



CRS Report for Congress

National Aeronautics and Space Administration: Overview, FY2007 Budget in Brief, and Key Issues for Congress

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Summary

The National Aeronautics and Space Administration (NASA) conducts U.S. civilian space and aeronautics activities. Its regular FY2006 appropriation was \$16.623 billion. For FY2007, the Administration requested \$16.792 billion, a 3.2% increase (or a 1% increase if one-time FY2006 funding for hurricane recovery is included). The NASA Authorization Act of 2005 (P.L. 109-155) authorized FY2007 funding of \$17.932 billion. The House provided \$16.709 billion. The Senate Appropriations Committee recommended \$17.797 billion. The final appropriation was \$16.247 billion (P.L. 110-5). The key issue for Congress is how NASA is implementing the Vision for Space Exploration, including whether it is maintaining a balanced portfolio of programs that include science and aeronautics.

Agency Overview

The National Aeronautics and Space Administration (NASA) was created by the 1958 National Aeronautics and Space Act (P.L. 85-568) to conduct civilian space and aeronautics activities. NASA opened its doors on October 1, 1958, almost exactly a year after the Soviet Union launched the world's first satellite, Sputnik. In the five decades since, NASA has conducted far-reaching programs in human and robotic spaceflight, technology development, and scientific research.

NASA is managed from headquarters in Washington, DC. It has nine major field centers: **Ames Research Center**, Moffett Field, CA; **Dryden Flight Research Center**, Edwards, CA; **Glenn Research Center**, Cleveland, OH; **Goddard Space Flight Center**, Greenbelt, MD; **Johnson Space Center**, near Houston, TX; **Kennedy Space Center**, near Cape Canaveral, FL; **Langley Research Center**, Hampton, VA; **Marshall Space Flight Center**, Huntsville, AL; and **Stennis Space Center**, in Mississippi, near Slidell, LA. In addition, it has a federally funded research and development center, the **Jet Propulsion Laboratory**, Pasadena, CA, operated by the California Institute of Technology. NASA Administrator Dr. Michael Griffin leads a workforce of more than

19,000 civil servants and more than 40,000 contractors and grantees ([<http://nasapeople.nasa.gov/Workforce/data/page7.htm>]). More information on NASA's organization, including details of its four Mission Directorates (Aeronautics Research, Exploration Systems, Science, and Space Operations) can be found on the NASA website at [<http://www.nasa.gov/centers/hq/organization/>].

NASA's FY2007 Budget

For FY2007, NASA requested \$16.792 billion in new budget authority. For FY2006, the agency received \$16.623 billion (when adjusted for two across-the-board rescissions totaling 1.28%, a transfer of \$27 million from the National Oceanic and Atmospheric Administration, and a supplemental appropriation of \$350 million for recovery from Hurricane Katrina). The net requested increase for FY2007 was 1%, or 3.2% if the one-time hurricane funding was excluded. The House provided \$16.709 billion (H.R. 5672, 109th Congress), while the Senate Appropriations Committee recommended \$17.797 billion, of which \$1.040 billion would have been emergency funding (S.Rept. 109-280). The final appropriation in the year-long continuing resolution was \$16.247 billion. For details, see **Tables 1 and 2**.

In September 2006, before Congress completed action on the FY2007 budget, NASA announced a change in how it accounts for overhead expenses. The new system is known as "full cost simplification." The change increases the stated cost of some programs and decreases the stated cost of others, without changing actual program content. The increases and decreases exactly balance, so that NASA's total budget is not affected. For any particular program, however, amounts expressed in the new accounting system are not directly comparable with amounts expressed in the previous accounting system.

Table 1: NASA FY2007 Budget, Action by the 109th Congress
(\$ millions, previous accounting system)

