

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

HEARING CHARTER

NASA's FY 2006 Budget Proposal

February 17, 2005
10:00 a.m. to 12:00 p.m.
2318 Rayburn House Office Building

Purpose:

On Thursday, February 17th at 10:00 a.m., the Committee on Science will hold a hearing on the National Aeronautics and Space Administration's (NASA) Fiscal Year (FY) 2006 budget proposal. The hearing will examine NASA's plans and programs and the rationale for the funding levels proposed in the agency's budget.

In January 2004, the President announced a new Vision for Space Exploration. The President's plan can be seen as having three distinct, but related aspects. The first aspect concerns current human space flight programs. The President proposes to complete construction of the International Space Station (ISS) by 2010 and to retire the Space Shuttle at that point. ISS research is to be reconfigured to focus on questions related to the impact on human health of spending long periods in space. Under the proposal, the U.S. participation in ISS is slated to end around 2016, although the Administration has said that that date may shift. NASA has also decided to cancel the Shuttle mission that was needed to keep the Hubble Space Telescope in operation past 2007. Completing construction of the Space Station by 2010, enabling the Shuttle to be retired that year, is necessary to free up the funds needed to return to the moon by 2020.

The second aspect of the Vision concerns new medium-term goals for human space flight. The central goal is to return humans to the Moon between 2015 and 2020. To do this, NASA will develop a new Crew Exploration Vehicle (CEV), which will be tested without carrying people by 2008 and will carry humans into space by 2014.

The third aspect of the Vision concerns long-range goals for the years past 2020. The entire plan is geared toward preparing for this period, but what will happen during these years is (perhaps necessarily) left entirely open-ended. The ultimate goals are to send humans to Mars and "worlds beyond" and to increase the commercial exploitation of space. The timing of future exploration is left open and will depend on the pace of technology development and discovery and the availability of funds.

Overarching Questions:

Questions about the budget proposal basically fall into three categories:

1. SHUTTLE AND STATION: How will NASA ensure that the Shuttle is retired by 2010? Will that require scaling back the Space Station? How will the Space Station contribute to Space Exploration?
2. IMPLEMENTATION OF THE EXPLORATION VISION: When and how will NASA determine the specific goals for the CEV? Will the development costs of the CEV stay within budget projections?

3. OVERALL NASA BUDGET: To what extent should other portions of the NASA budget (Earth Science, Space Science, Aeronautics) be cut to free up funds for human space programs? What would the impact be of the proposed cuts in these areas?

Witness:

Mr. Frederick D. Gregory is the NASA Deputy Administrator. He is expected to be named Acting Administrator once the resignation of Sean O'Keefe is officially effective on Feb. 18.

Budget Highlights:

NASA's budget request for FY 06 is \$16.5 billion, an increase of 2.4 percent over the \$16.1 billion provided in FY 05. (The FY 05 level does not include the \$126 million emergency supplemental provided to fix facilities damaged from last year's hurricanes.) While this year's increase for NASA is larger than that for most other agencies, NASA's overall the budget is \$546 million less than the 4.7 percent by which its budget was projected to grow in last year's budget documents.

The Vision for Space Exploration continues to be the priority in NASA's budget. The Space Shuttle and Space Station continue to bulk large in the budget, together accounting for 39 percent of the proposed NASA budget for FY 06. Development of the CEV would jump in the FY 06 budget by more than 500 percent, from \$140 million in FY05 to \$753 million in FY 06, as work on the vehicle gets underway in earnest to allow for an unmanned test in 2008. In general, no element of NASA's budget related to exploration is proposed for a cut in FY 06 for reasons of budget stringency, although a few areas are cut either because new cost estimates are lower than previous "placeholder" numbers or because of problems with specific projects. The primary example of the latter is the reduction in Project Prometheus, which is working to develop nuclear propulsion techniques. NASA has decided not to move ahead now with the Jupiter Icy Moons Orbiter (JIMO) as a first test of Project Prometheus technology because it was proving to be too complex and expensive. NASA is reviewing options before deciding what mission to substitute for JIMO as a test. Funding for research aboard the Space Station is proposed for a cut as NASA reorients the program toward research on human physiology.

The budget does propose cuts to programs that are not related to the Vision, including Earth Science, Aeronautics and some portions of Space Science. The proposed cuts in these areas along with a reassessment of NASA's personnel needs for exploration is leading NASA to consider reducing its workforce by as many as 2,000 people, through layoffs if necessary.

