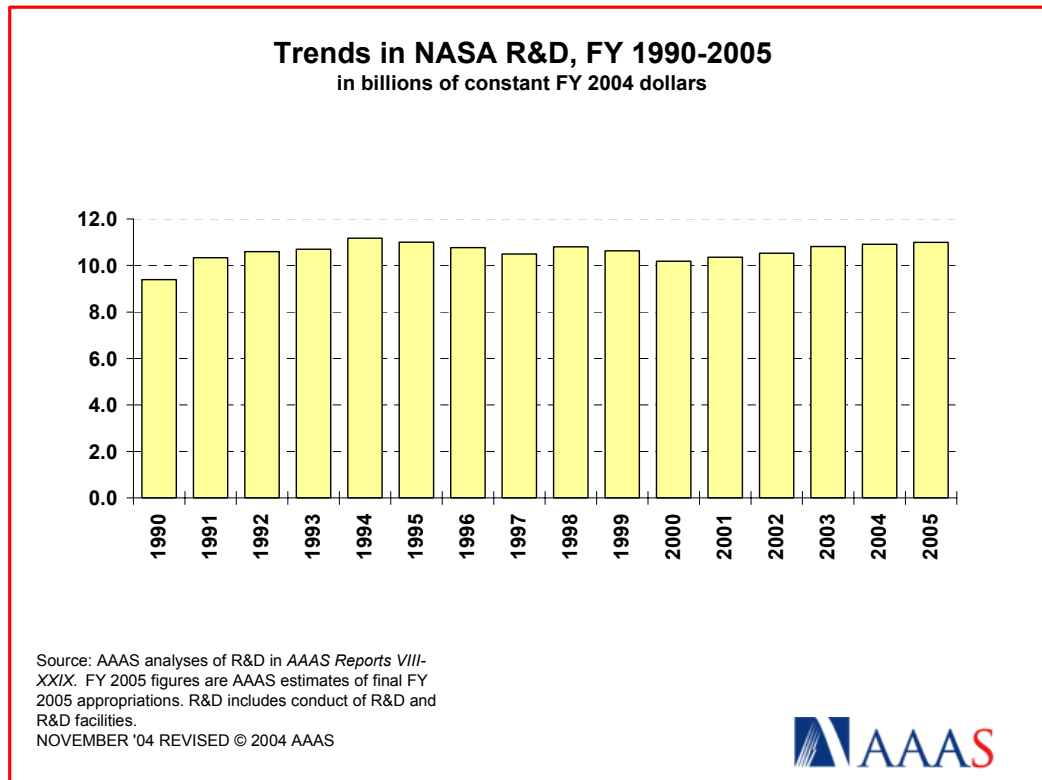


Figure 1. (click on the image for PDF)

Congress trimmed the \$1.9 billion request for the Space Station slightly to \$1.8 billion, which is still 19.5 percent more than FY 2004 spending for a substantial increase. With the original deadline of February 2004 for completion of the core station long shattered, the Station is now essentially in maintenance mode of two astronauts supplied by Russian spacecraft, with construction activities in limbo indefinitely until the Space Shuttle resumes its role of carrying Station components into orbit. The FY 2005 budget envisions Space Station construction getting back in high gear after the Shuttle returns to flight, though the flexibility NASA receives in the omnibus bill will allow for the funds to be transferred to other programs if Shuttle delays once again result in further Space Station delays.

With these two big-ticket current programs provided for, **the final FY 2005 budget also provide funds and a ringing endorsement of plans to start new moon-and-Mars related programs, especially within the Exploration Systems (ES) account.** NASA could have up to \$428 million to begin development of the Crew Exploration Vehicle (CEV), a project to develop a next-generation spacecraft capable of taking humans beyond low-Earth orbit. The CEV project is designed to replace the Space Launch Initiative, another program to develop next-generation space launch vehicles. Congress expresses concern in the omnibus bill that there has not been enough planning to determine what capabilities the CEV should have,

and therefore an insufficient plan for how to develop it; the report language accompanying the bill instructs NASA to prepare a report within 60 days of CEV development goals and their connections to NASA missions, and of safeguards to keep the project on budget. The bill also instructs NASA to designate an independent oversight committee to monitor the project and to keep the program on track and on budget.

