

THE FUTURE OF NASA

HEARING BEFORE THE COMMITTEE ON SCIENCE HOUSE OF REPRESENTATIVES ONE HUNDRED NINTH CONGRESS

FIRST SESSION

JUNE 28, 2005

Serial No. 109-19

Printed for the use of the Committee on Science



Available via the World Wide Web: <http://www.house.gov/science>

U.S. GOVERNMENT PRINTING OFFICE

21-949PS

WASHINGTON : 2006

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512-1800; DC area (202) 512-1800
Fax: (202) 512-2250 Mail: Stop SSOP, Washington, DC 20402-0001

COMMITTEE ON SCIENCE

HON. SHERWOOD L. BOEHLERT, New York, *Chairman*

RALPH M. HALL, Texas	BART GORDON, Tennessee
LAMAR S. SMITH, Texas	JERRY F. COSTELLO, Illinois
CURT WELDON, Pennsylvania	EDDIE BERNICE JOHNSON, Texas
DANA ROHRABACHER, California	LYNN C. WOOLSEY, California
KEN CALVERT, California	DARLENE HOOLEY, Oregon
ROSCOE G. BARTLETT, Maryland	MARK UDALL, Colorado
VERNON J. EHLERS, Michigan	DAVID WU, Oregon
GIL GUTKNECHT, Minnesota	MICHAEL M. HONDA, California
FRANK D. LUCAS, Oklahoma	BRAD MILLER, North Carolina
JUDY BIGGERT, Illinois	LINCOLN DAVIS, Tennessee
WAYNE T. GILCHREST, Maryland	RUSS CARNAHAN, Missouri
W. TODD AKIN, Missouri	DANIEL LIPINSKI, Illinois
TIMOTHY V. JOHNSON, Illinois	SHEILA JACKSON LEE, Texas
J. RANDY FORBES, Virginia	BRAD SHERMAN, California
JO BONNER, Alabama	BRIAN BAIRD, Washington
TOM FEENEY, Florida	JIM MATHESON, Utah
BOB INGLIS, South Carolina	JIM COSTA, California
DAVE G. REICHERT, Washington	AL GREEN, Texas
MICHAEL E. SODREL, Indiana	CHARLIE MELANCON, Louisiana
JOHN J.H. "JOE" SCHWARZ, Michigan	DENNIS MOORE, Kansas
MICHAEL T. MCCAUL, Texas	
VACANCY	
VACANCY	

CONTENTS

June 28, 2005

	Page
Witness List	2
Hearing Charter	3

Opening Statements

Statement by Representative Sherwood L. Boehlert, Chairman, Committee on Science, U.S. House of Representatives	9
Written Statement	10
Statement by Representative Bart Gordon, Ranking Minority Member, Committee on Science, U.S. House of Representatives	10
Written Statement	14
Statement of Representative Ken Calvert, Chairman, Subcommittee on Space and Aeronautics, Committee on Science, U.S. House of Representatives	15
Written Statement	16
Statement of Representative Mark Udall, Ranking Member, Subcommittee on Space and Aeronautics, Committee on Science, U.S. House of Representatives	17
Written Statement	17
Prepared Statement of Representative Ralph M. Hall, Member, Committee on Science, U.S. House of Representatives	18
Prepared Statement of Representative Curt Weldon, Member, Committee on Science, U.S. House of Representatives	19
Prepared Statement of Representative Jerry F. Costello, Member, Committee on Science, U.S. House of Representatives	20
Prepared Statement of Representative Russ Carnahan, Member, Committee on Science, U.S. House of Representatives	20
Prepared Statement by Representative Sheila Jackson Lee, Member, Committee on Science, U.S. House of Representatives	20
Prepared Statement by Representative Al Green, Member, Committee on Science, U.S. House of Representatives	22

Witness:

The Honorable Michael D. Griffin, Administrator, National Aeronautics and Space Administration	
Oral Statement	23
Written Statement	24
Discussion	
Timetable for Information	34
Budget Firewalls	36
Returning to Flight	39
The Centrifuge	39
Financial Management	39
Aeronautics	40
Hubble Space Telescope	41
The Iran Nonproliferation Act	42
Center Workforce	46
FFRDC	48
Safety and Risk	48
Voyager and CEV	49

IV

	Page
Life Science Research	50
Space Grant Programs	50
Lessons Learned From the International Space Station	56
Workforce	57
Manned Space Flight vs. Unmanned Space Flight	58
Debris Hazards	60
The Value of Humans on the Moon	60
Strategic Decision-making	60
The Role of HBCs	60
Launch Vehicle Determination	61
U.S. Preeminence in Space	63
Appendix 1: Answers to Post-Hearing Questions	
The Honorable Michael D. Griffin, Administrator, National Aeronautics and Space Administration	66
Appendix 2: Additional Material for the Record	
<i>Review of President's FY 2006 Budget</i> , Statement by Michael D. Griffin, NASA Administrator	78

THE FUTURE OF NASA

TUESDAY, JUNE 28, 2005

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE,
WASHINGTON, DC.

