

CRS Report for Congress

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The National Aeronautics and Space Administration: Overview, FY2005 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 activities. Its FY2005 budget request is \$16.2 billion, a 5.6% increase over its FY2004 appropriation of \$15.4 billion. The increase is primarily for fulfilling new exploration goals that were announced by President Bush on January 14, 2004. During consideration of the FY2005 request, Congress is focusing on NASA's plans to return the space shuttle to flight status following the February 1, 2003 space shuttle *Columbia* accident, the President's exploration initiative, and the health of NASA's aeronautics research program. This report is updated regularly.

Agency Overview

The National Aeronautics and Space Administration (NASA) was created by the 1958 National Aeronautics and Space Act (P.L. 85-568). NASA's charter is to conduct civilian space and aeronautics activities. Military space and aeronautics activities are conducted by the Department of Defense (DOD) and the intelligence community. DOD and NASA cooperate in some areas of technology development and occasionally have joint programs. NASA opened its doors on October 1, 1958, almost exactly one year after the Soviet Union ushered in the Space Age with the launch of the world's first satellite, Sputnik, on October 4, 1957. In the more than 45 years that have elapsed, NASA has conducted far reaching programs in human and robotic spaceflight, technology development, and scientific research.

The agency is managed from NASA Headquarters in Washington, D.C. It has nine major field centers around the country: **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**, Houston, TX; **Kennedy Space Center**, Cape Canaveral, FL; **Langley Research Center**, Hampton, VA; **Marshall Space Flight Center**, Huntsville, AL; **Stennis Space Center**, in Mississippi, near Slidell, LA. The **Jet Propulsion Laboratory**, Pasadena, CA (often

counted as a 10th NASA center), is a federally funded research and development center operated for NASA by the California Institute of Technology. Goddard Space Flight Center manages the Goddard Institute of Space Studies (New York, NY), the Independent Validation and Verification Facility (Fairmont, WV); and the Wallops Flight Facility (Wallops, VA). Ames Research Center manages Moffett Federal Airfield, Mountain View, CA. Johnson Space Center manages the White Sands Test Facility, White Sands, NM. Web links are at [<http://www.nasa.gov/about/highlights/OrganizationIndex.html>]. NASA employs approximately 19,000 civil servants (full time equivalents), and 40,000 contractors and grantees working at or near NASA centers. For more information on NASA's workforce, see [<http://nasapeople.nasa.gov/workforce/default.htm>].

Mr. Sean O'Keefe became Administrator of NASA in December 2001. NASA headquarters is organized into seven "strategic enterprises" that correspond to NASA's major programs and are often referred to by their mail codes: Aeronautics (Code R), Biological and Physical Research (Code U), Earth Science (Code Y), Exploration Systems (Code T), Space Flight (Code M), Space Science (Code S), and Education (Code N). NASA's main website is [<http://www.nasa.gov>]. A NASA headquarters' website [<http://www.hq.nasa.gov/hq/org.html>] has links to the various NASA program offices, and from those sites, to individual NASA programs.

NASA's FY2005 Budget Request

Table 1: NASA's FY2005 Budget Request
(In \$ millions)

Category	FY2004 Request	FY2004 approp.	FY2005 Request
Exploration, Science, & Aeronautics**	7,661	7,830	7,760
Space Science	4,007	3,971	4,138
Earth Science	1,552	1,613	1,485
Biological & Physical Research	973	985	1,049
Aeronautics	959	1,034	919
Education	170	226	169
Exploration Capabilities**	7,782	7,521	8,456
Exploration Systems**	1,673	1,646	1,782
<i>Space Launch Initiative</i>	<i>1,065</i>	†	†
<i>Other</i>	<i>607</i>	†	†
<i>Human & Robotic Technology</i>	†	679	1,094
<i>Transportation Systems</i>	†	967	689
Space Flight	6,110	5,875	6,674
<i>Space Station*</i>	<i>1,707</i>	<i>1,498</i>	<i>1,863</i>

Category	FY2004 Request	FY2004 approp.	FY2005 Request
<i>Space Shuttle</i>	3,968	3,945	4,319
<i>Space Flight Support</i>	434	432	492
Inspector General	26	27	28
Total	15,469	15,378	16,244

Source: NASA FY2004 and FY2005 budget justifications. Column totals may not add due to rounding.