NASA receives \$1.1 billion for the Human and Robotic Technology (HRT) program, up 64 percent from comparable programs in FY 2004. The large boost is due to an allocation of up to \$438 million for Project Prometheus to develop new power and propulsion technologies based on nuclear power for future NASA missions, a key need if NASA is to launch spacecraft to the Moon and beyond.

The Exploration, Science, and Aeronautics (ESA) account, which funds most of NASA's research, is battered with a reduction to \$7.7 billion, down 1.9 percent from FY 2004 in a year when the Space Shuttle, Space Station, and new space exploration technologies are higher priorities (see Table).

The Space Science program sees its budget rise modestly by \$21 million or 0.5 percent to \$4.0 billion, but \$291 million of the final appropriation goes to fund a previously unbudgeted servicing mission to the Hubble. NASA has attracted strong criticism this year for canceling a previously planned shuttle servicing mission to extend the life of the Hubble, instead focusing on robotic servicing. The House urged NASA to keep alive the option of a shuttle mission for Hubble, but did not provide any additional funds beyond the \$130 million request for the overall Hubble program (down sharply from \$241 million this year), which would not have paid for a mission. The Senate provided core Hubble funding plus \$300 million in dedicated funding for a servicing mission after the Shuttle eventually returns to flight. The final omnibus bill allocates \$291 million in the regular Space Science budget for a mission, but leaves NASA with the burden of finding the money from other NASA programs. Elsewhere in Space Science, Congress agreed to \$10 million for the Lunar Exploration program to develop the new technologies needed for a human return the moon, down dramatically from the \$70 million request.

Outside of Space Science, most of NASA's research-oriented programs face cuts. The Earth Science program falls 6.7 percent to \$1.5 billion in FY 2005, confirming the lower priority assigned to space-based observations of the Earth within NASA's portfolio of activities. Congress cut Aeronautics funding by 10.1 percent to \$930 million, similar to NASA's own plans. NASA's Education Programs funding falls 5.7 percent to \$213 million, despite congressional boosts for the National Space Grant College and Fellowship program (to \$28 million) and for the EPSCoR program (to \$12 million). **At the same time, Congress added \$172 million to the ESA budget for congressional earmarks, further squeezing the shrinking resources for these programs.**

As a result, **NASA may have to make deep cuts in its research programs.** AAAS estimates that NASA support of research could fall 5.5 percent to \$5.3 billion, even as funding for development (technologies for the moon-and-Mars mission) and R&D facilities (the International Space Station) increase substantially.

Impacts of the NASA R&D Portfolio

The modest increase to NASA's R&D portfolio in FY 2005 would continue a modest upward trend for the past several years, as shown in Figure 1. NASA's R&D funding has barely kept pace with inflation going back to FY 1991, and recent increases have been just barely ahead of inflation. Although the Bush Administration's moon and Mars plan promised new development efforts and increasing resources in a time of fiscal austerity, a closer look at the final FY 2005 budget shows that most of the money would come from reprogramming from other NASA programs rather than large funding increases in FY 2005 and later. Indeed, NASA has promised repeatedly over the past year that it could accomplish its ambitious goals over the next decades with a budget just keeping pace with expected inflation. With a return to the moon nearly twenty years away and a possible trip to Mars nearly three decades away, the presidential announcement and the apparently good FY 2005 omnibus bill did little to change NASA's near-term budget prospects for R&D, especially since the bulk of the budget increases go to more immediate priorities in the Shuttle and Station.

