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The National Aeronautics and Space Administration: Overview, FY2004 Budget in Brief, and Issues for Congress

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Summary

The National Aeronautics and Space Administration (NASA) was created in 1958 to conduct U.S. government civilian space activities (military space activities are under the purview of the Department of Defense). The FY2004 budget request for NASA is $15.5 billion, compared with its FY2003 appropriations level of $15.3 billion. During consideration of that request, attention is expected to focus on the investigation of the February 1, 2003 space shuttle *Columbia* tragedy (see CRS Report RS21408) and its implications for NASA and the space program as a whole. A more detailed analysis of NASA's FY2004 request is available in CRS Report RL31821. This report will be updated as events warrant.

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 40 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**, near Slidell,

MS. 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 to each are at [http://www.nasa.gov/nasaorgs/index.html]. NASA employs approximately 19,000 civil servants (full time equivalents), and 40,000 contractors and grantees working at or near NASA centers [http:nasapeople.nasa.gov/workforce/default.htm].

The Administrator of NASA is Mr. Sean O'Keefe, who was confirmed by the Senate on December 20, 2001. NASA headquarters is organized into six "strategic enterprises" that correspond to NASA's major programs: Aero-Space Technology, Biological and Physical Research, Earth Science, Human Exploration and Development of Space (HEDS), Space Science, and Education. NASA's main Web site is [http://www.nasa.gov]. A NASA headquarters' Web site [http://www.hq.nasa.gov/hq/org.html] has links to the various NASA program offices, and from those sites, to individual NASA programs.

Significant Changes in NASA's Budget Structure: "Full Cost Accounting" and Changes in Appropriations Accounts

Full Cost Accounting. Users of NASA's FY2004 budget material must bear in mind that it reflects NASA's shift to "full cost accounting." In full cost accounting, funding for each program (such as the space station program) includes the costs for personnel and facilities. Previously, those costs were accounted for separately. Last year, NASA began the transition to full cost accounting by assigning these costs to each enterprise (i.e. the Human Space Flight enterprise, or the Earth Science Enterprise). This year, NASA is taking the further step of assigning the costs directly to each program.

The intent of full cost accounting is to show more accurately a program's total cost. A consequence of this approach during the transition period, however, is to make it appear that funding for many programs has increased substantially. Glancing at NASA's FY2004 request, one might conclude, for example, that funding for the space shuttle increased more than $700 million from a request of $3.2 billion in FY2003, to a request of $3.9 billion FY2004. In fact, the FY2004 request is only $182 million higher than the FY2003 request. The remainder of the difference is due to inclusion of personnel and facilities costs that were included in the "Investments and Support" line in NASA's Human Space Flight budget last year.

New Appropriations Accounts. A second significant change in FY2004 is different appropriations accounts. NASA has two accounts (not including the Inspector General, which is listed separately). Last year, the two accounts were Human Space Flight (HSF), and Science, Aeronautics, and Technology (SAT). The HSF account included funding for: space station; space shuttle; payload and Expendable Launch Vehicle support; space communications and data support; and safety, mission assurance, and engineering. SAT funding included: space science, earth science, biological and physical research, aerospace technology, and academic programs. This year, NASA revamped the budget structure to better reflect its priorities and activities. NASA is

seeking to demonstrate that its mission is "Science, Aeronautics, and Exploration," and that mission is supported by "Space Flight Capabilities" such as a space station, space transportation (the space shuttle and expendable launch vehicles), space communications systems, and investing in new technologies. Everything that NASA does is not a perfect fit for the new structure. For example, NASA's investment in nuclear propulsion technologies is included in the Space Science request, not in Crosscutting Technologies with NASA's other investments in space transportation technologies.

Comparing FY2003 and FY2004. Thus, care must be exercised in making comparisons between FY2003 and FY2004. CRS cannot create a meaningful table comparing the FY2003 request, FY2003 appropriations, and the FY2004 request, as would normally be provided in this report. Instead, two tables are presented. Table 1 shows the original FY2003 request (without full cost accounting), the FY2003 request with full cost accounting, and the FY2004 request. All the figures were provided by NASA. **Special attention should be paid to the column headings, which explain what the figures represent**. Table 2 shows what Congress appropriated for NASA for FY2003 using the FY2003 appropriations categories, with no full cost accounting.

