

COMMITTEE ON SCIENCE  
U.S. HOUSE OF REPRESENTATIVES

**HEARING CHARTER**

*NASA's FY 2007 Budget Proposal*

February 16, 2006  
10:00 a.m. to 12:00 p.m.  
2318 Rayburn House Office Building

**Purpose:**

On Thursday, February 16<sup>th</sup> at 10:00 a.m., the Committee on Science will hold a hearing on the National Aeronautics and Space Administration's (NASA) Fiscal Year 2007 (FY07) budget.

**Witnesses:**

**Dr. Michael D. Griffin** is the NASA Administrator.

**Ms. Shana Dale** is the NASA Deputy Administrator.

**Brief Overview:**

NASA's overall proposed budget for FY07 is \$16.8 billion, an increase of 1 percent from the FY06 appropriated budget, or up 3.2 percent if one excludes the hurricane emergency supplemental funding (\$350 million) from the FY06 base. (That can be compared to the .5 percent cut proposed for non-security discretionary spending as a whole.) The FY07 budget includes projections for the out-years that show NASA increasing by 2 to 3 percent a year in FY08 through FY11.

The proposed NASA FY07 budget differs significantly from how NASA projected it would proceed when it released its FY06 budget. (Each NASA budget submission includes a five-year runout.) There are two reasons for this. First, the FY07 proposed budget is \$170 million below the level that NASA was projected to receive in FY07 in last year's budget. Second, and more significantly, NASA Administrator Mike Griffin announced at a Science Committee hearing last year that the FY06 five-year projections for the Space Shuttle were \$3-5 billion below the amount actually needed to keep the Shuttle flying through 2010. As a result, compared to past projections, the FY07 budget shifts funding from Science and, to a lesser extent, Exploration to fully fund the Shuttle program through 2010. Compared to the FY06 projections, the FY07 budget proposal provides about \$2.2 billion more to the Shuttle program between FY06 and FY10.

The proposed FY07 budget is also about \$1.1 billion less than the level authorized in the *NASA Authorization Act* (P.L. 109-155) Congress passed in December. This is because in writing the Act, Congress handled the Shuttle shortfall by adding money to NASA's total spending. Congress also provided more money than NASA had then requested for Science (to handle cost overruns in several programs and an unfunded commitment to the Hubble Space Telescope) and to Aeronautics (to prevent further cuts).

The key features of the proposed FY07 budget include:

- The Space Shuttle is fully funded through FY10 with an assumption of 16 flights to complete construction of the International Space Station (ISS) and one flight to service the Hubble. (The Shuttle budget for FY07 is actually lower than it was in FY06 because one-time expenses necessary to return the Shuttle to flight after the Columbia accident no longer need to be funded. But previous projections assumed that the continuing expenses associated with the Shuttle would begin to decline in FY08, and they will not.)
- NASA plans to award a contract for development of the Crew Exploration Vehicle (CEV), which would take astronauts to the moon, toward the end of FY06. The budget for the CEV and related vehicles would increase by 76 percent in FY07 under the budget proposal. NASA cannot yet predict whether it is technically or financially possible to fly the CEV before 2014. (President Bush set 2014 as the date for the first manned CEV flight when he announced the Vision for Space Exploration in 2004.) NASA is trying to fly the vehicle sooner – probably late 2011 is the earliest possible date – to reduce the time between the retirement of the Shuttle and the launch of the CEV.
- All programs in the Exploration Directorate other than those related to the CEV are cut back significantly. This includes all programs to develop technology that is not immediately needed by NASA (such as nuclear propulsion) and much of the ISS research program.
- Funding for the Science Directorate is increased by 1.5 percent in FY07 and by 1 percent thereafter – significantly below the levels previously projected. That level of budget growth, along with increased costs for some projects, will necessitate the deferral or cancellation of a number of space and earth science missions and will make it hard for new missions to get into the queue.
- Funding for aeronautics declines by 18 percent in FY07 with further reductions projected for the out-years. For reasons unrelated to the budget, NASA is totally revamping its aeronautics program to focus more on fundamental research questions and less on building demonstration projects. Work to develop a new air traffic control system in coordination with the Federal Aviation Administration and the Department of Defense will continue.