	FY2006 (OMB)	FY2006 (NASA)	FY2007 Request	FY2007 House	FY2007 Sen. Cmte.
Science, Aeronautics, and Exploration					
<i>Science</i>	\$5,254	\$5,254	\$5,330	\$5,405	\$5,362
Solar System Exploration	—	1,582	1,610	—	1,610
The Universe	—	1,508	1,509	—	1,509
Earth-Sun System	—	2,164	2,211	—	2,242
<i>Exploration Systems</i>	3,114	3,050	3,978	3,828	3,922
Constellation Systems	—	1,734	3,058	3,042	2,961
Exploration Systems R&T	—	692	646	511	686
Human Systems R&T	—	624	275	275	275
<i>Aeronautics Research</i>	929	884	724	824	759
<i>Cross-Agency Support Programs</i>	367	534	492	425	492
<i>Reductions not Allocated</i>	—	—	—	—	-45
Subtotal	9,664	9,721	10,524	10,482	10,489
Exploration Capabilities					
<i>Space Operations</i>	6,578	6,870	6,234	6,194	6,235
Space Shuttle	—	4,778	4,057	4,057	4,057
International Space Station	—	1,753	1,811	1,778	1,811
Space and Flight Support	—	339	367	359	367
Subtotal	6,578	6,870	6,234	6,194	6,235
Inspector General	32	32	34	34	34
Return to Flight (emergency)	—	—	—	—	1,000

Hurricane Katrina (emergency)	—	—	—	—	40
Total	16,273	16,623	16,792	16,709	17,797
2005 Hurricane Augmentation	350	—	—	—	—
Grand Total	16,623	16,623	16,792	16,709	17,797

Sources: The first FY2006 column is from Office of Management and Budget, *Budget of the United States Government, FY2007*, p. 272, with the grand total added by CRS. The second FY2006 column is from the FY2007 NASA budget request (http://www.nasa.gov/pdf/142458main_FY07_budget_full.pdf) and reflects the program allocation of hurricane recovery funds as well as other changes made by the agency's FY2006 initial operating plan. The FY2007 columns are from the budget request, H.Rept. 109-520, and S.Rept. 109-280. The House did not specify funding for the three themes within Science. The Senate committee did not specify amounts within the Science, Aeronautics, and Exploration appropriations account; these amounts are estimated by CRS based on the requested amounts and the program increases and decreases specified in the Senate committee report. The amount shown as "Reductions not Allocated" is calculated by CRS as the difference between the recommended overall decrease for the account and the sum of the specified program increases and decreases.

Notes: R&T = Research and Technology. Comparisons with years before FY2006 are difficult at anything less than the total agency level because of repeated changes in NASA's budget structure. The only major such change for FY2007 is the new Cross-Agency Support Programs category, which consists of the Education, Advanced Business Systems, and Shared Capabilities Themes and the Innovative Partnerships Program. Education was previously its own top-level budget category.

Table 2: NASA FY2007 Budget, Action by the 110th Congress
(\$ millions, new "full cost simplification" accounting system)

	FY2006 Comparable	FY2007 Request	FY2007 Appropriated
Science, Aeronautics, and Exploration			
<i>Science</i>	\$5,359	\$5,467	\$5,251
<i>Exploration Systems</i>	3,109	4,152	3,402
<i>Aeronautics Research</i>	715	529	890
<i>Cross-Agency Support Programs</i>	542	502	532
Subtotal	9,725	10,650	10,075
Exploration Capabilities			
<i>Space Operations</i>	6,516	6,108	6,140
Subtotal	6,516	6,108	6,140
Inspector General	32	34	32
Total	16,273	16,792	16,247
2005 Hurricane Augmentation	350	—	—
Grand Total	16,623	16,792	16,247

Source: NASA briefing charts and P.L. 110-5. The FY2006 amounts are the agency's final operating plan.

Note: Amounts below the detail level specified by P.L. 110-5 are not shown.

The Vision for Space Exploration

On January 14, 2004, President Bush announced new goals for NASA: the Vision for Space Exploration, often referred to as the Moon/Mars program. The President directed NASA to focus its efforts on returning humans to the Moon by 2020 and some day sending them to Mars and "worlds beyond." (Twelve U.S. astronauts walked on the Moon between 1969 and 1972. No humans have visited Mars.) The President also directed NASA to fulfill its commitments to its partners in building the International Space Station (ISS): Russia, Japan, Canada, and 10 European countries.

The President added only \$1 billion to NASA's budget plan to implement the Vision, out of the estimated \$12.6 billion that would be needed for FY2005-2009; the rest is to

be redirected from other NASA activities. To free funds for the Vision, the space shuttle program will be terminated in 2010, rather than in 2015 or later as was planned prior to the 2003 loss of the shuttle *Columbia*, and U.S. use of the ISS will end by FY2017. A key issue created by the Vision is whether NASA should be devoted solely to human space exploration or should retain its commitment to science and aeronautics.