The Committee met, pursuant to call, at 10:05 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Sherwood L. Boehlert [Chairman of the Committee] presiding.

**COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, DC 20515**

Hearing on

The Future of NASA

**Tuesday, June 28, 2005
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building**

WITNESS LIST

The Honorable Michael D. Griffin
Administrator
National Aeronautics and Space Administration

Section 210 of the Congressional Accountability Act of 1995 applies the rights and protections covered under the Americans with Disabilities Act of 1990 to the United States Congress. Accordingly, the Committee on Science strives to accommodate/meet the needs of those requiring special assistance. If you need special accommodation, please contact the Committee on Science in advance of the scheduled event (3 days requested) at (202) 225-6371 or FAX (202) 225-0891.
Should you need Committee materials in alternative formats, please contact the Committee as noted above.

HEARING CHARTER

**COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES****The Future of NASA**TUESDAY, JUNE 28, 2005
10:00 A.M.—12:00 P.M.

2318 RAYBURN HOUSE OFFICE BUILDING

Purpose:

On Tuesday, June 28, 2005 at 10:00 a.m., the Committee on Science will hold a hearing on the future of the National Aeronautics and Space Administration (NASA). NASA Administrator Michael D. Griffin will be the sole witness. The hearing will examine Administrator Griffin's guiding philosophy and plans for NASA's programs in human space flight, space science, Earth science, and aeronautics, as well as plans for the Agency's workforce, organization, and infrastructure. The hearing will set the stage for the Committee's action the following day on the NASA authorization bill.

Overarching Questions:

1. What are Administrator Griffin's priorities and how does he plan to maintain a balanced portfolio of science, aeronautics, and exploration programs?
2. What is the status of NASA's plans to define the final configuration of and research agenda for the International Space Station? What is the status of NASA's plans for returning the Space Shuttle to flight and for retiring it at the end of the decade?
3. What is the status of NASA's plans to define the Vision for Space Exploration, including accelerating the Crew Exploration Vehicle and selecting launch vehicles?
4. How does Administrator Griffin intend to ensure the Agency has the appropriate size and skill mix in its workforce, as well as the facilities and infrastructure necessary to support the Agency's goals?

Overview:

Dr. Michael D. Griffin was sworn in as NASA's 11th Administrator on April 14th. Administrator Griffin takes the reins of the Agency at a crucial time, when NASA faces significant issues in nearly every facet of the Agency's operations. Since taking office, Administrator Griffin has moved swiftly to begin tackling critical issues in many key areas. He has been personally involved in reviewing plans for returning the Shuttle to flight later this year. He has directed a team to undertake a study, to be completed in July, to define the final configuration of the Space Station, its research agenda, and to develop plans to continue Space Station following the retirement of the Shuttle, which he has stated will be in 2010. He has directed another team to undertake a study, to be completed in July as well, to better define plans for NASA's exploration program, including accelerating the Crew Exploration Vehicle (CEV) to minimize the gap after the Shuttle is retired in 2010 and defining the launch vehicle options for missions back to the Moon. Griffin has also made several significant organizational and personnel changes, including removing many key managers at headquarters and realigning the reporting structure for NASA's field centers so they report directly to him.

Looking forward, Administrator Griffin will have many critical decisions to make over the next year. He will need to install a new management team to replace those leaving their posts, and key decisions will be made as to what the focus and responsibilities of the various field centers will be and what facilities at those field centers are necessary to implement the Agency's goals. So far, Griffin has indicated a strong preference for giving the field centers more responsibility to manage programs and rebuild the expertise resident within the government.

Over the next year, Administrator Griffin will have many programmatic and technical issues to address. He will have to decide, once the Shuttle has flown a couple of times, whether the Agency should move forward with a Hubble servicing mission. Griffin will have to decide whether to recommend a Shuttle-derived launch vehicle

or use existing rockets for heavy lift missions to the Moon, a recommendation to be made jointly by the Administrator and the Secretary of Defense. He will also have to decide how to pay for increased costs on several programs, such as the recent cost increase on the Webb telescope, while maintaining a balanced portfolio of exploration, science, and aeronautics programs.

On the policy side, NASA and the Administration are still working out proposed legislative changes to the Iran Nonproliferation Act (INA), which currently prohibits the U.S. from purchasing or bartering for Soyuz capsules and Progress vehicles for the Space Station. Without a legislative proposal, it's difficult to know whether Congress would approve the change in law, but if the current law is not amended, the U.S. would not be able to have a permanent presence on the Space Station, at least not until the CEV was available. NASA is reportedly developing plans on how they would proceed with the station if the law is not changed, should that situation arise.