## **Overarching Questions:**

Questions about the budget proposal basically fall into three categories:

1. **BUDGET PRIORITIES:** Is the overall level of spending appropriate and is the budget properly balanced among human space flight, space science, earth science and aeronautics? Is the emphasis on near-term commitments over longer-term technology development and science missions appropriate? Given the level of funding, should Congress eliminate any of the requirements placed on NASA in the *NASA Authorization Act*, which mandated that NASA continue the Shuttle and ISS programs, launch a CEV as close to 2010 as possible and carry out robust programs in space and earth science and aeronautics?
2. **IMPLEMENTATION OF THE EXPLORATION VISION:** In implementing its plans for returning to the Moon, how will NASA avoid the cost growth, schedule delays and technical problems experienced by other space programs? If the program's costs grow, will NASA "go-as-you-can-pay" as stated by the President or will it redirect funds from other programs?
3. **SPACE SHUTTLE AND STATION:** What is the status of plans for the second return to flight Shuttle mission, and how realistic is the plan to complete 16 flights to Space Station and one to Hubble before the Shuttle is retired in 2010? Will NASA be able to use private companies to fly cargo flights to the ISS?

## **Key Issues:**

**Impact of Science cuts.** The FY07 budget proposes to cut Science by \$3.1 billion from FY06-FY10 compared to what was projected in the FY06 budget over the same period. Programs that sustained the largest cuts include the Mars robotic exploration program (by focusing on science-based missions every other year and dropping activities that were more related to laying the groundwork for human exploration), planned advanced telescopes to find planets around distant stars, and several programs to observe phenomena predicted by Einstein's theories, such as black holes, the Big Bang, and "dark energy." Several key earth science missions are deferred or cancelled. In addition, the FY07 budget proposes cutting funds for research (as opposed to the satellites or telescopes themselves) by 15 percent. What will be the long-term impact of these cuts? Is earth science any better off than it was last year when the National Academy of Sciences raised alarms about the future viability of the program? Will there be enough programs coming down the line to provide sufficient opportunities for scientists and engineers?

**Space Shuttle and Space Station Challenges Remain.** NASA believes it has solved the foam shedding problem that occurred again on the most recent Shuttle flight and hopes to launch the next Space Shuttle in May, although that could slip to July. NASA's latest plan calls for conducting 16 flights to complete the assembly of the International Space

Station (plus one flight sometime in 2008 to repair the Hubble Space Telescope). The Space Shuttle will then be retired in 2010. The tentative plan is to launch two flights in FY06, four in FY07, five each in FY08 and 09 and one in FY10, with the Shuttle retiring by Dec. 31, 2010. While the Shuttle program has accomplished that launch rate in the past, there is little tolerance for any delays. To accomplish this, the Shuttle program faces a number of challenges, including maintaining its key staff as the program moves toward completion. Between FY06 and the Shuttle retirement, NASA intends to spend approximately \$20 billion on the program. (The program costs about the same amount regardless of how many Shuttles are launched because the primary expenses of the program are the continuing costs of maintaining the workforce and facilities.)

On the Space Station side, NASA has cut ISS-related research funding by 50 percent for the second year in a row. Between FY06 and FY10, NASA intends to spend more than \$10 billion on the Space Station program. Can the Shuttle successfully complete the projected number of flights? How high a priority are the Shuttle and ISS programs?

**Are the synergies between Shuttle and CEV/CLV realistic?** NASA is assuming that it will save money by finding “synergies” between the Shuttle program and the efforts to develop the CEV and its launch vehicle (CLV). This is plausible because NASA has decided to use several key Shuttle parts in the CEV and CLV. For example, the Solid Rocket Boosters (SRB) used on the Shuttle will be the first stage of the CLV. To ease the transition on the workforce and to take advantage of facilities, systems, and capabilities that the two programs have in common, NASA has tried to identify areas of “synergy” to save money. Given the constrained budget, has NASA been realistic in its assumptions for these savings?