A Senate-requested study by the Congressional Budget Office last year determined that if costs for the Exploration Vision grew at the same pace as costs for previous NASA projects, the Vision could cost as much as \$32 billion to \$61 billion more than has been estimated by 2020. CBO did not assess the likelihood of such an escalation occurring.

In FY 05, as part of the Omnibus Appropriations Act, Congress provided NASA with its full funding request, an increase of more than 5 percent from FY 04, and gave NASA flexibility in allocating the money. The Appropriations Act did seek to limit spending on the Lunar Robotic Orbiter, scheduled to launch in 2008, but NASA has chosen to provide full funding for the project. The Act also provided funding for a robotic servicing mission to the Hubble, which NASA is now canceling. Congress has not yet had a specific vote or debate on the President's Vision, and the report accompanying the Appropriations Act asked for numerous reports to fill in details about the Vision.

Issues:

When will the Space Shuttle return to flight? The Shuttle is currently slated to return to flight in May or June of this year, after having been grounded for more than two years since the Feb. 1, 2003 loss of the Columbia. NASA has been working to implement the recommendations of the Columbia Accident Investigation Board (CAIB) and its efforts are being reviewed by a NASA-appointed group, the Stafford-Covey Task Force. The Task Force has determined that, so far, NASA has successfully completed work on six of the CAIB's 15 recommendations for returning to flight. NASA officials and the Task Force appear cautiously optimistic that NASA will be able to stick to the May-June schedule even though NASA will probably not have developed a repair capability for the Shuttle's tiles by then. NASA officials and Task Force members have expressed concern, however, that NASA could learn of problems during a successful first flight that could complicate future launches. The Shuttle will be under intense scrutiny during that flight, and since the Columbia disaster NASA engineers have learned of more aspects of Shuttle flights that need to be monitored (like the foam shedding that brought down the Columbia) because they could imperil the vehicle. NASA estimates that returning the Shuttle to flight will cost about \$762 million more in FY 05 than had been requested originally.

How many more Shuttle flights are needed to complete the Space Station? NASA has flown 16 Shuttle missions to the ISS so far and currently estimates that another 28 are needed to complete its construction. Doubts have been raised inside and outside NASA that 28 flights could be completed in time to retire the Shuttle by 2010. As a result, NASA is in the process of reviewing its options to reduce the number of flights (see more below), including by scaling back the Space Station and by using other vehicles for logistic and crew missions for which the Shuttle is not required. NASA officials have suggested that the number of flights could be reduced to 23 and perhaps to as few as 16 with changes to the Space Station. Also, the Shuttle is required to ferry large replacement parts to the Station, such as gyroscopes, as they wear out. If the Station is to remain in use until around 2016, the Shuttle will have to launch and pre-position in space, large replacement parts before the Shuttle is retired.

What is the future of the Space Station, and how will it contribute to the program to go to the moon and Mars? The President's Vision called for research on the Space Station to be reoriented from a range of biological and physical research projects to a narrower, more focused agenda researching matters necessary to keep humans alive and healthy during long stays in space. NASA now expects to have a review completed by the end of this month of how the Station could contribute to space exploration. The two greatest human health issues involve the effects of low gravity and the effects of radiation. Radiation research is better conducted on Earth than on the ISS, and NASA has a facility for that purpose at the Brookhaven National Laboratory in New York. The question then is what kinds of research can be done on the Station to learn how to mitigate the effects on the body of low gravity and whether that research can be conducted only on the Station. A related question is whether enough astronauts can serve on the ISS long enough for statistically sound conclusions to be reached before the Station is retired. NASA is seriously considering scaling back the Station to eliminate projects that may not be required to understand how astronauts could spend long periods on the moon. NASA may cancel the centrifuge being built for the U.S. by the Japanese that was to study the effects on animals of low gravity. While in the past, the centrifuge was described as perhaps the most useful piece of scientific equipment designed for the Station, NASA is now beginning to argue that it needs human rather than animal research and that the centrifuge research is more relevant to a Mars mission than to a lunar one. Once NASA determines how it will use the Station, it will then determine how many Shuttle flights will be needed to complete the Station and when they will be needed. That review is expected to be completed late this spring.