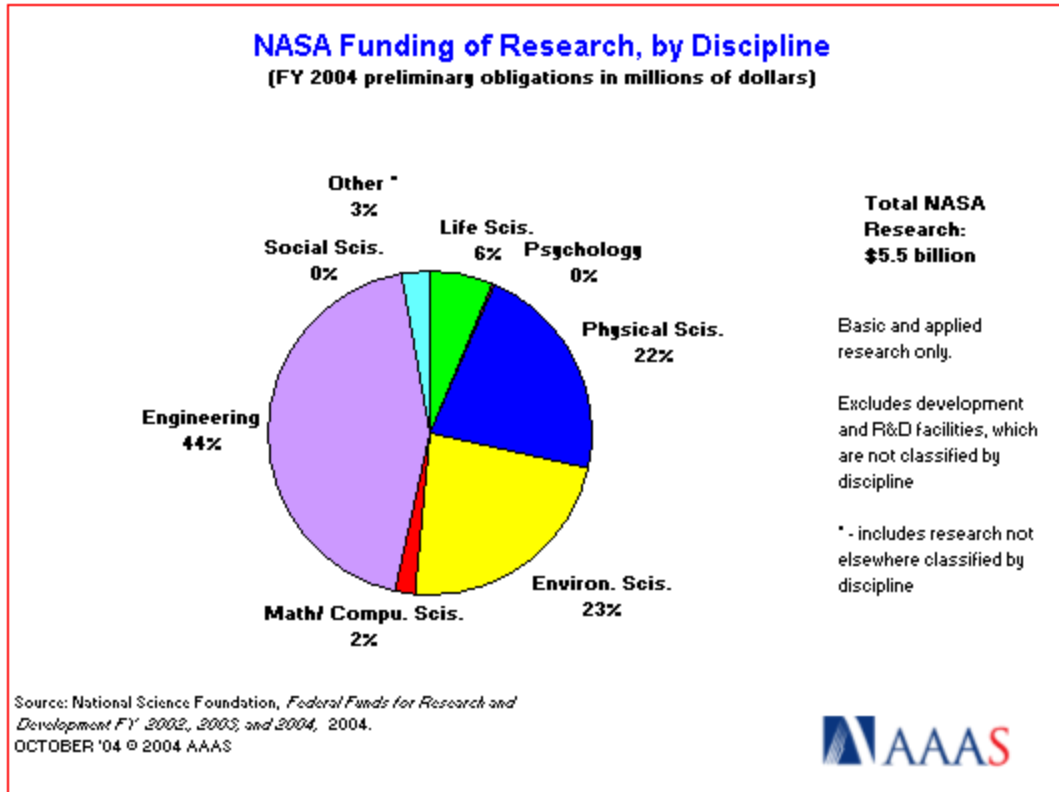


Figure 2. (click on the image to view or download a color, full-page PDF version of the chart)

Although much of NASA's R&D portfolio funds development and facilities projects such as the Space Station, **NASA is responsible for 10 percent of all federal support for basic and applied research but with far larger roles in key fields.** Engineering research makes up the largest part of the NASA portfolio (see Figure 2). NASA funds more than a quarter of total federal support for engineering research. NASA supplies nearly all the federal support for some engineering sub-fields such as astronautical engineering and aeronautical engineering. NASA is the leading federal sponsor of the environmental sciences (oceanography, atmospheric sciences, geological sciences). The environmental sciences are a quarter of NASA's portfolio, but NASA accounts for a third of total federal support for environmental sciences research. NASA also invests heavily in the physical sciences (astronomy, chemistry, and physics). NASA is the second largest federal sponsor of physical sciences behind the Department of Energy, and is by far the leading sponsor of astronomy research with more than 70 percent of the federal total. **NASA research falls 5.5 percent in FY 2005 because of cuts in Earth Science, Space Science, and aeronautics research,** which will most likely lead to cuts in NASA support for most of the above disciplines.