Issues:

Shuttle Return-to-Flight

Administrator Griffin's first priority has been to review NASA's progress in preparing the Space Shuttle for return-to-flight. He has personally participated in several technical reviews in preparation for the launch. Shortly after becoming Administrator, he postponed a planned Shuttle launch in May because of technical concerns with the Shuttle's External Tank and to provide additional time to complete some of the analysis. The launch is now scheduled for July 13th.

The Stafford-Covey Return-to-Flight Task Group, created to oversee NASA's implementation of the *Columbia* Accident Investigation Board's (CAIB) return-to-flight recommendations, has approved all but three of the CAIB's 15 return-to-flight recommendations. The three remaining items relate to developing an adequate tile repair capability, completing an analysis of potential sources of debris that could harm the Shuttle, and hardening the Shuttle against potential debris damage. The Stafford-Covey panel is scheduled to hold its final meeting on Monday, June 27th and will then provide NASA with its final results and recommendations.

Griffin will ultimately make the final decision on whether the Shuttle is ready to launch. The launch window extends from July 13th through to July 31st. The next launch window occurs in September.

Planning for Human Space Flight: Shuttle Transition and CEV Acceleration

Administrator Griffin has indicated that he will take a different approach in developing the missions to return astronauts to the Moon. He has created a new Office of Program Analysis and Evaluation (PA&E) and charged it with developing two critical plans for NASA's human space flight programs: one to examine options for how to configure the Space Station to conduct the research NASA must do to enable human exploration in deeper space, to minimize the number of Shuttle flights necessary to finish putting the station together, and to ensure the Shuttle can retire by the end of 2010.

The second planning effort involves developing the strategy for how to return astronauts to the Moon and possibly to Mars, including how to accelerate the development of the Crew Exploration Vehicle to minimize the gap between the retirement of the Shuttle and the first flight of the CEV, when the U.S. will not have its own capability of putting an astronaut into space. Both studies will be completed this summer in time to aid key Agency and Congressional decisions.

Administrator Griffin has set a goal to accelerate the Crew Exploration Vehicle (CEV) so it is ready as close to 2010 as possible to minimize any gap. Griffin has also directed that the CEV be designed to fly to the Space Station, a requirement that had not been set previously. NASA recently awarded contracts to two industry teams to begin preliminary design work for the CEV. Later this year, NASA is expected to release updated specifications and plans for accelerating the CEV. A key decision will be the selection of the launch vehicle for the CEV program.

Webb Telescope Cost Increase

Recently NASA announced that the cost of the James Webb Space Telescope, one of NASA's highest priority space science programs, was expected to increase by approximately \$1 billion to a total of \$4.5 billion. Under current plans, the mission is scheduled to be launched in 2011. NASA has convened a science panel and an engineering panel to review the mission, focusing on options to control costs and perhaps scale back the program. The panels' reports and recommendations are due to be completed later this summer. Any increases in cost will likely have to be borne by the science program. Both NASA and the scientific community will face tough choices as the options for dealing with Webb telescope become clear and a decision on whether NASA should conduct a Hubble servicing mission nears.

Workforce and Institutional Issues

The reduction in aeronautics funding proposed in the fiscal year 2006 budget request would require the elimination of 1,100 civil service jobs at NASA centers, although NASA has also said that there will not be any layoffs in 2006. In addition, NASA officials insist that there are no plans to close any NASA centers. Also, the retirement of the Space Shuttle in 2010 will require NASA to address the size and skill mix of a significant segment of the workforce at some centers. Work on the CEV and other elements of the mission to the Moon will significantly help offset the loss of Shuttle work, but some jobs and skills may still need to be eliminated. NASA may be able to help affected employees take advantage of training, retraining, and job placement programs to help the transition.

How to “right size” NASA, its facilities, and its workforce, and ensure NASA has the necessary skill mix, are among the issues Griffin and Congress will have to face.

Iran Nonproliferation Act Limits Use of the Space Station

NASA faces a legal hurdle, the Iran Nonproliferation Act (INA), that could affect utilization of the Space Station after April 2006. The U.S. is totally dependent on Russian Soyuz capsules for crew rescue, and without access to Soyuz capsules, Americans will not be able to stay on Space Station for long duration missions. U.S. astronauts will still be able to visit the Space Station using the Shuttle and will be able to continue construction of the station, but the Shuttle is not capable of remaining docked to the Space Station long enough to provide a crew rescue capability. NASA policy prevents astronauts from being aboard the Space Station if there is no rescue capability. Russia is currently providing capsules under an agreement that was grandfathered into the INA. However, Russia fulfills its obligation under that agreement in April 2006 and will no longer provide capsules or other services without payment.

The INA prohibits the U.S. from purchasing or bartering for services from Russia in connection with the International Space Station unless the President certifies that the Russians are not proliferating nuclear or certain missile technologies to 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, until the CEV is available.