Table 1: NASA's FY2004 Budget Request

(In millions of dollars)

Category	FY2003 Request (Nov. 2002) *Not in full cost accounting*	FY2003 *Request* Expressed in Full Cost Accounting	FY2004 Request Expressed in Full Cost Accounting
Science, Aeronautics & Exploration	**7,015**	**7,101**	**7,661**
Space Science	3,414	3,468	4,007
Earth Science	1,628	1,610	1,552
Biological & Physical Research	842	913	973
Aeronautics	986	949	959
Education	144	160	170
Space Flight Capabilities	**7,960**	**7,875**	**7,782**
Space Flight	6,131	6,107	6,110
Space Station*	(1,492)*	(1,851)*	(1,707)*
Space Shuttle	(3,208)	(3,786)	(3,968)
Other	(1,431)	(471)	(434)
Crosscutting Technologies	1,829	1,768	1,673
Space Launch Initiative	(879)	(1,150)	(1,065)
Other	(950)	(617)	(607)
Inspector General	**25**	**25**	**26**
Total	**15,000**	**15,000**	**15,469**

Source: NASA FY2004 budget documents and H.Rept. 108-10, to accompany H.J.Res. 2. Column totals may not add due to rounding. NASA submitted an amended FY2003 budget request in November 2002, which NASA used in developing the numbers in this table. **The NASA-provided figures in the third (shaded) column adjust the FY2003 numbers as though they had been prepared in full cost accounting. They are for comparison purposes only and do not reflect actual funding increases or decreases.**

*Does not include funding for space station research, which is embedded in the Biological and Physical Research line. For FY2004, that amount is $578 million, making the total FY2004 space station request $2,285 million. Some also would include funding for the Orbital Space Plane in the space station request, but NASA includes it in the Space Launch Initiative line item. For FY2004, that request is $550 million.

Table 2. NASA's FY2003 Request v. FY2003 Appropriations (in $ millions)

Funding Category	FY2003 Request	FY2003 Appropriations
Human Space Flight	**6,130.9**	**6,058.6**
International Space Station	1,492.1*	1,462.4
Space Shuttle	3,208.0	3,252.8
Payload and ELV Support	87.5	84.4
Investments and Support	1,178.2	1,094.9
Space Comm. & Data Systems	117.5	115.3
Safety, Mission Assur., Engineering	47.6	48.8
Science, Aeronautics, and Technology	**8,844.5**	**9,254.9**
Space Science	3,414.3	3,529.2
Biological. & Physical Research	842.3*	896.0
Earth Science	1,628.4	1,697.4
Aero-Space Technology	2,815.8	2,933.6
Academic Programs	143.7	198.6
Inspector General	**24.6**	**25.4**
TOTAL	**15,000.0**	**15,338.9**

Source: NASA FY2003 budget estimate and initial FY2003 operating plan. Columns may not add due to rounding.
† Space shuttle is exempt from the rescission.
*Total funding for the space station is the sum of the funding under Human Space Flight plus a portion of the funding in Biological and Physical Research. The total FY2003 request for the space station was $1.839 billion; Congress approved that amount and added $8 million for ISS plant and animal habitats. With the rescission and other adjustments NASA made in its FY2003 initial operating plan, the amount available for the space station in FY2003 is $1.810 billion

Issues for Congress

As Congress debates NASA's FY2004 budget request, attention undoubtedly will focus on one issue: the space shuttle *Columbia* tragedy and its aftermath. Changes to the budget request are likely because the space shuttle system is currently grounded, impacting not only the space shuttle program, but the space station program, the biological and physical research program, and perhaps the Space Launch Initiative. What impact the tragedy will have on NASA's space science, earth science, aeronautics, and education programs is less clear. Of those activities, Project Prometheus (see below), in the space science account, may generate the most interest. Other issues may be added to this report as the year progresses.

The Loss of Space Shuttle Columbia. On February 1, 2003, the space shuttle *Columbia* disintegrated as it returned to Earth following a 16-day scientific mission in Earth orbit. All seven astronauts—six Americans and one Israeli—were killed. An investigation is underway. CRS Report RS21408 provides more information about the *Columbia* tragedy and the investigation. The shuttle fleet is grounded.

What impact the *Columbia* tragedy will have on NASA, and the space program as a whole, will not be known until the cause of the accident is understood, and remedial steps identified and implemented. When space shuttle flights will resume is unknown, and that is a critical component of answering questions such as what long-term strategy to follow in staffing the International Space Station (ISS). In the two other cases of U.S. spaceflight-related fatalities (the 1967 Apollo fire, in which three astronauts died; and the 1986 *Challenger* tragedy, which killed seven astronauts), the programs were suspended for 21 months and 32 months, respectively

The space shuttle has been used to take crews and cargo to ISS, which is under construction in orbit. The "Expedition 6" crew—two Americans and one Russian—is now aboard ISS (see CRS Issue Brief IB93017). The Expedition crews rotate on a 4-6 month basis, and Expedition 6 was scheduled to return to Earth in March via the space shuttle, which also was to bring Expedition 7. NASA stresses that the ISS crew has sufficient supplies until June 2003, and can return to Earth at any time using the Soyuz spacecraft now attached to ISS. Soyuz is a Russian spacecraft that is used as a "lifeboat" so the crew can return to Earth in an emergency. Each Soyuz must be replaced every 6 months. The next Soyuz launch is scheduled for April 26, 2003. While the shuttle is grounded, NASA and the other ISS partners (Russia, Canada, Europe, and Japan) have decided to reduce the size of ISS crews to two (instead of three) to reduce resupply requirements. The reconstituted Expedition 7 crew (one Russian and one American) is scheduled to go to ISS on that Soyuz flight, and the Expedition 6 crew will return to Earth on the Soyuz spacecraft currently attached to ISS. ISS crews can be resupplied with food and other consumables using another Russian spacecraft called Progress. The Russians have three decades of experience in operating space stations using only Soyuz and Progress, so it is possible for ISS to continue operating with crews no matter how long the U.S. shuttle is grounded. Questions may arise, though, as to whether there is sufficient reason for them to stay, since the shuttle is needed to bring additional segments of the space station into orbit to continue construction, and also to bring the scientific experiments that form the research program.