**Challenges of Implementing the Exploration System Architecture.** NASA estimates that it will need about \$100 billion between now and 2018 to return to the Moon. Given that nearly every major government space program has run into cost growth and schedule delay problems, often because they were overly optimistic about the technologies, underestimated the complexity, and underestimated the cost, what is NASA’s approach to minimize the possibility that the CEV and CLV will run into the same problems? If the CEV or CLV run into cost growth problems will NASA stretch the program schedule, as it has done on the Webb telescope program, or will it look to other non-Exploration programs for funds?

**Hurricane Katrina Response and Recovery.** Hurricane Katrina inflicted significant damage on the Stennis Space Center in Mississippi and the Michoud Assembly Facility in Louisiana. The Michoud facility is located just outside New Orleans and is the manufacturing facility for the Space Shuttle’s External Tanks. NASA’s cost estimate for the damage, including emergency response and programmatic costs is \$760 million. Last year, Congress provided NASA with \$350 million in emergency relief funding. In total, NASA has put \$450 million toward hurricane relief. To pay back the \$100 million NASA internally redirected and make up the shortfall from NASA’s estimate of the damage, the agency will need about \$300 million in additional funds. Another hurricane

supplemental request may be sent to Congress shortly. How will NASA handle hurricane relief if additional funds are not available?

### **FY07 Budget Details:**

#### **Science Budget Highlights:**

NASA's Science budget request for FY07 is \$5.33 billion, an increase of \$76 million, or 1.5 percent over the FY06 appropriated budget, but \$354 million less than was projected for FY07 in the FY06 budget.

Over the period from FY06-FY10 the Science program is to be cut by approximately \$3.1 billion as compared with the FY06 projected budget over the same period. These cuts were primarily used to fund the shortfall in the Space Shuttle program.

The following are highlights of NASA's FY07 budget for Science:

- The Mars Exploration program is significantly scaled back compared to previous plans, primarily by cutting missions that had more to do with future human exploration than with science. NASA continues to operate several ongoing Mars missions, including the twin Mars rovers Spirit and Opportunity, and the proposed plans call for flying a robotic mission to Mars approximately every two years. But the FY07 budget proposes cancellation of several future missions, such as the Mars Telecommunications Orbiter, two Mars testbed missions, and future Mars human precursor missions. The Mars Sample Return mission to robotically bring back a sample from the Martian surface has been indefinitely deferred.
- NASA is planning a Shuttle mission to service the Hubble in 2008, assuming the next Shuttle flight shows the vehicle can operate safely. Over the last several years, NASA has implemented conservation measures to help extend the life of the batteries and gyros on Hubble so that it should remain operational into 2008. To pay for continued operations and preparations for the planned servicing mission, the FY07 budget for Hubble has been increased. (Note: the Shuttle portion of the costs for the servicing mission is not included in the Science budget, but is included as part of the Shuttle program.)
- In earth science, NASA plans to fly as independent satellite missions two research instruments that were previously going to "hitch a ride" on vehicles intended for other purposes. The Committee had long questioned the viability of the "hitching" approach. The two missions are Glory, which will measure chemicals in the atmosphere, and Landsat, the continuing effort to provide large-scale imagery of the Earth.
- The Stratospheric Observatory for Infrared Astronomy (SOFIA) program is zeroed out in the FY07 budget, but is under review. The SOFIA observatory, a joint program with the German Aerospace Center, is significantly over budget and behind

schedule. SOFIA was planned to work in conjunction with the Spitzer telescope but now would have little overlap with Spitzer. SOFIA is still funded in FY06, but NASA has directed that no new work is to be started until the review is completed. A final decision on SOFIA is expected in the next few months.