The matter is currently the subject of an interagency review, and the Administration is expected to send up a legislative proposal to amend the INA as early as next month. However, 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 shares jurisdiction with the Science Committee over the INA, so any legislative effort would involve both committees. 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 Space Station. NASA has begun the process of developing contingency plans for the Space Station in the event that an exception in INA is not made for whatever reason. Without access to Soyuz, U.S. astronauts could be there as long as the Shuttle is docked, and thus could continue to utilize the station as long as the Shuttle is flying, but only on short-term visits. After the Shuttle is retired they would not be able to be there at all until the Crew Exploration Vehicle is available.

The Future of the Hubble Space Telescope

Two days after the President’s speech announcing the Vision for Space Exploration in January of 2004, NASA announced that it would not use the Shuttle to conduct further servicing missions to the Hubble Space Telescope. Then-Administrator Sean O’Keefe cited Shuttle safety concerns as the primary reason for his decision. Widespread criticism led NASA to explore the possibility of a robotic servicing mission. A December 2004 report from the National Research Council, however, concluded that a robotic servicing mission was not likely to succeed in the time available. In the fiscal year 2006 request, NASA requested funds only for a de-orbit mission (to ensure that Hubble re-enters from orbit without posing danger to populated areas).

During his April 2005 confirmation hearing, however, Administrator Griffin pledged to revisit the decision after the Shuttle returns to flight and its risks are better understood following the post-*Columbia* modifications. He also directed NASA engineers to resume planning for a Shuttle servicing mission so they could move forward expeditiously if needed. Work on more advanced space telescopes, such as the Space Interferometry Mission and the Terrestrial Planet Finder, is being deferred in order to preserve the option to service Hubble and provide for its safe de-orbit.

Aeronautics Research, Wind Tunnels and Workforce

Over the last decade, funding for NASA's aeronautics budget has declined by more than 50 percent, to about \$900 million. For fiscal year 2006, NASA proposes a relatively small decrease (\$54 million, or about six percent) in aeronautics research and development compared to 2005. The proposed five-year budget projection for aeronautics contemplates substantial funding reductions (20 percent) for aeronautics research, together with significant cutbacks in its civil service and contractor workforces. Civil service personnel and infrastructure costs account for much of the aeronautics budget, largely because of the expenses involved in the operation and maintenance of NASA's 31 wind tunnels. Specifically, the aeronautics program receives only six percent of NASA's total budget, yet it employs more than 20 percent of the entire NASA workforce and is responsible for 40 percent of all of NASA's infrastructure costs.

NASA commissioned a study last year from RAND, which concluded that NASA should continue to operate 29 of its 31 wind tunnels. RAND estimated the annual operating cost of all 31 tunnels to be \$125-\$130 million. RAND argued that while some of the tunnels were not well used now, they offered capabilities that could be needed in the future and that would be hard to replicate if the tunnels were shut down. RAND also argued that while some questions that once needed to be solved with wind tunnels could now be answered through computer simulation, many critical questions still required wind tunnels. It also said that wind tunnel data were sometimes needed to develop computer simulation software.

The Committee held a hearing on aeronautics earlier this year and the House appropriations bill restores the cuts to the fiscal year 2006 budget. In addition, the appropriations bill includes a legislative provision directing the Administration to develop a national aeronautics policy to guide NASA's aeronautics research program.

Balancing Science and Exploration

The President's Vision for Space Exploration provides the human space flight program with a clear set of goals to guide its programs. Many applaud the Administration for providing clear direction for the human space flight program, but it has also made others nervous, particularly in the science community, that the Vision will require a disproportionate amount of NASA's funding and that valuable science programs will suffer.

In the past, Congress has played an important role in ensuring that a balance exists between science and human space activities. However last year, because of the uncertainty surrounding the implementation of the Vision and the unknown costs of the return-to-flight costs for the Shuttle, Congress provided an unprecedented level of authority to transfer funding between appropriations accounts. The effect of this authority was to remove the "wall" between science and human space activities.

Administrator Griffin has stated that the Vision is not intended to undermine other core functions of the Agency, such as aeronautics, space science, and Earth science, but it is not yet clear how NASA will maintain a balance between science and human space activities within its projected budget.

Organizational and Personnel Changes

Administrator Griffin has moved quickly in making key personnel and organizational changes. First, he announced that the directors for each of NASA's field centers would report directly to him, instead of through the Associate Administrators. Next, he informed three of the four Associate Administrators (human space flight, science, and exploration) of his intent to reassign them to other positions within the Agency. The fourth Associate Administrator (for aeronautics) has decided to step down. Additional personnel changes are expected over the next several months as Griffin begins to install his own management team. An important issue is how quickly he will be able to fill key slots to completely staff his management team.

FY 2005 Operating Plan Update

On May 11, Administrator Griffin submitted an updated Operating Plan for fiscal year 2005. The plan provides the first complete picture of how NASA is prioritizing its funding for 2005. The plan fully funds the \$762 million increase above the appropriated amount for 2005 for returning the Shuttle to flight and provides the full \$291 million appropriated to begin planning for a Hubble servicing mission, as well as re-programs over \$500 million in cost increases for several programs, most notably to cover costs for the Mars Reconnaissance Orbiter, scheduled for launch this August, and the New Horizons mission to Pluto set to launch in January 2006. The plan also fully funds Congressionally-directed items, as adjusted for the rescission.