From a budgetary standpoint, the grounding of the shuttle will impact the schedule for construction of the station, and could therefore increase its costs. ISS costs have been controversial for years because of overruns. Another part of the NASA budget that could be impacted is the Office of Biological and Physical Research (OBPR), which uses the space shuttle and space station to conduct many of its research activities. It was the sponsor of many of the experiments on *Columbia*'s ill-fated STS-107 mission. The delay in space station construction and utilization could also impact OBPR's plans, and therefore its budget. A third part of the NASA budget that could be impacted is that for the Space Launch Initiative (SLI), now part of "Crosscutting Technologies." NASA decided in November 2002 to rely on the space shuttle for a longer period of time than originally planned—until 2015 or longer, instead of 2012. Instead of continuing attempts to develop technologies to build a "second generation" reusable launch vehicle to replace the shuttle, NASA decided to focus on building an Orbital Space Plane (OSP) to take crews to and from the space station, and separately, on developing technologies for new launch vehicles to take cargo into space. See CRS Issue Brief IB93062 for more on SLI, and CRS Issue Brief IB93017 for more on OSP. In the aftermath of the *Columbia* accident, NASA may revisit its plans for developing new space transportation systems. For example, NASA's current plan is to have the OSP ready by 2010 to bring crews back from the space station. Its full capabilities—taking crews to the space station as well as bringing them home—is estimated for 2012. Some are suggesting that the schedule be accelerated since the shuttle

fleet now consists of only three orbiters and it is not clear if that provides sufficient capability to meet all of NASA's needs. (Building a replacement shuttle orbiter could be very expensive and time consuming. The last orbiter that was built—*Endeavour*, the replacement for *Challenger*— was finished more than a decade ago. The skilled personnel and tooling may no longer be available to build another.) The OSP is still conceptual, however, and it is not clear that accelerating it would be possible.

The *Columbia* tragedy may have much broader ramifications, as policy makers and the public reassess the costs and risks of human spaceflight versus the benefits. Some are questioning whether more could be accomplished with robotic spacecraft instead of sending humans into space, while others are calling for a renewed commitment to human spaceflight. It is too soon to assess how this debate will evolve.

Project Prometheus

In FY2003, NASA requested $125.5 million to begin a "Nuclear Systems Initiative" to resume development of radioisotope thermoelectric generators (RTGs) and nuclear propulsion for planetary exploration spacecraft. Congress approved the program, although it cut $19 million of the funding.

In FY2004, NASA is proposing an expansion of the NSI to include a specific planetary exploration mission that would make use of the new nuclear systems—the Jupiter Icy Moon Orbiter (JIMO). Its mission would be to search for evidence of oceans on three moons of Jupiter: Europa, Ganymede, and Callisto. NASA groups NSI and JIMO together under the name Project Prometheus. The FY2004 request for Project Prometheus is $279 million. The 5-year (FY2004-2008) estimate is $3 billion ($1 billion for NSI, and $2 billion for JIMO). JIMO is a new request in the FY2004 budget, but Congress included $20 million for it in the FY2003 appropriations act (H.J.Res. 2, H.Rept. 108-10). The head of NASA's space science office, Dr. Edward Weiler, is quoted in Science magazine (March 28, 2003, p. 1970) as saying the total program cost through 2012 (when JIMO would be launched) is estimated at $8-9 billion, while cautioning that it is very preliminary.

The project may raise several questions. First is whether the agency can afford such an expensive program at this time. Second is whether the mission is consistent with NASA Administrator O'Keefe's insistence that NASA be a "science-driven" agency. In this case, some may argue that this is a "technology-driven" program, since the intent is to develop nuclear technology, and it appears to some that a science mission was conceived to justify development of the technology, rather than the reverse. There is strong scientific interest in detailed studies of Europa, and Congress approved a Europa mission in the FY2002 budget, capping its cost at $1 billion. In the FY2003 budget request, NASA wanted to terminate that mission because it was too expensive. Initiating an even more expensive mission may spark debate. Third is public reaction to the use of nuclear power in space. NASA's launches of nuclear-powered spacecraft since the late 1980s have generated protests by some public interest groups concerned about the environment or other issues. Attempts by those groups to prevent the launches have failed, however.