- The James Webb Space Telescope (JWST) budget is increased to cope with the projected \$1 billion cost growth, and its launch is delayed two years to 2013. JWST, which is ranked as the top priority in the National Academy's decadal survey of astronomy and astrophysics programs, is designed to be the follow-on mission to Hubble. To avoid damage to other science programs' budgets, NASA plans to make up the remaining portion of the \$1 billion overrun by stretching the program out and delaying the launch date to 2013. NASA is reviewing the program now. Detailed cost and schedule estimates will be completed in spring 2006 and will be reflected in the FY08 budget.
- The Navigator program, a series of ground-based and space-based telescopes used to detect planets around other stars, is cut significantly. The programs under Navigator are the Space Interferometry Mission (SIM), the Terrestrial Planet Finder (TPF), the Keck Interferometer, and the Large Binocular Telescope Interferometer (LBTI). SIM is under review with a launch date no earlier than 2015. TPF has been deferred indefinitely. The Keck Interferometer is in operations, but proposed upgrades to improve performance are cancelled (four additional "outrigger" telescopes will not be added to the two main telescopes).
- NASA is reviewing the elements of the Beyond Einstein program to determine priorities. The program is designed to observe phenomena predicted by theoretical physics, such as phenomena that would shed light on the Big Bang, black holes, and the existence of a "dark energy." NASA plans to proceed with studies related to the missions in FY07.
- The FY07 budget request does not include any funding for planning a mission to Europa, a moon of Jupiter that may have, or may have had in the past, liquid water. A mission to Europa was a top-rated mission by the National Academy of Sciences decadal survey of priorities for solar system exploration. NASA cannot afford such an expensive mission right now and also wants to determine whether it should set its sights instead on Saturn's moon Titan, which recent studies have shown may be an even more promising target. However, Congress directed NASA in the FY06 Science, State, Justice Commerce Appropriations Act (H.R. 2862) to begin planning a mission to Europa and include it as part of its FY07 budget.
- Funding for Research and Analysis (R&A) across the entire Science program was cut. The R&A account provides funds to scientists to perform the research on the data collected by the various missions. The reduction was driven by the overall cuts in the Science budget and the fact that fewer missions are planned to be flown as a result of program cancellations.

## **Exploration Systems Budget Highlights:**

Since becoming Administrator, Griffin has overhauled NASA's approach for returning to the Moon. As a result of NASA's Exploration Systems Architecture Study (ESAS) completed last year, NASA hopes to accelerate the delivery of the Crew Exploration Vehicle (CEV) to minimize the gap following the Shuttle retirement in 2010. The budget documents state that CEV will come "on-line by 2014, and potentially much sooner." In briefings, NASA has said that until it awards a CEV development contract, it cannot be sure whether it is technically or financially feasible to move ahead before 2014. The contract solicitation sets 2012 as a target launch date, and NASA officials have said it would be extremely unlikely in any event to launch before late 2011.

The plan also calls for NASA to develop two new launch vehicles to be derived from Shuttle elements, one to launch the CEV and one to launch heavier loads to return to the Moon by 2018. The preliminary ESAS cost estimate through 2018 is \$104 billion, excluding the operational costs of CEV missions to the ISS, which are expected to cost \$12 billion between FY12 and FY16. Estimates for cost and schedule will be refined as the program moves forward. To fund CEV development, NASA has virtually eliminated all of the long-term high-risk research and technology projects beyond what is necessary to return humans to the Moon for short visits.

NASA's Exploration Systems budget request as a whole for FY07 is \$3.98 billion, an increase of \$930 million, or 30 percent, over the FY06 appropriated budget. Compared to projections made in last year's budget, however, the Exploration Systems budget is cut by nearly \$1.6 billion over the period from FY06-FY10. This cut, in addition to cuts in the Science program, was required to pay for the funding shortfall in the Shuttle and Station budgets.

Not all the funding for CEV requested for FY07 will be spent next year. NASA wants to "bank" funding for CEV, so that it can begin to accumulate funds that will be needed in the peak years of development. NASA has not yet said how much will actually be spent in FY07.