Administrator Griffin has said that his overarching philosophy in finding offsets is to eliminate lower-priority programs rather than reducing all programs in the face of budget difficulties. To do so, he must set clear priorities within the budget that has been allocated. To pay for the increases included the Operating Plan NASA is considering a two-year delay in the Mars Science Laboratory to 2011. To pay for the 2005 costs to prepare for a possible Hubble servicing mission, NASA will defer work on several advanced space telescopes, such as the Space Interferometry Mission (SIM) and the Terrestrial Planet Finder. NASA is also reviewing plans for its nuclear systems program, Project Prometheus. NASA has indefinitely deferred the Jupiter Icy Moons Orbiter (JIMO) and will focus on higher priority and more near-term needs for nuclear power, such as for use as a power source on the Moon's surface. A summary of NASA's Operating Plan changes is in the Appendix.

APPENDIX A

Summary of Budget and Operating Plan Changes

National Aeronautics and Space Administration								
(Budget authority, \$ in millions)	FULL COST							
By Appropriation Account	Initial Operating Plan	April Operating Plan	May Operating Plan					
By Mission Directorate By Theme	FY 2005	FY 2005	FY 2005	FY 2005	FY 2007	FY 2008	FY 2009	FY 2010
Science, Aeronautics, and Exploration	9,334.7	9,334.7	9,050.5	9,661.0	10,549.8	11,214.6	12,209.6	12,796.1
Science*	5,527.2	5,527.2	5,553.7	5,476.3	5,960.3	6,503.4	6,853.0	6,797.6
Solar System Exploration	1,958.1	1,859.1	1,787.1	1,900.5	2,347.7	2,831.8	2,998.9	3,066.1
The Universe	1,513.2	1,513.2	1,475.1	1,512.2	1,531.5	1,539.4	1,495.0	1,406.7
Earth-Sun System	2,155.8	2,155.8	2,291.4	2,063.6	2,081.2	2,132.2	2,359.0	2,324.8
Exploration Systems**	2,684.5	2,684.5	2,355.9	3,165.4	3,707.0	3,825.9	4,473.7	5,125.5
Constellation Systems	526.0	526.0	421.9	1,120.1	1,579.5	1,523.7	1,990.9	2,452.2
Exploration Systems Research and Technology	722.8	722.8	766.0	919.2	907.3	989.2	1,050.3	1,078.5
Prometheus Nuclear Systems and Technology	431.7	431.7	270.3	319.6	423.5	500.6	614.0	779.0
Human Systems Research and Technology	1,003.9	1,003.9	897.7	806.5	796.7	812.4	818.5	815.6
Aeronautics Research	906.2	906.2	962.0	852.3	727.6	730.7	727.5	717.6
Aeronautics Technology	906.2	906.2	962.0	852.3	727.6	730.7	727.5	717.6
Education Programs	216.7	216.7	178.9	166.9	154.9	154.7	155.4	155.4
Education Programs	216.7	216.7	178.9	166.9	154.9	154.7	155.4	155.4
Exploration Capabilities	6,704.4	6,704.4	6,998.4	6,763.0	6,378.6	6,056.7	5,367.1	5,193.8
Space Operations	6,704.4	6,704.4	6,988.4	6,763.0	6,378.6	6,056.7	5,367.1	5,193.8
International Space Station	1,676.3	1,676.3	1,676.3	1,656.7	1,835.3	1,790.9	2,152.3	2,375.5
Space Shuttle	4,543.0	4,543.0	4,838.2	4,530.6	4,172.4	3,865.7	2,815.1	2,419.2
Space and Flight Support	485.1	485.1	473.9	375.9	370.9	400.0	399.7	399.1
Inspector General	31.3	31.3	31.3	32.4	33.5	34.6	35.2	37.3
TOTAL	16,070.4	16,070.4	16,070.4	16,456.3	16,962.0	17,305.9	17,611.9	18,027.1
Year to year increase				2.4%	3.1%	2.0%	1.8%	2.4%
Emergency Hurricane Supplemental	126.0	126.0	126.0					

*Science Mission Directorate reflects the combination of the former Space Science and Earth Science Enterprises.
 **Beginning in FY 2005, Exploration Systems moves from Exploration Capabilities to Science, Aeronautics and Exploration, Exploration Systems
 Mission Directorate reflects the combination of the former Biological & Physical Research and Exploration Systems Enterprises.

Totals may not add due to rounding.

Chairman BOEHLERT. The Committee will come to order.

It is a great honor and pleasure to welcome Dr. Michael Griffin this morning in his first appearance before this committee as NASA Administrator. Dr. Griffin appeared before us many times as a private citizen, and he has long served this committee as a trusted advisor. The announcement of his nomination was greeted in these precincts with something close to glee, and we have not been disappointed.