Will Americans still be able to use the Space Station effectively after next April when our agreement with the Russians expires? NASA faces a legal hurdle next year that could prevent any effective utilization of the Space Station after next April. The U.S. is dependent on the Russians for crew rescue capability, which is provided by Russian Soyuz vehicles. The Shuttle is not capable of remaining docked at the Station for long enough stays to provide this service, and U.S. regulations prevent astronauts from being aboard the Station if there is no rescue capability. But under the Iran Nonproliferation Act (INA), the U.S. is forbidden to provide the Russians with cash or services under a new agreement unless the President certifies that the Russians are not proliferating nuclear technology from Iran – a certification the President is highly unlikely to make. NASA has no known alternative plans for providing a crew rescue capability beyond buying such services from the Russians. The matter is currently the subject of an interagency review, and the Administration is expected to send up an amendment to the INA, perhaps as early as next month. It is unclear how Congress would react to such a proposal with Iran being such a focus of attention in foreign policy. The International Relations Committee, which shares jurisdiction with the Science Committee over the Act, has been a strong proponent of the Act. If Congress fails to amend the INA, the U.S. would not be able to use the Soyuz as a rescue vehicle or to use Russian Soyuz and Progress vehicles to ferry astronauts and cargo, respectively, to and from the Station to limit the use of the Shuttle.

Will the Space Station program exceed the Congressional cost cap? Another legal hurdle facing the ISS program is the \$25 billion cost cap for ISS development set by Congress. (The cap only applies to ISS development costs and does not include costs for operations, Shuttle, and research.) The original cost estimate for ISS development in 1993 was \$17.4 billion. In 1998, NASA announced an increase to \$21.3 billion. As a result, NASA asked an outside task force to evaluate the cost and schedule credibility of the ISS program. The task force estimated the development cost of the ISS, given the configuration at the time, at \$24.7 billion. Congress then set a \$25 billion cost cap on the ISS in the NASA Authorization Act of 2000 (P.L. 106-391). According to NASA's FY 06 budget request, the ISS will exceed the Congressional cost cap in FY 05. NASA is likely to request legislative relief from the existing cost cap.

How is NASA proceeding with development of the CEV? NASA intends to issue a Request for Proposals for companies interested in developing the CEV in March. Then toward the end of FY 05, NASA intends to select two teams to prepare prototypes of a CEV. As a result, large-scale spending on the CEV is slated to begin in FY 06. NASA has described its budget request for CEV for FY 06 as something of a "placeholder" because no contract has yet been let. NASA has estimated total development costs for the vehicle at about \$15 billion. NASA is moving ahead with contractor awards without settling many of the questions concerning the vehicle, and, indeed, will leave some of these questions to two contractor teams that will design the vehicle. Among the key open questions are whether the CEV will be able to dock with or service the Space Station and the number of crew members it will be able to carry. Relatedly, NASA has not yet decided what astronauts will do once they get to the moon. Some of those decisions will have to await the data gathered by the Lunar Robotic Orbiter, due to be launched in 2008, which will gather data on potentially landing sites and the availability of resources on the moon, including water.

What launch vehicle will the CEV will require? NASA has also not yet decided what vehicle to use to launch the CEV. It could choose to launch the CEV into space on top of an expendable rocket like the Defense Department uses to launch satellites, although alterations might need to be made to such a rocket for it to be considered sufficiently safe for human launches. Or NASA may choose to develop a launch vehicle based on the components of the Space Shuttle. Alternatively, it may choose to develop an entirely new vehicle, although that would probably increase the costs for the Vision beyond current estimates.

NASA must make a decision soon, especially if the agency chooses a Shuttle-derived design, because it must work to keep open production lines for Shuttle components beyond the point when they would otherwise be needed. The President's recently released Space Transportation Policy directs that NASA's decision be made jointly with the Department of Defense. NASA anticipates that it will conclude its study of launch vehicle options and submit its decision for interagency review sometime in the next few months.

How will the Vision affect NASA's science and aeronautics programs? NASA considers planetary science (such as robotic missions to Mars) as part of the exploration program. But other areas of Space Science, such as those more related to astrophysics, and all of Earth Science are not considered NASA priorities in the FY 06 budget, although they continue to receive significant funding. The proposed changes in these areas are highlighted in the budget details in the next section of this charter. The FY 06 budget calls for a significant paring back of aeronautics research, refocusing the program, and reducing funding to \$850 million, down \$250 million from FY 04. NASA has requested adequate funding to preserve the launch date of 2011 for the James Webb Telescope, the successor to the Hubble Space Telescope.

