Order Code RS22625
March 14, 2007

CRS Report for Congress

National Aeronautics and Space Administration: Overview, FY2008 Budget in Brief, and Key Issues for Congress

Daniel Morgan and Carl E. Behrens
Resources, Science, and Industry Division

Summary

The National Aeronautics and Space Administration (NASA) conducts U.S. civilian space and aeronautics activities. For FY2008, the Administration has requested $17.309 billion for NASA, an increase of 6.5% from the FY2007 appropriation of $16.247 billion. The NASA Authorization Act of 2005 (P.L. 109-155) authorizes FY2008 funding of $18.686 billion. The key issue for Congress is implementation of the Vision for Space Exploration, including development of new vehicles for human spaceflight, plans for the transition to these vehicles after the space shuttle is retired in 2010, and the balance in NASA's priorities between human exploration and its other activities in 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's programs are organized into four Mission Directorates: Aeronautics Research, Exploration Systems, Science, and Space Operations. More

information on the agency's centers, directorates, and management team can be found on the NASA website at [http://www.hq.nasa.gov/hq/org.html].

NASA's FY2008 Budget in Brief

The requested FY2008 budget for NASA is $17.309 billion. That is 6.5% more than the FY2007 appropriation of $16.247 billion, but 7.4% less than the $18.686 billion authorized by the NASA Authorization Act of 2005 (P.L. 109-155). For a breakdown of the request and past appropriations by program, see **Table 1.**

In September 2006, 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 affecting actual program content. The increases and decreases exactly balance, so that NASA's total budget is unchanged. Note, however, that for any particular program, amounts expressed in the new accounting system are not directly comparable with amounts expressed in the previous system.

Table 1: NASA FY2008 Budget

($ millions)

	FY2006 Comparable	FY2007 Appropriated	FY2008 Request
Science, Aeronautics, and Exploration			
Science	*$5,359*	*$5,251*	*$5,516*
Planetary Science	—	—	1,396
Astrophysics	—	—	1,566
Heliophysics	—	—	1,057
Earth Science	—	—	1,497
Exploration Systems	*3,109*	*3,402*	*3,924*
Constellation Systems	—	—	3,068
Advanced Capabilities	—	—	859
Aeronautics Research	*715*	*890*	*554*
Cross-Agency Support Programs	*542*	*532*	*489*
Subtotal	**9,725**	**10,075**	**10,483**
Exploration Capabilities			
Space Operations	*6,516*	*6,140*	*6,792*
Space Shuttle	—	—	2,239
International Space Station	—	—	4,008
Space and Flight Support	—	—	546
Subtotal	**6,516**	**6,140**	**6,792**
Inspector General	**32**	**32**	**35**
Total	**16,273**	**16,247**	**17,309**

Sources: FY2006 from NASA briefing charts, based on the final operating plan and excluding a supplemental appropriation of $350 million for Hurricane Katrina recovery. FY2007 from Sec. 20915 of P.L. 110-5. FY2008 from the FY2008 NASA budget request ([http://www.nasa.gov/about/budget/]).
Note: All amounts are in "full cost simplification" accounting (as explained in the text). Amounts below the directorate level (in italics) are not available for FY2006 because of the change in accounting. Amounts below the directorate level are not yet available for FY2007 because they are not specified in P.L. 110-5.

Note also that the FY2008 budget was released 10 days before final action on NASA appropriations for FY2007. Administration budget documents for FY2008 therefore typically compare the FY2008 request with the FY2007 *request*, not the FY2007 *appropriation*.

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 further directed NASA to fulfill commitments made to the 13 countries that are its partners in the International Space Station (ISS). In the 2005 NASA authorization act (P.L. 109-155), Congress endorsed the goals of the Vision and directed NASA to establish a program to accomplish them. NASA is now developing a new spacecraft called Orion (formerly the Crew Exploration Vehicle) and a launch vehicle for it called Ares I (formerly the Crew Launch Vehicle). An Earth-orbit capability is planned by 2014 (although NASA now considers early 2015 more likely) with the ability to take astronauts to and from the Moon following no later than 2020.