Mike has taken on his duties with gusto and with candor. In fact, it would be easy to paint Mike as a Don Quixote-like figure, lost in his books. Mike does not realize that idealism has dimmed, and he suits up and wanders about NASA, righting old wrongs, questioning old varieties, and rescuing programs in distress.

But there is an essential difference between Administrator Griffin and the man of La Mancha. The errors Dr. Griffin is battling are real, and the results are consequential rather than comic.

Indeed, much is riding on Dr. Griffin's tenure at NASA. Each and every NASA program is facing fundamental questions. What will the CEV look like, and what will we do on the Moon? What kind of aeronautics research will NASA pursue and at what facilities? Will NASA continue to have a robust Earth science program? What is the future of the Hubble and Webb telescopes? What will be done about the *Iran Nonproliferation Act*?

And those are just a few of the basic issues. In fact, more than two years after the President announced his *Vision for Space Exploration*, NASA can barely give a definitive answer to a single question about its programs. That is not, believe it or not, criticism of NASA. The Agency is rethinking its activities, and the answers will take time. Moreover, Administrator Griffin wisely sent some of his teams working on the answers back to the drawing board. But it is important to remember that we are pretty much flying blind right now. We expect to have the first answers about the human space flight program some time in July. And NASA will have to answer the most fundamental question about its current manned programs this week, when it determines whether to return the Shuttle to flight. As yesterday's Stafford Covey deliberations indicated, that is a close question. And I am ready to abide by any decision Administrator Griffin makes.

But even as NASA wrestles with these thorny issues, congress needs to move ahead with authorizing legislation. The bill that Chairman Calvert and I introduced yesterday provides a framework for moving forward, ensuring that Congress has the information it needs to make more detailed policy calls in the years ahead.

I look forward to working with all of the members of this committee as we move the bill forward to enactment over the next several months.

There are two matters on which the bill is crystal clear: first, that we should move ahead with returning to the Moon by 2020; and second, that human space flight programs cannot become the sole mission of the Agency. Figuring out how to balance those goals will be no easy task, but it is essential. Part of the answer is ensuring that the Shuttle is indeed retired no later than 2010. But it will take more than that to ensure that NASA continues to have vibrant and productive aeronautics, Earth science, and space science

programs, programs that are not evaluated in terms of the vision but on their own terms for their own contributions.

I look forward to working with Administrator Griffin, who also wants to see a balanced and multi-mission NASA. And so I look forward to hearing from the Administrator on his latest thoughts this morning. If things don't go well, he can just write us off as one more windmill he has to tilt with today.

Thank you.

Mr. Gordon.

[The prepared statement of Chairman Boehlert follows:]

PREPARED STATEMENT OF CHAIRMAN SHERWOOD L. BOEHLERT

It is a great honor and pleasure to welcome Mike Griffin this morning in his first appearance before this committee as NASA Administrator. Dr. Griffin appeared before us many times as a private citizen and he has long served this committee as a trusted advisor. The announcement of his nomination was greeted in these precincts with something close to glee.

And we have not been disappointed. Mike has taken on his duties with gusto and with candor. In fact, it would be easy to paint Mike as a Don Quixote-like figure: lost in his books, Mike does not realize that idealism has dimmed, and he suits up and wanders about NASA, righting old wrongs, questioning old verities and rescuing programs in distress.

But there's an essential difference between Administrator Griffin and the Man of LaMancha: the errors Mike is battling are real, and the results are consequential rather than comic.

Indeed, much is riding on Mike's tenure at NASA. Each and every NASA program is facing fundamental questions: what will the CEV look like and what will we do on the Moon? What kind of aeronautics research will NASA pursue and at what facilities? Will NASA continue to have a robust Earth science program? What is the future of the Hubble and Webb telescopes? What will be done about the *Iran Non-Proliferation Act*?

And those are just a few of the basic issues. In fact, more than two years after the President announced his *Vision for Space Exploration*, NASA can barely give a definitive answer to a single question about its programs.

That is not, believe it or not, a criticism of NASA. The Agency is rethinking its activities, and the answers will take time. Moreover, Administrator Griffin, wisely, sent some of the teams working on the answers back to the drawing board. But it's important to remember that we are pretty much "flying blind" right now. We expect to have the first answers about the human space flight program some time in July.

And NASA will have to answer the most fundamental question about its current manned programs this week, when it determines whether to return the Shuttle to flight. As yesterday's Stafford-Covey deliberations indicated, that is a close question, and I am ready to abide by any decision Administrator Griffin makes.

But even as NASA wrestles with these thorny issues, Congress needs to move ahead with authorizing legislation. The bill that Chairman Calvert and I introduced yesterday provides a framework for moving forward, ensuring that Congress has the information it needs to make more detailed policy calls in the years ahead. I look forward to working with all the Members of this committee as we move the bill forward to enactment over the next several months.