The following are highlights of NASA's FY07 budget for Exploration Systems:

- The funding request for the CEV and the CLV, as well as the main elements needed to return to the Moon, such as heavy-lift launch systems, communications and navigations systems, and new space suits (collectively called Constellation Systems) for FY07 is \$3.1 billion, an increase of \$1.3 billion, or 76 percent, over the FY06 appropriated budget. To try to accelerate the CEV and CLV, the FY07 budget proposes to add more than \$5.6 billion over the period from FY06 to FY10 over what was planned in the FY06 budget projection. CEV will initially be used to transport crews to and from the Space Station.
- The ISS Crew and Cargo budget is increased slightly in the near-term and reduced overall over the next five years. The ISS Crew and Cargo budget contains two

components, funds to purchase Soyuz capsules and Progress supply vehicles from Russia and funds for a commercial crew/cargo demonstration project, the Commercial Orbital Transportation Systems (COTS) demonstration project. Under COTS, NASA has solicited proposals from private sector companies that want to demonstrate that they could fly missions to supply cargo and perhaps crew to the ISS. The proposals are due in March. NASA has set aside \$500 million for the program through FY09, and the funds would help the winning private company or companies develop their spacecraft. Then NASA would pay the company or companies to actually fly missions if they demonstrate that they can do so successfully for less money than it would cost to pay the Russians or Europeans.

- Exploration Systems Research and Technology (ESRT) is dramatically cut and scaled back. The ESRT budget includes the Robotic Lunar Exploration Program, and some technology projects for returning to the Moon. This cutback has resulted in the cancellation of more than 80 projects that were deemed not essential to getting humans back to the Moon. Project Prometheus, NASA's nuclear power and propulsion program, which was once planned as a \$400 million per year program, is now a small technology initiative funded at \$10 million per year. The Robotic Lunar Exploration Program (RLEP), which will launch satellites to learn about the moon in advance of a human landing, remains on track with the launch of its first mission, the Lunar Reconnaissance Orbiter, scheduled for 2008.
- The Centennial Challenges prize program receives little funding. At NASA's request, the *NASA Authorization Act* included language giving the agency the authority to conduct large prize contests for concepts that could contribute to NASA's mission. The FY07 budget provides \$10 million for the program in each of FY07 and FY08 and no funding beyond that. NASA does plan to move forward with several new small prize programs, and will decide about future prizes after that.
- The Human Systems Research and Technology (HSRT) budget is cut by more than 50 percent. HSRT funds life and microgravity research, primarily on the ISS. Projects in all areas have been cut back to the bare minimum, with the focus on programs to get health data from astronauts aboard ISS. Some projects will be continued to meet the requirement in the *NASA Authorization Act* that at least 15 percent of the research funded aboard the ISS be unrelated to future human space missions.

#### **Aeronautics Research Budget Highlights:**

Beginning last fall, NASA has been revamping its aeronautics program to move away from narrowly focused technology demonstration projects and toward a more fundamental research program. The *NASA Authorization Act* directs NASA to lead a government-wide effort to develop a National Aeronautics Policy to guide NASA's aeronautics research program. That policy plan is due at the end of 2006.

NASA's FY07 Aeronautics Research budget request is \$724 million, a \$160 million reduction, or 18 percent cut from FY06. NASA's aeronautics research program consists of three integrated research programs: the Aviation Safety Program, the Airspace Systems Program, and the Fundamental Aeronautics Program. A new component has been added this year called the Aeronautics Test Program. It was created to ensure that critical facilities, such as wind tunnels, remain available at a reasonable cost to users.

The following are highlights of NASA's FY07 budget for Aeronautics Research:

- The Fundamental Aeronautics Program budget is increased in the FY07 budget. The Fundamental Aeronautics Program represents a complete revamping of what used to be called the Vehicle Systems Program. The Fundamental Aeronautics Program will develop advanced tools and capabilities to better understand the underlying physics of flight. These tools and capabilities will enable new classes of aircraft to be more efficient and more economical with reduced noise.
- The Aviation Safety Program budget is cut over the next several years. The Aviation Safety Program conducts research to improve safety of future aircraft and to eliminate safety-related technology barriers. Areas of research include the development of technologies to improve situational awareness during flight and to improve vehicle health management and aging-related hazards.
- The Airspace Systems Program budget is cut. The Airspace Systems Program conducts research and development to address the future air traffic management needs.
- The aeronautics program would move away from research on "human factors" and from security issues. NASA argues that security issues do not fit well with its expertise and responsibilities.