Industrial firms receive half the NASA R&D portfolio. In FY 2004, industry received 50 percent of the NASA R&D budget. 20 percent of NASA R&D went to the agency's own federal laboratories, while another 14 percent went to the Jet Propulsion Laboratory in California, a privately-operated (by CalTech) NASA-owned laboratory. Universities and colleges received 10 percent of NASA's R&D.

Because of NASA's reliance on large firms and large federal laboratories, NASA's R&D is heavily concentrated in just a few states. As shown in Figure 3, fully two-thirds of NASA's R&D is performed in just the four states of California, Texas, Maryland, and Virginia. California is home to three major NASA facilities: the Jet Propulsion Laboratory in Pasadena, the Ames Research Center in Moffett Field, and the Dryden Flight Research Center in Edwards. Texas is home to the Johnson Space Center in Houston; Maryland houses the Goddard Space Flight Center; and Virginia houses the Langley Research Center in Hampton. These states are also where many industrial contractors on projects such as the International Space Station are located.

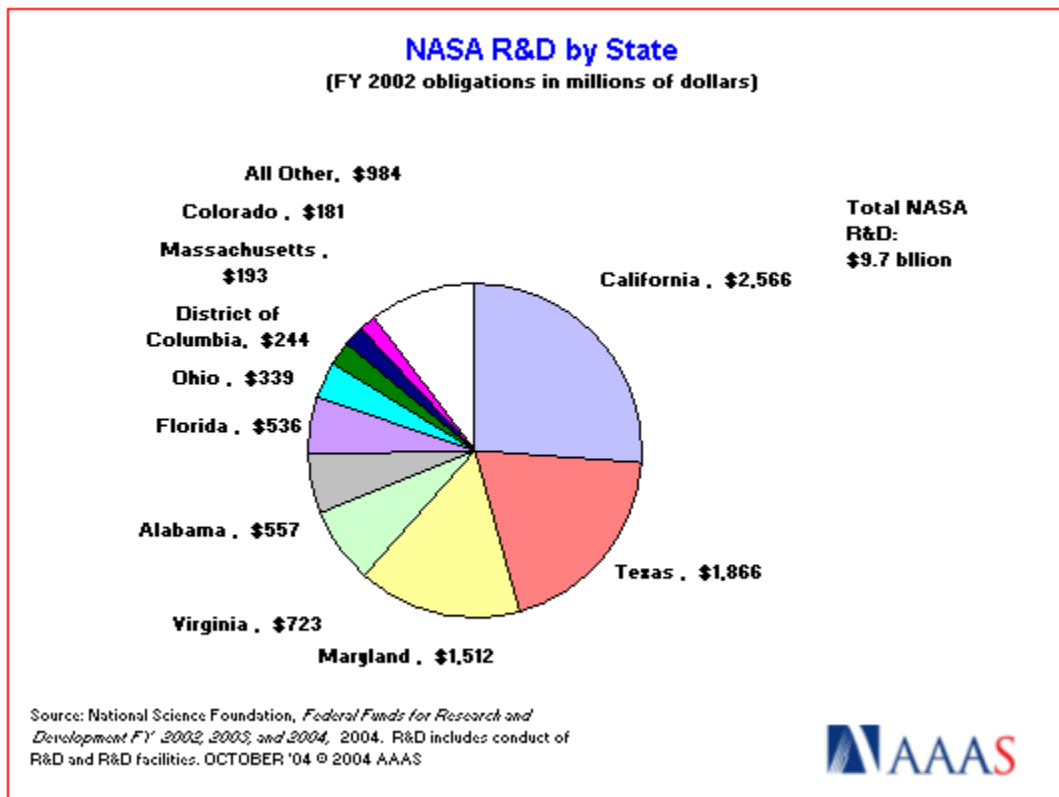


Figure 3. (click on the image to view or download a color, full-page PDF version of the chart)

Next Steps

Although NASA's budget does well in FY 2005, NASA's R&D portfolio does less well and NASA's research funding actually falls. With NASA and Congress continuing to put the Space Shuttle first, the Space Station second, and moon-and-Mars missions third, there seems little likelihood that this state of affairs will change much in the coming years. Although NASA is projected to be one of the few domestic agencies to receive budget increases in the second Bush Administration, NASA's own plans show its research accounts (Earth Science, Aeronautics, Biological and Physical Research) declining in the next few years, with increases going toward development and R&D facilities investments.

