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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 activities. For FY2006, NASA received $16,623 million when adjusted for two across-the-board rescissions and a $350 million augmentation for hurricane recovery. For FY2007, the request is $16,792 million, a 1% increase. NASA officials state that the FY2007 request is a 3.2% increase over FY2006 because they do not include the hurricane augmentation in their calculation. The key issue for Congress is how NASA is implementing the new Vision for Space Exploration, especially whether it is maintaining a balanced portfolio of programs that include science and aeronautics. NASA funding is appropriated in the Science, State, Justice, Commerce appropriations bill. In 2005, Congress passed a NASA authorization act (P.L. 109-155) that authorized NASA funding for FY2007 at $17,932 million. This report will be updated.

Agency Overview

The National Aeronautics and Space Administration (NASA) was created by the 1958 National Aeronautics and Space Act (P.L. 85-568). NASA conducts civilian space and aeronautics activities. 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 47 years since, NASA has conducted far reaching programs in human and robotic spaceflight, technology development, and scientific research.

Dr. Michael Griffin is the Administrator of NASA. The agency is managed from NASA Headquarters in Washington, D.C. Links to NASA's four Mission Directorates (Aeronautics Research, Exploration Systems, Science, and Space Operations), and individual NASA programs, are at [http://www.hq.nasa.gov/hq/org.html]. NASA 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. The **Jet Propulsion Laboratory**, Pasadena, CA, is a Federally Funded Research and Development Center operated for NASA by the California Institute of Technology. According to NASA, the agency has approximately 19,000 civil servants [http://nasapeople.nasa.gov/Workforce/data/page7.htm].

NASA's FY2007 Budget Request

For FY2007, the Administration is requesting $16,792 million in budget authority for NASA. By comparison, the agency received $16,623 million for FY2006 when adjusted for two across-the-board rescissions (totaling 1.28%) and the addition of $350 million for recovery from Hurricane Katrina. The increase from FY2006 to FY2007 is 1%, however NASA officials calculate it at 3.2% because they do not include the hurricane supplemental since it is a one-time appropriation. The NASA budget structure in FY2007 is similar to FY2006, although a new category of "Cross Agency Support Programs" is created. It includes education, which was separately identified in previous budgets. For several years prior to FY2006, the budget structure changed each year, making comparisons with previous years difficult or impossible at anything less than the total agency level. **Table 1** thus includes figures only for FY2006 and FY2007.

Table 1: NASA FY2007 Budget Request

(In $ millions)

Category	FY2006 OMB Est.	FY2006 NASA Initial Operating Plan	FY2007 Request
Science, Aeronautics, & Exploration	**9,664**	**9,721**	**10,524**
Science	5,254	5,254	5,330
Exploration Systems	3,114	3,050	3,978
Aeronautics Research	929	884	724
Cross-Agency Support Programs*	367	534	492
Exploration Capabilities	**6,578**	**6,870**	**6,234**
Space Operations	6,578	6,870	6,234
— Space Shuttle		*4,778*	*4,057*
— International Space Station		*1,753*	*1,811*
— Space and Flight Support		*339*	*367*
Inspector General	**32**	**32**	**34**
Total	**16,274**	**16,623**	**16,792**
2005 Hurricane Augmentation	**350**	**N/A**	**N/A**
Grand Total	**16,623**	**16,623**	**16,792**

Source: Column 2 is from the Office of Management and Budget's *Budget of the United States Government, FY2007*, p. 272, (CRS added "Grand Total"), and does not reflect the allocation of the hurricane funds to

various NASA accounts and other changes reflected in NASA's FY2006 Initial Operating Plan. Column 3 is from NASA's FY2007 Budget Request, p. 1, and shows the allocation of the hurricane funds and other changes. Column 4 is from NASA's FY2007 Budget Request, p. 1. N/A means Not Applicable. Totals may not add due to rounding.
* "Cross-Agency Support Programs" is a new designation in FY2007. It includes four sub-elements: Education, Advanced Business Systems, Innovative Partnerships Program, and Shared Capabilities.