There are two matters on which the bill is crystal clear. First, that we should move ahead with returning to the Moon by 2020, and second that human space flight programs cannot become the sole mission of the Agency.

Figuring out how to balance those goals will be no easy task, but it is essential. Part of the answer is ensuring that the Shuttle is indeed retired no later than 2010.

But it will take more than that to ensure that NASA continues to have vibrant and productive aeronautics, Earth science and space science programs—programs that are not evaluated in terms of the Vision, but on their own terms, for their own contributions. I look forward to working with Administrator Griffin, who also wants to see a balanced and multi-mission NASA.

And so I look forward to hearing Administrator Griffin's latest thoughts this morning. If things don't go well, he can just write us off as one more windmill he had to tilt with today.

Thank you.

Mr. GORDON. Thank you, Mr. Chairman.

I want to welcome not only Dr. Griffin, but also our audience today. I think the number of folks that are here indicate the significance of this hearing, and I am sure there are many more that are watching elsewhere. So welcome everyone. And as usual, I want everyone to know that I concur with my Chairman and his statement, and we are on board in most ways—and in sync in our direction for NASA.

Dr. Griffin, you have come to the job of Administrator with impressive technical credentials and a wealth of experience. I want to wish you well. I look forward to working with you to ensure that the United States maintains a strong and robust civil space and aeronautics program.

I count myself among the supporters of the Exploration Initiative. I believe that the long-term goals for human space flight program proposed by the President makes sense. At the same time, I must say that I am concerned about where NASA is headed and about the large number of unanswered questions that remain almost 18 months after the President announced his Exploration Initiative.

And let me elaborate for a minute on some of those unanswered questions. For example, what is the overall architecture for achieving the President's exploration goals? That is, where are we going, how are we going to get there, what are we going to do when we get there, how long will it take, and how much will it cost?

Last year, we were told that there was a rigorous process underway involving 11 concept exploration and refinement teams from industry and academia working with NASA to answer these questions. Now we are being told that the process is no longer relevant. Instead, a small internal NASA team has been tasked with coming up with an exploration architecture by some time in July.

Another set of questions. What is the Crew Exploration Vehicle going to do? How are we going to acquire it? And what will it cost? Last year, we were told that there was a rigorous process to develop a "System of Systems" concept for the CEV and associated launch vehicles, incorporating a "spiral development" acquisition approach.

Now we are being told that the planned CEV acquisition approach is no longer relevant and that a new approach is being taken in order to accelerate the CEV, but there is no way of knowing, at this point, how much it will cost to accomplish the accelerated program.

What is the International Space Station going to be used for, and what is it going to look like? Last year, we were told that the International Space Station research program was being restructured to more closely align it with the Exploration Initiative and that Congress would be given the restructured plan last fall.

Now we are being told that the entire ISS program content is once again being restructured and that it will be later this summer before we will know what those plans are. And we hear that our international partners are very concerned about the impact on their plans from NASA's restructuring.

And what is the priority of the nuclear power and propulsion system in the President's Exploration Initiative? For the last several years, we were told that the most appropriate demonstration of the

Project Prometheus space nuclear technology would be the scientific probe to Jupiter's moons, called the JIMO mission.

Now we are being told that the JIMO mission is essentially dead, that Project Prometheus is being restructured, and that the main Project Prometheus activity at present appears to be transferring money from NASA to DOE's Office of Naval Reactors.

Last year, we were told that it was important to undertake the whole series of exploration systems research and technology development projects at a cost of more than \$700 million in fiscal year 2005 alone.

Now we are being told that the funding for many of those proposed projects has been put on hold. Now I could go on, but I hope my point is clear. Almost 18 months after the President announced his Exploration Initiative, basic questions are still unanswered, and much of what Congress was told last year is no longer valid.

Yet in the absence of needed information, Congress is being asked to support the exact funding levels for exploration proposed in the fiscal year 2006 NASA budget request, almost \$3.2 billion, and to cut other non-exploration programs in order to free up funds for the initiative.

That is, we are being asked to make a "trust me" vote on NASA's funding requests, and I might add that is what the previous Administrator not only asked but demanded and received, and you see where we are.

Dr. Griffin, you have only been on the job for about two months, and you cannot be held accountable for anything that had gone on at the Agency prior to your arrival. At the same time, given all of the changes you have made to the exploration program since you became NASA Administrator, it would seem that you have concluded that none, or rather not all of more than \$2 billion allocated for NASA's exploration system program since January 2004, has been wisely spent.

And that is troubling, because even \$100 million of that exploration system's funding could make a significant difference in the health of NASA's aeronautics program or NASA's Earth science program.

Yet the reality is that under the President's plan, those other programs may increasingly become bill payers for the Exploration Initiative in coming years, and the healthy balance that should exist between all of NASA's core missions will be lost. That is certainly going to be the case if NASA continues cutting NASA's—or if the Administration continues cutting NASA's out-year funding profile in the upcoming fiscal year 2007 request as it did in the fiscal year 2006 request, while at the same time attempting to hold on to the President's milestones for his Exploration Initiative.