Under the Vision, NASA is to develop a new spacecraft called Orion (formerly the Crew Exploration Vehicle) and a launch vehicle for it called Ares I (formerly the Crew Launch Vehicle), with an Earth-orbit capability by 2014 and the ability to take astronauts to and from the Moon no later than 2020. NASA stresses, however, that this is a “go-as-you-can-pay” program, with its pace set, in part, by available funding. A cost estimate for the Vision as a whole has not been provided by NASA. The implementation plan released on September 19, 2005, estimates that it will cost \$104 billion to return astronauts to the Moon, not including robotic missions or \$20 billion to use Orion to service the ISS. (NASA plans at least two robotic missions to the Moon, the first in 2008, to provide data on potential landing sites.)

NASA created the Exploration Systems Mission Directorate (ESMD) to implement the Moon/Mars program. The FY2007 budget request and its out-year projections proposed shifting about \$1.5 billion out of ESMD to help pay for shortfalls in the space shuttle and ISS programs. In order to fund Orion and Ares I, other ESMD activities were significantly cut, including Project Prometheus (to develop space nuclear power and propulsion systems) and microgravity research on the ISS. Final congressional action on the FY2007 budget reduced funding for ESMD by a further \$750 million relative to the request. These reductions put pressure on the schedule for Orion and Ares I.

Key Congressional Issues

The major issue facing Congress as it debated NASA’s FY2007 budget request was how to implement the Vision. Debate over NASA’s FY2005 and FY2006 budgets answered the question of *whether* the Vision should be adopted: the 2005 NASA authorization act (P.L. 109-155) directs NASA to establish a program to accomplish the goals set out by the President. However, that law and NASA’s FY2006 appropriations act (P.L. 109-108) emphasize that NASA should have a balanced set of programs that include not only those related to the Vision, but science and aeronautics as well. Exacerbating the dilemma of how to maintain this balance without a significant long-term budget increase, NASA is contending with the costs of returning the space shuttle to flight status, completing the ISS, and overruns in a number of science programs. Dr. Griffin has stated that “I will do everything I can to keep Orion and Ares I on schedule. That will be right behind keeping shuttle and station on track, and then after that we’ll fill up the bucket with our other priorities.”¹

Impact on NASA’s Science Programs

The FY2007 request proposed taking \$3.1 billion from the Science Mission Directorate (SMD) over the five-year period FY2007-2011 relative to projections in the

¹ Quoted in “NASA Will Protect CEV, Station Against Flat-Budget Squeeze,” *Aerospace Daily and Defense Report*, January 11, 2007.

FY2006 budget. Most of that (about \$2 billion) was to cover a shortfall in the space shuttle and ISS budgets. The proposed budget for SMD increased by 1.5% in FY2007 and 1% in the subsequent four years, less than the projections given in the FY2006 budget and less than the rate of inflation. In addition, the FY2006 initial operating plan showed that NASA shifted \$176 million from SMD to ESMD in FY2006 and took the entire congressionally directed general reduction for the Science, Aeronautics, and Exploration account (\$90 million) from SMD. NASA officials stressed that funding for space science during the 1990s and early 2000s grew at a rate faster than the total NASA budget and stated that sustaining such increases was not possible. They also said that science programs accounted for 32% of NASA's budget in the FY2007 request, significantly more than the 24% allocated to them in 1992.

The requested budget would have delayed or deferred several space science programs because of budget constraints. Among these were two space telescopes (the Space Interferometry Mission and the Terrestrial Planet Finder), several robotic Mars probes, a dedicated mission to study Jupiter's moon Europa, research on new space propulsion and spacecraft power sources, and the Global Precipitation Mission. Funding for Research and Analysis, which provides grant funding to individual investigators, would have been cut 15%. No funding was requested for the SOFIA airborne infrared telescope. On the other hand, the request did include FY2007 funding for missions such as the James Webb Space Telescope, robotic Mars probes to be launched at each of the next three launch opportunities (2007, 2009, and 2011), the Juno probe to study Jupiter, the Glory spacecraft to study atmospheric aerosols and solar irradiance, and a dedicated land remote sensing satellite to continue the Landsat series. Information on all these programs is available on NASA's website at [<http://science.hq.nasa.gov/missions/>].