* Does not include funding for research conducted aboard the space station, which is embedded in the Biological and Physical Research line. For FY2004, it is \$578 million, making the total FY2004 space station request \$2,285 million and final appropriation \$2,085 million. For FY2005, it is \$549 million, making the total space station request \$2,412 million.

** In FY2004, "Exploration, Science & Aeronautics" was called "Science, Aeronautics and Exploration"; "Exploration Capabilities" was called "Space Flight Capabilities"; and "Exploration Systems" was called "Crosscutting Technologies."

† In FY2005, NASA is proposing cancellation of the Space Launch Initiative (SLI). Funding appropriated for SLI would be reallocated to activities in support of President Bush's exploration initiative.

For FY2005, NASA is requesting \$16.2 billion, a 5.6% increase over its FY2004 appropriation of \$15.4 billion (adjusted for the across-the-board rescission). NASA's transition to full cost accounting and changes to its budget structure in FY2004 (see CRS Report RL31821) make comparisons further back than FY2004 difficult. The budget is again slightly modified in FY2005 (see footnotes to Table 1).

Key Issues for Congress

NASA is facing a number of issues as it copes with the 2003 loss of the space shuttle *Columbia*, and the challenges of a new exploration initiative announced by President Bush in January 2004. Following are a few of the key issues Congress is considering as it reviews NASA's FY2005 budget request.

Return to Flight of the Space Shuttle

The space shuttle *Columbia* disintegrated as it returned to Earth on February 1, 2003; all seven astronauts aboard were killed. NASA and its contractors are working to resume shuttle launches as soon as possible, consistent with ensuring the shuttle is as safe as possible. See CRS Report RS21408 for more on *Columbia* and "Return to Flight" (RTF). In the FY2005 budget request, shuttle funding would rise from \$4 billion to \$4.3 billion. One issue involved RTF is whether schedule pressure could influence shuttle program managers to take shortcuts, and if President Bush's new exploration initiative (see below) adds to that pressure. In 2003, some NASA officials referred to a sense of urgency to resume shuttle flights in order to continue construction of the International Space Station (ISS, see CRS Issue Brief IB93017). Now, President Bush has called for ISS construction to be completed by 2010, at which point the shuttle system would be retired. NASA estimates that 25-30 shuttle launches are required to achieve that milestone. By ending the shuttle program, funds would be freed for the President's exploration initiative. NASA's FY2005 request includes "out-year" projections that reduce the shuttle budget by \$1.5 billion in FY2008 and FY2009 to help pay for the exploration initiative. The *Columbia* Accident Investigation Board (CAIB) cited schedule pressure as one factor in the *Columbia* tragedy. It also noted that funding was taken from the shuttle budget over

several years to pay for other NASA programs, particularly ISS. NASA's willingness to slip RTF, most recently to March/April 2005, suggests to some that NASA is proceeding cautiously, but the agency's plan to launch 25-30 flights in less than six years makes others continue to worry that an environment similar to that prior to *Columbia* is being recreated. An additional issue is that CAIB recommended that the shuttle be recertified if it is to be used beyond 2010. If construction of ISS slips beyond 2010, the question is whether recertification still would be required, and if so, how much that would cost.

President Bush's New Exploration Initiative

On January 14, 2004, President George W. Bush made a major space policy address in which he directed that NASA reorient its activities to achieve a new goal: return astronauts to the Moon in the 2015-2020 time frame, and someday send them to Mars and "worlds beyond" (see CRS Report RS21720). To accomplish that goal, NASA would terminate the shuttle program in 2010 (discussed above); build a new Crew Exploration Vehicle (CEV) able to take astronauts to Earth orbit by 2014 and eventually to the Moon; restructure the U.S. ISS-based research program to support only life sciences research associated with achieving the exploration goal, rather than the broadly-based multidisciplinary research program that was planned; and build robotic probes as "trailblazers" for the astronauts. The President invited other countries to join. The opportunity is not limited to those who are partners with the United States in the ISS program (Canada, Europe, Japan, and Russia). Between 2010 when the shuttle is terminated, and 2014 when the CEV is expected to be ready, U.S. astronauts would have to rely on Russia to travel to and from the space station.