(This analysis is one of a series of AAAS R&D Funding Updates on the FY 2005 appropriations process. This analysis includes information on R&D in final FY 2005 appropriations for NASA. The complete series of AAAS R&D Funding Updates, including continually updated analyses of R&D by agency in FY 2005 appropriations, is available on the AAAS R&D Web Site (<http://www.aaas.org/spp/rd>) in the "FY 2005 R&D" or the "What's New" sections.)

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Table. NASA R&D in FY 2005 Final Appropriations

**Table. National Aeronautics and Space Administration
Final Congressional Action on R&D in the FY 2005 Budget
(budget authority in millions of dollars)**

	FY 2004 Estimate	FY 2005 Request	FY 2005 Approved	House-Senate Conference			
				Chg. from Request Amount	Percent	Chg. from FY 2004 Amount	Percent
Summary of R&D by Appropriation:							
1. Exploration Capabilities (EC) * / Space Flight Capabilities							
Space Flight							
International Space Station	1,498	1,863	1,790	-73	-3.9%	291	19.5%
Space Shuttle	3,945	4,319	4,319	0	0.0%	374	9.5%
Space and Flight Support	432	492	473	-19	-3.9%	41	9.5%
Total Space Flight	5,875	6,674	6,581	-93	-1.4%	707	12.0%
Exploration Systems							
Human and Robotic Technology	679	1,094	1,115	22	2.0%	436	64.2%
Transportation Systems	967	689	662	-27	-3.9%	-305	-31.5%
Total Exploration Systems	1,646	1,782	1,777	-5	-0.3%	131	8.0%
Total EC	7,521	8,456	8,358	-98	-1.2%	838	11.1%
2. Exploration, Science, and Aeronautics (ESA) * / Science, Aeronautics and Exploration							
Space Science	3,971	4,138	3,992	-146	-3.5%	21	0.5%
Earth Science	1,613	1,485	1,505	20	1.3%	-108	-6.7%
Biological and Physical Research	985	1,049	1,040	-9	-0.8%	55	5.5%
Aeronautics	1,034	919	930	11	1.2%	-104	-10.1%
Education Programs	226	169	213	45	26.7%	-13	-5.7%
Total ESA	7,830	7,760	7,681	-79	-1.0%	-150	-1.9%
3. Inspector General	27	28	31	4	13.6%	4	16.1%
Total NASA Budget	15,378	16,244	16,070	-174	-1.1%	693	4.5%
<i>minus non-R&D Activities:</i>							
Space Shuttle	-3,945	-4,319	-4,319	0	0.0%	-374	9.5%
Other non-R&D	-432	-492	-488	4	-0.8%	-56	13.1%
Inspector General	-27	-28	-31	-4	13.6%	-4	16.1%
Education and Training	-65	-71	-99	-28	38.8%	-34	52.4%
Total NASA Non-R&D Activities	-4,469	-4,910	-4,938	-28	0.6%	-469	10.5%
TOTAL NASA R&D	10,909	11,334	11,132	-201	-1.8%	223	2.0%

AAAS estimates based on FY 2005 appropriations bills. Includes conduct of R&D and R&D facilities.

FY 2004 and FY 2005 request figures based on OMB R&D data and supplemental agency budget data.

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

* NASA funds are not appropriated by program. The FY 2005 program-level figures are AAAS estimates based on report language in the FY 2005 omnibus appropriations bill; NASA has broad flexibility to shift funds between programs.

FY 2005 Approved figures adjusted to reflect across-the-board reductions in the FY 2005 omnibus bill.

November 24, 2004 - AAAS estimates of final FY 2005 appropriations bills.