The "Vision for Space Exploration"

On January 14, 2004, President George W. Bush announced new goals for NASA — a "Vision for Space Exploration," often referred to as "the Vision," or the "Moon/Mars program." The President directed NASA to focus its efforts on returning humans to the Moon by 2020, and someday sending them to Mars and "worlds beyond." (Twelve U.S. astronauts walked on the Moon between 1969 and 1972. No humans have visited Mars.) Other countries were invited to participate in the Vision, and the President further 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 did not add significant funds for NASA to implement the Vision, however. Of the $12.6 billion estimated that would be needed for FY2005-2009, only $1 billion was added to NASA's budget plan; the rest is to be redirected from other NASA activities. For the future (FY2010-2020), NASA's budget would remain level with inflation. To free funds for the Vision in future years, for example, the President directed that the space shuttle program be terminated in 2010, and, according to a NASA budget chart released in conjunction with the President's speech, U.S. use of the ISS will end by FY2017. The Vision creates issues that center on whether NASA should be a "single mission" agency devoted to human space exploration, or retain its commitment to science and aeronautics.

Under the Vision, NASA is to develop a new spacecraft, the Crew Exploration Vehicle (CEV), and a launch vehicle for it, the Crew Launch Vehicle (CLV), with an Earth-orbit capability by 2014, and an ability to take astronauts to and from the Moon no later than 2020. On September 19, 2005, NASA released its implementation plan for the Vision, setting a goal of having the CEV/CLV ready for Earth-orbital missions by 2012, and astronauts returning to the Moon by 2018. However, NASA stresses 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 September 2005 implementation plan estimates that it will cost $104 billion to return astronauts to the Moon by 2018, not including robotic missions or $20 billion to use the CEV 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, for example.)

NASA created the Exploration Systems Mission Directorate (ESMD) to implement the "Moon/Mars" program. Although the Vision is the main focus of NASA activities today, as described below, a variety of budget pressures have forced NASA to make difficult choices about what programs can be pursued in the near-term. For example, the FY2007 budget and its out-year projections shift about $1.5 billion from ESMD to help pay for shortfalls in the space shuttle and ISS programs. In order to fund the CEV and CLV, other ESMD activities have been cut significantly, such as Project Prometheus (to develop space nuclear power and propulsion systems), and microgravity research that was to be conducted on the ISS. How much of NASA's budget is devoted to the Vision depends on how that set of programs is defined. Some consider the space shuttle and ISS

to be the first step in the Vision, and others consider Vision funding to be only that contained in the ESMD budget line. **Table 1** shows those figures.

Key Congressional Issues

The major issue facing Congress as it debates NASA's FY2007 budget request is 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. The FY2007 debate is likely to focus on whether NASA's request achieves that balance.

Overall Constraints on the NASA Budget

President Bush's decision to provide NASA with a long term goal for the future without a significant increase in NASA's budget is one of the factors creating a funding dilemma for the agency. The first budget that included funds for the Vision, FY2005, projected that NASA's budget would increase over the previous year by 5.6% in FY2005, 4.7% in FY2006, and 4.8% in FY2007. The President requested the 5.6% increase for FY2005, but the FY2006 request was for an increase of 2.4%, and the FY2007 request is an increase of 3.2%, and if hurricane supplementals are included in the calculation, the FY2006 requested increase was 1.6%, and the FY2007 requested increase is 1%. Thus, the amount being requested has not matched what the White House promised for FY2006 or FY2007. Congress approved approximately the requested amounts in FY2005 and FY2006, but they were subject to across-the-board rescissions, and included a significant number of congressionally-directed items that had to be absorbed, thereby reducing the amount of funds available for NASA's planned activities. The FY2006 NASA budget, for example, has 198 congressionally-directed items totaling $568.5 million. Although NASA received supplementals to pay for hurricane recovery in FY2005 and FY2006, those were not programmatic increases. In addition, NASA is contending with the costs associated with returning the space shuttle to flight status, completing the International Space Station, and overruns in a number of science programs. Thus, while some may consider NASA's budget to be generous, space program supporters argue that it is very constrained, forcing difficult decisions.

How to "right size" NASA, its facilities, and its workforce, and ensure NASA has the necessary skill mix for the Vision, are related issues. The FY2006 appropriations act that includes NASA (P.L. 109-108) and the 2005 NASA authorization act (P.L.109-155) restricts NASA's use of buyouts and Reductions in Force (RIFs).