NASA stresses that its strategy is to "go as we can afford to pay," with the pace of the program set, in part, by the available funding. The President added $1 billion to NASA's budget plans for FY2005 to FY2009 to help pay for the Vision, but from FY2010 to FY2020, NASA's planned budget remains level with inflation. Most funding for the Vision is thus being redirected from other NASA activities. To free up funding for Orion and Ares I, the space shuttle program will be terminated in 2010, and U.S. use of the ISS will end by 2017. NASA has not provided a cost estimate for the Vision as a whole. Its 2005 implementation plan estimates that returning astronauts to the Moon will cost $104 billion, not including the cost of two planned robotic precursor missions or $20 billion to use Orion to service the ISS.[1] A report by the Government Accountability Office gives a total cost for the Vision of $230 billion over two decades.[2]

The Exploration Systems Mission Directorate (ESMD) is responsible for implementing the Moon/Mars program. The FY2008 request for ESMD is $3.924 billion. Although this is a substantial increase from FY2007, the FY2007 appropriation was $750 million less than had been requested (after adjusting for the accounting change). NASA Administrator Michael Griffin has testified that the FY2007 funding reduction will delay the schedule for Orion and Ares I by four to six months, with an initial operating capability (i.e., a first crewed flight) now planned in early 2015.[3]

---

[1] NASA, *Exploration Systems Architecture Study: Final Report*, NASA-TM-2005-214062, November 2005, [http://www.nasa.gov/mission_pages/exploration/news/ESAS_report.html].

[2] Government Accountability Office, *High Risk Series*, GAO-07-310, January 2007, p. 75.

[3] Michael D. Griffin, testimony before the Senate Committee on Commerce, Science, and Transportation, Subcommittee on Space, Aeronautics, and Related Sciences, February 28, 2007.

Along with a host of implementation challenges, the Vision creates issues about the balance between human space exploration and NASA's other activities in science and aeronautics. Both the 2005 NASA authorization act and NASA's FY2006 appropriations act (P.L. 109-108) emphasized that NASA should have a balanced set of programs, including science and aeronautics as well as activities related to the Vision. The challenge of maintaining this balance within a constrained budget is exacerbated by the costs of returning the space shuttle to flight status and completing construction of the ISS. (Shuttle flights were halted after the *Columbia* disaster in February 2003. Regular flights resumed in September 2006. ISS construction is scheduled to continue through 2010.) NASA Administrator Michael Griffin has reportedly 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."[4]

NASA Science Programs

The FY2008 request for the Science Mission Directorate (SMD) is $5.516 billion. Although that is a 5% increase from FY2007, most of the increase results from the FY2007 appropriation being less than NASA requested. After adjusting for the new accounting system, there is no net change from NASA's previous plans, which projected 1% growth in Science funding each year through FY2011. In particular, NASA still proposes to spend $3.1 billion less on Science over the five-year period from FY2007 to FY2011 than it had projected in early 2005. (Most of that amount would go to cover shortfalls in the space shuttle and space station budgets.) In response to critics who note that 1% growth is less than inflation, NASA officials say that funding for science at NASA grew faster than the agency's total budget during the 1990s and early 2000s and that sustaining such increases is impossible. They also state that the 32% share of NASA's budget allocated to Science in the FY2008 request is significantly more than the 24% allocated to science programs in FY1992. Accurate comparisons between current programs and FY1992 are difficult because of numerous intervening changes in how NASA presents its budget and categorizes expenditures.

In late 2006, NASA announced a reorganization of the Science Mission Directorate, creating four divisions where previously there had been three. The main result of the reorganization was to create a separate Earth Science Division. The Science Mission Directorate was established in 2004 from the merger of the former Office of Space Science and Office of Earth Science, and in the FY2006 and FY2007 budget cycles there was no separate budget for Earth science at NASA. Earth science supporters were concerned that this was adversely affecting support for the field. For example, the House report on the FY2006 appropriations bill (H.Rept. 109-118) stated that "the Committee is very concerned about the reductions to NASA's science programs especially the drastic reductions to earth science programs," while the Senate report on the FY2007 appropriations bill (S.Rept. 109-280) stated that "the Committee remains fully committed to a robust Earth science program at NASA and the Committee expects NASA to remain fully committed to Earth science." A National Research Council survey of space-based Earth science recommended in January 2007 that "the U.S. government . . . should renew its investment in Earth observing systems and restore its leadership in Earth science and

---

[4] Quoted in "NASA Will Protect CEV, Station Against Flat-Budget Squeeze," *Aerospace Daily and Defense Report*, January 11, 2007.

applications."[5] Although the FY2008 request includes increased funding for Earth Science and projects further increases in FY2009 and FY2010 relative to previous plans, most of the increases would go to cover cost growth and schedule delays in existing missions.