### **Space Operations (Space Shuttle and Space Station) Budget Highlights:**

In developing the FY07 budget, the Administration had a clear choice regarding Shuttle and Station. Given that the fixed costs on the Space Shuttle and Space Station consume the vast majority of their budgets, the only choices basically boiled down to either finding the funds to make the program "whole" or ending the Shuttle program, thereby prevent any future assembly of the ISS. The FY07 budget reflects the Administration's decision to make the program whole.

NASA's FY07 Space Operations budget request is \$6.2 billion, which is about 40 percent of the whole NASA budget. This is about a 4 percent cut from last year's level, but an increase of \$47 million over last year's projection for the FY07 budget. Over the period from FY06-FY10 the Space Operations budget is increased by \$3.6 billion as compared to the levels projected in last year's budget for the same period. This account includes the Space Shuttle, the International Space Station (ISS), and a much smaller line called Space and Flight Support.

The following are highlights of NASA's FY07 budget for Space Operations:

- NASA now plans to fly the Shuttle on 16 missions to complete the International Space Station and one mission, probably in 2008, to service the Hubble Space Telescope. The Shuttle will be retired in 2010. While the Shuttle has averaged over four flights each year over the past 25 years, it will be challenging to complete all 17 of these missions by 2010 because there are only three Shuttles instead of four, missions to the ISS can be conducted only during limited launch windows, and the missions must be conducted in a specific order so that the ISS can be assembled. On the other hand, all three of the Shuttles have been thoroughly refurbished. What can't be predicted, of course, is some new problem with the Shuttle that would require another significant stand down.
- Last November, the Space Station program marked the fifth anniversary of continuous U.S. presence in space. Despite the grounding of the Shuttle over the past three years, the Space Station program has continued, albeit in a reduced mode with only two crew members aboard and no progress on completing the assembly of the ISS. NASA intends to increase the crew size from two to three beginning with the next Shuttle flight, currently planned for May. NASA has also been able to continue the ISS program because Congress provided NASA with an exception to the Iran Nonproliferation Act allowing the agency to purchase Soyuz capsules and Progress supply vehicles from Russia. This exception will sunset in 2012. NASA hopes to have the CEV online by then to meet the U.S. commitment to provide crew transportation for the program. A top concern for the ISS program is resuming a regular tempo of Shuttle flights so that the ISS can be completed by 2010 when the Shuttle is to be retired. The Space Station budget is increased by \$167 million for FY07 and by nearly \$1.5 billion over the period from FY06-FY10 as compared to levels projected in last year's budget over the same period, when the transfer of the ISS Crew/Cargo project to Exploration Systems is taken into account.

**Other programs and issues:**

- The Education program is cut slightly from what was projected for FY07 last year and is essentially flat funded for the next several years at about \$150 million per year. NASA proposes to spend \$47 million on elementary and secondary education, \$54 million on higher education, \$12 million for E-Education and informal education, and about \$40 million on the Minority University Research and Education Program (MUREP).
- As NASA shifts its focus from the Space Station and Space Shuttle to the CEV and CLV, it plans to reassign workers to new jobs, as well as cut back on the overall number of positions. NASA plans to reduce its workforce from 18,410 in FY06 to 17,979 for FY07. NASA officials have said that many employees will be shifted to different positions or locations, and attrition will take care of some of the problem. Some layoffs maybe needed, but the *NASA Authorization Act* prohibits a layoff

(Reduction In Force, or RIF) until March of 2007. In an effort to rebalance and reshape the workforce, the agency is conducting buyouts at all NASA Centers and Headquarters. Buyouts have been offered to employees in positions identified with excess competencies. To date, 303 employees have taken advantage of these buyouts in FY06. NASA's current estimate of "uncovered capacity"—personnel not directly assigned to a program—is about 920 civil servants. NASA hopes to rebalance its workforce and eliminate or reduce the need for a RIF. The objective is to assign work among the 10 NASA Centers to maintain a balance and meet the projected workforce levels. Earlier this month, NASA released its draft workforce strategy to its unions so that they can comment on it.