How Much Will it Cost? Initially, the President and NASA did not provide cost estimates for returning to the Moon or going to Mars, only budget estimates for FY2005-FY2009, and a budget chart (the so-called "sand chart," see below) extending to FY2020, which they emphasized was intended to demonstrate there was no "balloon" in funding past FY2009. In late February 2004, however, NASA released charts providing some detail on the budget assumptions behind the chart, including a cost estimate for landing a crew on the Moon in 2020: \$64 billion in FY2003 dollars. The \$64 billion consists of \$24 billion to build and operate the Crew Exploration Vehicle from FY2004-2020; plus \$40 billion for the years 2011-2020 to build the lunar lander portion of that vehicle, a new launch vehicle, and operations. The \$64 billion does not include the cost of robotic missions. A cost estimate for sending astronauts to Mars was not provided.

Is the Projected Budget Sufficient and What is the Impact on Other NASA Activities? The President plans to fund the initiative by redirecting most of the needed funding from other NASA activities, rather than adding significant sums to the NASA budget. The premise is that the nation would spend a certain amount of money on NASA with or without the initiative, and that money now will be directed primarily towards the exploration initiative instead of elsewhere. This approach may soften criticism that the proposal would "break the budget" by worsening deficits and diverting funds from other national priorities. The President is proposing that the NASA budget grow by approximately 5% each year for FY2005-2007, and then increase by 1% each year for FY2008-2009. The rate of inflation is assumed by NASA to be about 2% in those and future years. A NASA budget chart (dubbed the "sand chart," and available at [http://www.nasa.gov/pdf/54873main_budget_chart_14jan04.pdf]) covering FY2004-2020 was released the day of the President's speech that shows a NASA budget that stays

level with inflation beyond FY2009. Between FY2004 and FY2020, the percentage of NASA's budget devoted to "exploration" (both human and robotic missions, and the development of nuclear power and propulsion and other technologies) would increase from about 20% in FY2004 to about 75% by 2020. The total amount of funding represented in the chart appears to be on the order of \$150-170 billion.

NASA's FY2005 budget materials describe the entire NASA request for FY2005-2009 (\$87.1 billion) as the budget for the "exploration vision," of which \$31.4 billion is "exploration specific." In FY2005, \$4.5 billion of the \$16.2 billion request is "exploration specific," but that does not include the space shuttle and space station programs that are part of the exploration initiative. NASA asserts that the FY2005 budget request and its associated projections for the next four years include an "additional" \$12.6 billion for the exploration initiative, of which \$1 billion is new money, and \$11.6 billion is redirected from other NASA programs. However, the "additional" funds were based on a NASA assumption that without the President's initiative, NASA would have been held to a flat budget for those five years, rather than using the out-year projections that accompanied NASA's FY2004 request. The "increase," therefore, is above a hypothetical budget that is lower than what NASA projected last year.

Table 2: NASA's Proposed Reductions to Fund The New Initiative
(In \$ billions)

Activity	2005	2006	2007	2008	2009	Total
Discontinue SLI	-0.8	-1.2	-1.3	-1.2	-1.4	-5.9
Shuttle retirement	0.0	0.0	0.0	-0.2	-1.3	-1.5
Eliminate ISS research not tied to vision	-0.1	-0.2	-0.3	-0.3	-0.3	-1.2
<i>Human Space Flight related reductions</i>	<i>-0.9</i>	<i>-1.4</i>	<i>-1.5</i>	<i>-1.7</i>	<i>-3.0</i>	<i>-8.6</i>
Defer new space and earth science missions and freeze spending	-0.2	-0.5	-0.7	-0.7	-0.6	-2.7
Reduce space technology and defer institutional activities	-0.15	-0.03	-0.04	-0.05	-0.07	-0.3
<i>Other Reductions</i>	<i>-0.3</i>	<i>-0.5</i>	<i>-0.7</i>	<i>-0.8</i>	<i>-0.7</i>	<i>-3.0</i>
TOTAL REDUCTIONS	-1.3	-1.9	-2.3	-2.5	-3.7	-11.6

Source: NASA briefing chart, February 5, 2004.