In the Astrophysics Division, the FY2008 request reinstates funding for the SOFIA airborne infrared telescope but defers the Space Interferometer mission (SIM) beyond the budget horizon. The House and Senate appropriations reports for FY2007 were supportive of SOFIA, for which no funding was requested in that year. An initial operational capability is now expected in about 2010, and a full operational capability in about 2013. Requested funding for SIM in FY2008 is $22 million, down from a projected $139 million, with further reductions projected in future years. According to the budget request, the lower funding level will support engineering risk reduction, mission design, and core scientific expertise, but no actual development work until after FY2012.

Comparing the FY2008 request for Science with projections made in the FY2007 request, most other changes reflect cost growth and schedule delays rather than changes in program content. However, because the FY2008 request was released before final action on appropriations for FY2007, additional changes may be required. (After adjusting for the new accounting system, Science received $216 million less than the request in FY2007.) More information on each individual Science mission is available on the NASA website at [http://science.hq.nasa.gov/missions/].

NASA Aeronautics Research

The FY2008 request for the Aeronautics Research Mission Directorate is $554 million. Although that is $336 million less than the FY2007 appropriation, it is $25 million more than the FY2007 request (after adjusting for the new accounting system) and $49 million more than the out-year projection for FY2008 that accompanied the FY2007 request. NASA has not yet announced how the aeronautics program will be adjusted to reflect the large increase in FY2007 funding relative to the request. These funding changes follow significant changes in the structure and content of the program, the release of a major policy report on the future of aeronautics at NASA, and the establishment of a new national policy on federal aeronautics research and development.

In late 2005, the NASA aeronautics program was refocused on core competencies in subsonic, supersonic, and hypersonic flight. 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 wind tunnels and other test facilities, whose continued viability has been under pressure for several years.

In June 2006, the National Research Council released a decadal strategy for federal civil aeronautics activities, with a particular emphasis on NASA's research program.[6]

---

[5] National Research Council, *Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond*, 2007, [http://www.nap.edu/catalog/11820.html].

[6] National Research Council, *Decadal Survey of Civil Aeronautics: Foundation for the Future*, 2006, [http://www.nap.edu/catalog/11664.html].

Along with other recommendations, the report identified 51 technology challenges to serve as the foundation for aeronautics research at NASA for the next decade.

In December 2006, President Bush issued a new National Aeronautics Research and Development Policy,[7] as required by the FY2006 appropriations act (P.L. 109-108, Sec. 628). The policy establishes general principles and goals for federal aeronautics activities, lays out the roles and responsibilities of NASA and other agencies, and directs the National Science and Technology Council to issue a national aeronautics R&D plan by December 2007 and at least every two years thereafter.

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 the ISS, 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* disaster. 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 more than $2 billion per year plus about $4 billion per year for the shuttle, considering the modest ISS 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: for example, the 2005 NASA authorization act (P.L. 109-155) directs that 15% of ISS research spending be used for non-Vision-related research. Fulfilling U.S. commitments to its international partners in the ISS (Russia, Japan, Canada, and 10 countries in Europe) is seen as essential by some observers; others find this rationale insufficient to justify the expense.

The FY2008 request includes $6.792 billion for the Space Operations Mission Directorate, which includes the space shuttle, the space station, and the Space and Flight Support program. This is an increase of about 11% above the FY2007 appropriation, but almost the entire increase was previously planned to reflect the schedule of ISS construction. New funding for two additional Tracking and Data Relay System (TDRS) satellites, required for ground communications with near-Earth spacecraft, is approximately offset by reductions in reserves for the shuttle and the ISS.

---

[7] [http://www.ostp.gov/html/NationalAeroR&DPolicy12-19-06.pdf]