What is the future of the Hubble Space Telescope? The budget request, in effect, allows the Hubble Space Telescope to die, as funding is included only to continue work on a deorbiting mission; no funds are included for servicing. The Committee recently held a hearing to examine the options for the Hubble, of which there are basically four, each of which arguably cost in the range of \$2 billion:

- Do not service the telescope. The telescope will then cease to function as early as 2007. NASA does have other space telescopes in orbit and others are planned to be launched in 2011, but none has the same capabilities as Hubble.
- Send the Shuttle to service the telescope. This is the recommendation of the National Academy of Sciences. Like any Shuttle mission, this would put astronauts at risk. It would also delay completion of the ISS.
- Send a robotic mission to service the telescope. There is wide disagreement as to whether this mission could be ready in time. The National Academy of Science concluded it could not, but those involved in the robotic effort believe it can be done in time.
- Launch a new "platform" with the equipment that was designed to be added to the Hubble (this is sometimes called "rehosting") and perhaps include new equipment as well. This would leave a gap in Hubble science, as the new platform would probably not be ready until after the Hubble stopped operating.

Details of NASA's FY 06 Budget:

Comparison of NASA's FY06 Budget Request with Prior Years' Budgets

Program	FY 2004	FY2005 NASA (Op Plan)¹	FY 2006 (Projected)²	FY 2006 (Proposed)	Change FY 2006 (Projected) to FY 2006 (Proposed)	Change FY 2005 to FY 2006 Proposed
Science	5,584	5,527	5,794	5,476	-318	-51
Exploration Systems	2,631	2,685	3,529	3,165	-364	480
Aeronautics	1,034	906	957	852	-105	-54
ISS and Space Shuttle	5,443	6,219	6,090	6,388	298	169
Other (Flight Support, Education, and IG)	686	733	632	575	-57	-158
Total	15,378	16,070	17,002	16,456	-546	386
Emergency Hurricane Relief Funds		126				

All amounts are in millions of dollars.

¹ Amounts listed are those included in NASA's initial operating plan for FY2005 and are thus subject to change throughout the year as NASA identifies changes in program needs.

² Amounts listed are those projected as NASA's needs for FY06 in the President's FY05 budget documents.

Space Operations

The primary programs within Space Operations are the ISS and the Space Shuttle, which together make up almost 40 percent of NASA's budget. The FY 06 budget request for ISS and Space Shuttle totals \$6.4 billion, up \$169 from FY05 and \$945 million from FY04.

Funding for the Shuttle would decline from nearly \$5 billion in FY05 to \$4.5 billion in FY 06 as NASA finishes paying for the increased costs associated with returning the Shuttles to flight. NASA says that it will not know whether it will need to make adjustments to its FY06 request for Shuttle until after the Shuttle returns to flight and the agency can assess whether additional work must be done to ensure the vehicles' safety. Also, NASA has indicated that the funding levels proposed for the years beyond FY 06 (see attached table) are ballpark estimates and could rise as NASA develops a better understanding of the costs associated with retiring the Shuttle.

The large increases in the Shuttle program from FY04 to FY05 were due to the escalating costs of returning the Shuttles to flight, expected this spring. The current launch window for return to flight is May 12th through June 3rd.

Exploration Systems

Funding for Exploration Systems – which includes funding for the human Moon mission, including the CEV, and for the development of nuclear reactors for use in space and on other planets – would grow by nearly half a billion dollars from FY05 to \$3.165 billion under the request. The CEV would grow from \$140 million in FY05 to \$753 million in FY06. Meanwhile Prometheus, NASA’s nuclear reactor program, would be cut from \$432 million in FY05 to \$320 million in FY06.

The Administration has described its FY06 request for the CEV program as something of a “placeholder” while the program continues to be defined. The funding level requested for Prometheus is a placeholder, as well, as NASA recently announced that it was scrapping its plan to send a nuclear-powered robotic mission to Jupiter’s icy moons (an orbiter known as JIMO) and is instead conducting a complete review of its nuclear program. The agency says that the analysis will help it to determine how Prometheus might fit into the Vision and what kind of mission might provide the best opportunity to demonstrate its capabilities. In the meantime, JIMO is on hold, sidelining a mission that included investigations of the Jovian moon Europa, the number one priority among scientists, according to the latest National Academy of Sciences decadal survey of astronomy priorities.

The budget requests \$34 million for NASA’s prize program, called Centennial Challenges, up from \$9.7 million appropriated for FY05. NASA needs authorization from Congress to move forward with prizes greater than \$250,000.