<i>(Budget authority, \$ in millions)</i>	FY 2006 Op Plan	FY 2007	Change	FY 2008	FY 2009	FY 2010	FY 2011
<b>Science, Aeronautics, and Exploration</b>	<b>9,721.3</b>	<b>10,524.4</b>	<b>8.3%</b>	<b>10,594.4</b>	<b>11,136.4</b>	<b>11,747.0</b>	<b>15,526.4</b>
<b>SCIENCE</b>	<b>5,253.6</b>	<b>5,330.0</b>	<b>1.5%</b>	<b>5,383.1</b>	<b>5,437.1</b>	<b>5,491.5</b>	<b>5,546.4</b>
Solar System Exploration	1,582.3	1,610.2	1.8%	1,598.6	1,840.4	1,899.6	1,846.7
The Universe	1,507.9	1,509.2	0.1%	1,500.9	1,307.9	1,276.1	1,309.7
Earth-Sun System	2,163.5	2,210.6	2.2%	2,283.7	2,288.9	2,315.8	2,390.0
<b>EXPLORATION SYSTEMS</b>	<b>3,050.1</b>	<b>3,978.3</b>	<b>30.4%</b>	<b>3,981.6</b>	<b>4,499.8</b>	<b>5,055.9</b>	<b>8,775.1</b>
Constellation Systems	1,733.5	3,057.6	76.4%	3,067.6	3,612.9	4,083.8	7,698.4
Exploration Sys Res & Tech	692.5	646.1	-6.7%	632.2	605.1	679.2	764.6
Human Sys Res & Tech	624.1	274.6	-56.0%	281.8	281.8	292.8	312.1
<b>AERONAUTICS RESEARCH</b>	<b>884.1</b>	<b>724.4</b>	<b>-18.1%</b>	<b>731.8</b>	<b>732.4</b>	<b>722.8</b>	<b>722.7</b>
<b>CROSS-AGENCY SUPPORT</b>	<b>533.5</b>	<b>491.7</b>	<b>-7.8%</b>	<b>497.9</b>	<b>467.1</b>	<b>476.9</b>	<b>482.2</b>
Education Programs	162.4	153.3	-5.6%	152.4	153.2	154.0	153.3
Advanced Business Systems	156.3	108.2	-30.8%	106.9	73.8	78.5	80.6
Innovative Partnerships	214.8	197.9	-7.9%	205.5	206.2	209.7	212.9
Shared Capabilities	0.0	32.2	-	33.1	33.9	34.7	35.5
<b>EXPLORATION CAPABILITIES</b>	<b>6,519.9</b>	<b>6,234.4</b>	<b>-4.4%</b>	<b>6,680.4</b>	<b>6,442.3</b>	<b>6,242.9</b>	<b>2,896.7</b>
<b>Space Operations</b>	<b>6,519.9</b>	<b>6,234.4</b>	<b>-4.4%</b>	<b>6,680.4</b>	<b>6,442.3</b>	<b>6,242.9</b>	<b>2,896.7</b>
International Space Station	1,753.4	1,811.3	3.3%	2,200.3	2,255.6	2,197.1	2,360.8
Space Shuttle*	4,427.7	4,056.7	-8.4%	4,087.3	3,794.8	3,651.1	146.7
Space and Flight Support	338.8	366.5	8.2%	392.8	392.0	394.7	389.2
<b>Inspector General</b>	<b>32.0</b>	<b>33.5</b>	<b>4.7%</b>	<b>34.6</b>	<b>35.5</b>	<b>36.4</b>	<b>37.3</b>
<b>TOTAL AGENCY (not incl emergency supp)</b>	<b>16,273.2</b>	<b>16,792.3</b>	<b>3.2%</b>	<b>17,309.4</b>	<b>17,614.2</b>	<b>18,026.3</b>	<b>18,460.4</b>
Year to Year Increase		<b>3.2%</b>	-	3.1%	1.8%	2.3%	2.4%
Emergency Hurricane Supplemental	349.8						
<b>TOTAL AGENCY (with emergency supp)</b>	<b>16,623.0</b>	<b>16,792.3</b>					
Year to Year Increase		<b>1.02%</b>					