The House provided \$75 million more than the request for Science: \$50 million more for Research and Analysis, \$15 million to initiate planning for a Europa mission, and \$10 million for continued development of the Terrestrial Planet Finder. The Senate Appropriations Committee recommended an increase of \$31.5 million and directed NASA to fund SOFIA through a reprogramming request. The final appropriation, after adjusting for "full cost simplification," was a reduction of \$216 million.

Impact on Aeronautics

The FY2007 budget request for the Aeronautics Research Mission Directorate was consistent with the out-year projection for FY2007 in the FY2006 request, but the structure and content of the program changed significantly.

In February 2005, NASA proposed transforming the largest element of the aeronautics program, Vehicle Systems, by placing more emphasis on barrier-breaking demonstrations and focusing resources on a smaller number of research areas. Among the topics to be eliminated from the restructured program were hypersonics, rotorcraft, and most of subsonic aeronautics. This proposal drew strong criticism from the House and Senate committees with oversight over NASA.

In late 2005, NASA reshaped its plans for aeronautics in a manner that it described as "consistent with direction received from our Committees." The new plan, which was reflected in the FY2007 request, refocused the program on core competencies in subsonic, supersonic, and hypersonic flight, including rotorcraft. The former Vehicle Systems

program was renamed Fundamental Aeronautics to reflect its new character. The other two programs, Aviation Safety and Airspace Systems, had their content reorganized. A fourth program, the Aeronautics Test Program, was created to ensure the availability of aeronautics test facilities, such as wind tunnels, whose continued viability has been under pressure for several years. Aeronautics research supporters have expressed continuing concern over the program's downward funding trend. The impact of that reduced funding on the NASA workforce has also been an issue for Congress. The new National Aeronautics Research and Development Policy, required by the FY2006 appropriations act and issued by President Bush as an Executive Order on December 20, 2006, came too late to influence action in the 109th Congress.

An amendment to the Senate FY2007 budget resolution (S.Amdt. 3033 to S.Con.Res. 83) increased the recommended funding for NASA aeronautics by \$179 million. The House provided an increase of \$100 million. House report language directed NASA to report on its response to the National Research Council's decadal survey of aeronautics released in June 2006. The Senate Appropriations Committee recommended an increase of \$35 million. The final appropriation, after adjusting for the "full cost simplification" accounting change, was an increase of \$361 million.

The Space Shuttle and the International Space Station

Construction of the ISS, suspended after the *Columbia* disaster, was resumed in September 2006. NASA plans 13 shuttle flights in 2007-2010 to complete ISS construction, plus one mission in 2008 to service the Hubble Space Telescope. NASA has also allocated \$500 million over five years to help private-sector companies develop low-cost space transportation systems that could service the ISS after the shuttle is retired.

The gap between the end of shuttle flights in 2010 and the planned availability of Orion in 2014 raises several issues. Some analysts are concerned that placing a fixed termination date on the shuttle may create schedule pressure similar to that identified as a contributing factor in the *Columbia* accident. Some question whether the United States should be dependent on Russia to launch U.S. astronauts to the ISS during the gap period. A major concern is how NASA will retain its skilled workforce during the transition from shuttle to Orion, especially if Orion's schedule slips and the gap lengthens.

Some also question is whether completing the ISS is worth the cost, which is about \$2 billion per year plus \$4 billion per year for the shuttle, considering the modest research agenda that remains. (Following the Vision speech, the President directed NASA to narrow the program of research on the ISS to include only what is needed to accomplish the Vision.) Alternatively, some want to restore the ISS research program: the 2005 NASA authorization act (P.L. 109-155), for example, directs that 15% of ISS research spending be used for non-Vision-related research. Fulfilling U.S. commitments to its international partners is seen by some observers as sufficient rationale for continued U.S. involvement in the ISS; others find this argument inadequate.

The House provided \$41 million less for Exploration Capabilities than was requested for FY2007, including \$33 million less for the ISS program, in light of "the uncertainties surrounding the nature and scope of the science to be conducted on the ISS." The Senate Appropriations Committee recommended the requested amount. The final appropriation, after adjusting for "full cost simplification," was an increase of \$32 million.