Impact on NASA's Science Programs

NASA's activities in space science and earth science were merged into the Science Mission Directorate (SMD) in 2004. On several occasions in 2005, Dr. Griffin said that he would not take money from NASA's space science, earth science, or aeronautics programs to pay for the exploration vision. (This pledge did not include microgravity science activities, such as research aboard the ISS.) The FY2007 budget request takes

$3.1 billion from the science programs over the five-year period (FY2007-2011) compared with projections in the FY2006 budget. Most of that (about $2 billion) would be used to cover a shortfall in the space shuttle and ISS budgets. Consequently, the budget for SMD will increase by 1.5% for FY2007, and 1% for the remaining four years, less than the projections in the FY2006 budget and less than the rate of inflation. In addition, the FY2006 Initial Operating Plan shows that NASA chose to take $176 million from SMD and shift it to ESMD in FY2006, and to take the entire congressionally-directed general reduction ($90 million) for that account from SMD. NASA officials stress that funding for space science during the 1990s and early 2000s grew at a rate faster than the total NASA budget, and sustaining such increases was not possible. They also say that science programs account for 32% of NASA's budget in FY2007, significantly more than the 24% allocated to them in 1992.

A number of space science programs would be delayed or deferred because of budget constraints. Information on these programs is available on NASA's website [http://science.hq.nasa.gov/missions/index.html]. Among the delays and deferrals are 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 of data gathered by space science probes would be cut 15%. NASA also is reviewing the future of two missions, Dawn and SOFIA, due to cost overruns and schedule delays, not specifically the budget situation. On the other hand, FY2007 funding is included for many space and earth science missions, including 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 further study Jupiter itself, the Glory spacecraft to study atmospheric aerosols and solar irradiance, and a dedicated land remote sensing satellite to continue the Landsat series.

Impact on Aeronautics

The FY2007 request for the Aeronautics Research Mission Directorate (see **Table 1**) is consistent with the out-year projection for FY2007 in the FY2006 request, but the structure and content of the program has 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 October 2005, Dr. Lisa Porter was named NASA's associate administrator for aeronautics. Dr. Porter is seen as the driving force behind a reshaping of NASA's plans for aeronautics, which NASA has described as "consistent with direction received from our Committees."

The new plan, which is reflected in the FY2007 request, refocuses 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. As Congress considers the FY2007 budget request, aeronautics research supporters will likely express continuing concern over the program's downward funding trend. The impact of that reduced funding on the NASA workforce may also be a continuing issue for Congress. A new National Aeronautics Policy, required by the FY2006 appropriations act, is not due from the White House until November 22, 2006, so may not influence this budget cycle.

The Space Shuttle and the International Space Station

Under the Vision, NASA was directed to terminate the space shuttle program in 2010, instead of continuing the program until 2015 or beyond as planned prior to the *Columbia* tragedy. The President also directed NASA to narrow the research program to be conducted aboard the ISS to only research needed to accomplish the Vision. A NASA budget chart released at the time of the President's speech showed NASA discontinuing its utilization of the ISS by FY2017. Funds currently allocated to the space shuttle and the ISS would be redirected to the Vision.

Construction of the ISS has been suspended since the *Columbia* tragedy; it is approximately 50% complete. U.S.-Russian crews continue to live and work aboard the ISS, using Russian spacecraft to take crews back and forth and resupply the outpost with cargo. As noted earlier, President Bush directed NASA to fulfill its commitments to the other countries building the ISS in partnership with the United States. NASA currently estimates that 16 shuttle flights are needed to complete ISS construction, with a potential 17th shuttle mission to repair the Hubble Space Telescope if such a decision is made after the shuttle's second "Return to Flight" mission, expected some time in 2006. NASA has 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.

NASA's FY2006 budget request included estimates ("placeholders") for shuttle funding in FY2008-2010 that were $3-5 billion less than what is actually needed. Additional funds also are required for the ISS program. Thus, the FY2007 request shifts funding into the space shuttle and ISS programs to cover the shortfall: approximately $2 billion from SMD and $1.5 billion from ESMD. Thus, although the space shuttle and ISS are scheduled for termination over the next decade, in the near term they require additional funding, which is being taken from science and exploration activities.

Among the issues surrounding the space shuttle and ISS programs is whether placing a fixed termination date on the space shuttle creates schedule pressure similar to that prior to the *Columbia* accident, and whether the United States wants to be dependent on Russia to launch U.S. astronauts to the ISS during the "gap" between the end of the shuttle and the availability of the CEV. Dr. Griffin hopes to accelerate the CEV to 2012, but it us not clear whether sufficient funds are available. Some question whether ISS is worth the investment of approximately $2 billion per year, in addition to the $4 billion per year cost of the shuttle, considering the modest research agenda that remains. Others 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, however, is seen by some observers as sufficient rationale for continued U.S. involvement in the ISS.