Redirecting most of the funding from other NASA activities may quell concerns about rising deficits and neglecting other national priorities, but it subjects the plan to criticism that total agency projected funding level is insufficient, and that the plan will preclude other NASA activities, particularly in space and earth science, and aeronautics research. At congressional hearings, NASA Administrator O'Keefes responded to the first concern by saying that if the funding is insufficient, the schedule will be allowed to slip, rather than increasing the budget. Regarding the shifting of priorities within NASA, the agency provided a chart showing where the cuts will be made in FY2005-2009 (see

Table 2). One feature of the chart seems to be an attempt to show that the cuts will come primarily from other human space flight programs, not space and earth sciences. However, the chart categorizes the Space Launch Initiative as “human space flight” even though only half of its budget was to support human space flight by building an Orbital Space Plane. The other half was for Next Generation Launch Technology to enable a 2009 decision on what new launch vehicle NASA should build.

Two days after the President’s speech, Mr. O’Keefe announced that no more shuttle servicing missions would be made to the Hubble Space Telescope. The decision is very controversial, and is discussed in CRS Report RS21767.

What If the New Goals are Not Adopted? By agreeing to take most of the funding from other NASA activities, NASA has opened the door to questions about the value of those activities even if the Bush initiative is not adopted. If Congress and the public are not persuaded to embark upon the President’s vision, what direction should NASA be given for the future? Is it reasonable to assume that the proposed \$11.6 billion in cuts can be made in any case? Should U.S. participation in the ISS program continue? Under the President’s plan, the only apparent reasons for U.S. involvement in ISS are fulfilling its commitments to the other partners, and performing research associated with the President’s goals. If the latter rationale is eliminated, are the international commitments sufficient to warrant spending \$6.7 billion (\$2.4 billion for the space station and \$4.3 billion for the shuttle) in FY2005 alone? Are they worth the risk to astronaut lives inherent in human space flight? Or are there other reasons that U.S. taxpayers may wish to continue the human space flight program, such as its oft-cited value in demonstrating U.S. technological leadership, stimulating children to study math and science, or satisfying an intangible “desire written in the human heart” as stated by President Bush following the *Columbia* accident?

Aeronautics

Congress has expressed concern about constraints in NASA’s funding for aeronautics R&D for several years. The need to reprioritize NASA spending in light of President Bush’s new initiative may exacerbate those concerns. Aeronautics advocates decry a multi-year slide in funding, although this trend has been difficult to track recently because of changes in how NASA presents its annual budget. Aeronautics R&D at NASA was cut by about one-third in the late 1990s, with the termination of programs in high-speed research and advanced subsonic technology. NASA’s aeronautics activities have been restructured several times. Following President Bush’s announcement, NASA split the Office of Aerospace Technology into the Office of Exploration Systems (which will focus on implementing much of the new initiative), and the Office of Aeronautics, raising aeronautics to “enterprise” status. Critics have argued for several years that NASA lacks a clear vision of its goals and direction in aeronautics, despite release of the *NASA Aeronautics Blueprint* [http://www.aerospace.nasa.gov/aero_blueprint/] in February 2001 and further recommendations by the congressionally established Commission on the Future of the United States Aerospace Industry ([<http://www.aerospacecommission.gov/>]) and the National Research Council ([<http://books.nap.edu/html/atp/0309091195.pdf>]). The FY2005 request for aeronautics is \$919 million, a reduction of 11% from FY2004. Most of the reduction comes from eliminating funds for items added at congressional direction in FY2004. Other changes include a \$7 million increase for aircraft noise reduction and \$15 million to fund rotorcraft research.