NASA proposes to shift into the Exploration Systems account what was previously the Biological and Physical Research (BPR) program, now called Human Systems Research and Technology. The program funds research aboard the ISS. The program has been restructured numerous times over the past several years. The budget proposes a \$198 million or 20 percent decrease from FY05 levels to \$806 million as NASA determines the future of the program.

Science

Funding for Earth and Space Science programs, which NASA proposes to combine into a single Science account for FY 06, is only slightly down from FY 05, but several hundred million below the level NASA projected last year that it would need. To accommodate the addition last year of the Lunar Reconnaissance Orbiter (LRO) mission, which will orbit the moon to gather data in advance of a human mission, a number of Space Science and Earth science programs have been delayed or cut. As the LRO mission ramps up the amount of funding required, it is expected to have a larger effect on other space and Earth science missions unless the overall level of funding for science grows accordingly.

Last year, NASA announced that it would delay the launch of the Joint Dark Energy Mission (JDEM), a mission NASA had planned to carry out together with the Department of Energy to explore the nature of dark energy. Scientists believe that understanding dark energy has the potential to fundamentally alter our understanding of the universe.

The following are changes NASA proposes to make in this year’s budget:

- **Cut to Earth Science:** The budget cuts the Earth Systematic Missions program by \$118 million, or 40 percent below FY05. As a result, NASA proposes essentially to cancel the Glory mission, which the Administration believes will answer critical questions about climate change. While the budget continues the Global Precipitation Measurement (GPM) mission, it is not clear whether enough funds are provided in FY 06 to allow for the planned 2010 launch. Earth scientists have called GPM one of their top priorities for understanding severe weather events such as hurricanes.

Also, a mission designed to ensure that weather instruments are properly tested before they are launched on the nation's next generation of weather satellites is running into problems and will be delayed if it does not receive additional funding.

- **Addition to Earth Science:** The budget increases funds for Earth System Science Pathfinder projects by \$27 million, or 25 percent over FY05. However, the budget documents NASA has provided do not contain sufficient detail to determine which programs will benefit from the increase.
- **Change to Space Science:** The proposed budget provides \$371 million for the James Webb Space Telescope. NASA continues to hold to a launch date of the Webb to 2011. The budget for Webb is an increase of \$60 million over the FY05 level, but a \$23 million decrease from the level projected for FY06 last year. It is unclear why NASA now believes the Webb Telescope needs less than it had previously projected.
- **Cut to Space Science:** The budget proposes slipping the Space Interferometer Mission (SIM) by two years with launch now scheduled for 2012. SIM will detect Earth-like planets.
- **Cut to Space Science:** The Future New Frontiers program is cut by \$56 million from FY 05. The budget cut will delay selection of the second New Frontiers mission. The first mission, called New Horizons, a mission to Pluto, is scheduled to be launched next year.

Aeronautics Research

The budget request for Aeronautics is \$852 million, a decrease of \$54 million from FY05 and \$182 million below the FY04 level of \$1.034 billion. The Aeronautics program has three main components, Aviation Safety and Security, Airspace Systems, and Vehicle systems. NASA proposes to limit research within Vehicle Systems to activities related to noise and emissions reductions, and unmanned aerial vehicles. Vehicle Systems is a big user of wind tunnels, and maintaining these facilities puts significant pressure on the budget. NASA is proposing to restructure its research programs to focus on those that do not depend as heavily on wind tunnel tests.

Education Programs

NASA proposes \$167 million for its education programs, \$2 million less than FY05, or a 1 percent cut. NASA's FY06 budget runout projects that education will get cut again in FY07, bringing it down to \$155 million where it will remain at that level through 2010.

Other Issues:

Financial Management Issues at NASA

In three of the past four years, NASA has not been able to produce auditable financial statements; its financial auditors disclaimed opinions on NASA's financial statements for fiscal years 2001, 2003, and 2004. NASA's new auditors for FY 2004, Ernst & Young, reported that many financial management weaknesses continue to persist, including the following:

- NASA has not been able to reconcile its Fund Balance with Treasury account since FY 2003. Although NASA reportedly has resolved many of the errors causing a difference of almost \$2

billion as of September 30, 2003, Ernst & Young identified unreconciled differences between NASA and Treasury of \$313 million as of September 30, 2004.

- NASA lacks adequate controls to ensure that its Property, Plant, and Equipment and Materials and Supplies are properly valued and accounted for. As of the end of FY 2004, NASA reported the value of these assets as \$37.6 billion.
- NASA lacks an integrated financial management system, as required by the Federal Financial Management Improvement Act of 1996.

In April 2000, NASA began development of its Integrated Financial Management Program (IFMP), consisting of nine systems or modules to support a range of activities, including accounting, asset management, contract administration, and human resource management. The Core Financial module, considered the backbone of IFMP, was implemented in 2003. However, the Government Accountability Office (GAO) reported that NASA did not follow disciplined processes in implementing this module and as a result, NASA has been experiencing numerous data integrity problems with the system. Ernst & Young recently reported that the Core Financial module is not integrated with certain subsidiary systems, does not facilitate the preparation of financial statements, and does not contain sufficient controls to detect and correct invalid data in a timely fashion. According to NASA, problems with the Core Financial module are the cause of \$565 billion in adjustments needed to complete its FY 2004 financial statements.

NASA plans to complete implementation of all nine IFMP modules by FY 07. While NASA has estimated the lifecycle cost of IFMP to be almost \$1 billion, GAO found that this estimate does not include all costs.

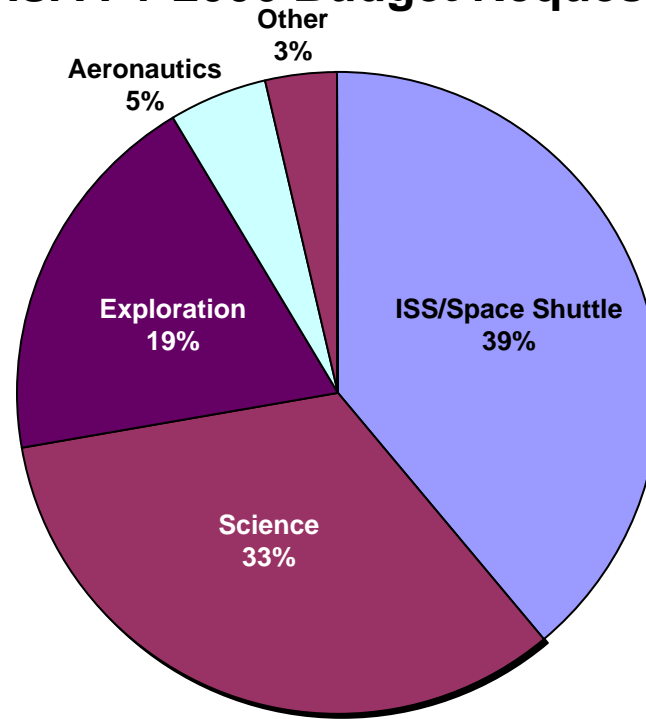
Workforce

To support the Vision, NASA has said that it needs to “transform” its workforce into a smaller force with a different set of skills than those possessed by its current employees. Overall, the agency aims to reduce its total workforce from 19,227 full-time employees in FY05 to 18,798 in FY06, a net reduction of 429 employees.

The total additions and reductions in staff are likely to be greater, however, as NASA has determined that about 2,000 of its employees have skills that are not well matched to the skills the agency now believes it needs. NASA believes that it simply no longer needs the skills of about 1,000 of these employees, many of them technicians that work in with aeronautics research facilities. NASA has offered voluntary buyouts to these employees, but as of January 12, only 302 employees had accepted them. As of February 7, NASA has given its center directors approval to begin talking about the potential for positions to be eliminated and the news has been covered widely in media reports, so the number of employees taking voluntary buyouts may increase.

NASA believes the other 1,000 employees might be able to compete for future projects and thus retain their jobs, but that outcome is uncertain and it is possible that the agency would eventually resort to mandatory Reductions In Force (RIFs) to accomplish its workforce goals.

NASA FY 2006 Budget Request



\$ in millions	FY2005 12/23 Op Plan	FY 2006 budget request	FY2007 budget request	FY2008 budget request	FY2009 budget request	FY 2010 budget request
Science	5,527	5,476	5,960	6,503	6,853	6,798
Exploration Systems	2,685	3,165	3,707	3,826	4,474	5,126
Aeronautics	906	852	728	731	728	718
ISS/Space Shuttle	6,219	6,388	6,007	5,657	4,967	4,795
Other (Flight Support, Education, and IG)	733	575	560	590	590	592
Total	16,070	16,456	16,962	17,305	17,612	18,027
Emerg. Hurricane supp	126					