Unfortunately, the results of that approach are already evident. Some 2,500 current NASA employees are at risk of losing their jobs. Scientific missions are being canceled, deferred, or cut, and NASA's aeronautics approach—or program is on a path of becoming "irrelevant" in the words of one of the recent witnesses before this committee.

In addition to being a waste of human capital and infrastructure built up at NASA over the last forty years, I believe such actions will make it increasingly difficult to sustain support for NASA's

budget in coming years as the Agency's focus is narrowed and the overall fiscal situation facing the Nation becomes worse. I hope we can avoid such an outcome, but I think it will require a course of correction within NASA and the White House if that is to succeed.

Now, Mr. Griffin, what does all of this mean? Let me tell you. You remember very well a few years ago when we had a number of votes at a time when we had a tough—we had world-record budget deficits, we had a lot of needs here on Earth, and the question was: "Should we continue with the International Space Station?" And after a number of votes, by only one vote did the Space Station succeed.

Now what I am afraid that we are going to see is, at a time when we have even worse deficits, even more needs on Earth, we are going to see a series of attempts to take money out of Mission to Mars and put it here on Earth. And as we do this, and it is not going to be tomorrow, it is going to be in the next three or four years, during that same period of time, I am afraid that we are going to see a cannibalization of other programs in NASA. We are going to see a lot of long-term employees with expertise and core missions within the centers to be lost.

And so the situation then could very well be, at this point, and whatever it might be in three or four years, we have those same kind of votes. The—we decide that money, rather than going to Mars, ought to be placed in schools or veterans or something else on Earth, while at the same time, we have already undermined our existing programs. Well, then do we say, "Well, NASA now is not relevant in even more ways, and there are even more cuts." That is my concern.

And so I also have a suggestion. And let me tell you what my suggestion is. I am taking a little more time than I normally do, maybe going back to some previous times, because you haven't been to see me yet, and so I want to have—take this opportunity to let you know.

Here is what I think that we need to do.

If we are planning on going to Mars in the year 2030, or I guess it is 2035 or beyond, then rather than 30 years, it might be 31 years. I don't think we are any worse off, and we might save a lot of money. What I would hope you would do is go forward with those things we know that need to be done. We have got to return-to-flight. We have got to get this Crew Exploration Vehicle going. We need to go ahead and look for the—a heavy payload type of lift. We have got to do those things, but let us slow down in terms of restructuring NASA until we—until you answer those questions that are out there. Let us take this year to try to find out what are those programs outside the exploration mission that really are important. Let us have some priorities there. Let us be sure that we are not going to have this start-stop approach any longer. I think we will save money. I think it would be the best thing for NASA, and I hope that you will give that some consideration.

And thank you for your indulgence, Mr. Chairman. I guess I am reclaiming lots of time that I yielded early in the past.

[The prepared statement of Mr. Gordon follows:]

PREPARED STATEMENT OF REPRESENTATIVE BART GORDON

Good morning. I want to join the Chairman in welcoming Dr. Griffin to today's hearing.

Although Dr. Griffin has testified before this committee on previous occasions, this will be the first time we will have a chance to hear from him in his capacity as NASA Administrator.

Dr. Griffin, you come to the job of Administrator with impressive technical credentials and a wealth of experience. I want to wish you well, and I look forward to working with you to ensure that the United States maintains a strong and robust civil space and aeronautics program.

I count myself among the supporters of the exploration initiative—I believe that the long-term goals for the human space flight program proposed by the President make sense. At the same time, I must say that I am concerned about where NASA is headed, and about the large number of unanswered questions that remain almost 18 months after the President announced his exploration initiative.

Let me elaborate for a minute on some of those unanswered questions. For example, what is the overall architecture for achieving the President's exploration goals—that is, where are we going, how are we going to get there, what will we do when we get there, and how long will it take and how much will it cost?

Last year, we were told that there was a rigorous process underway involving 11 Concept Exploration and Refinement teams from industry and academia working with NASA to answer those questions. Now we are being told that that process is no longer relevant—instead, a small internal NASA team has been tasked with coming up with an exploration architecture by sometime in July.

Another set of questions: What is the Crew Exploration Vehicle going to do, how are we going to acquire it, and what will it cost? Last year, we were told that there was a rigorous process to develop a "System of Systems" concept for the CEV and associated launch vehicles, incorporating a "spiral development" acquisition approach.

Now we are being told that the planned CEV acquisition approach is no longer relevant, and that a new approach is being taken in order to accelerate the CEV—but that there "is no way to know" at this point how much it will cost to accomplish that accelerated program.

What is the International Space Station going to be used for, and what is it going to look like? Last year, we were told that the International Space Station research program was being restructured to more closely align it with the exploration initiative—and that Congress would be given that restructured plan last fall.

Now we are being told that the entire ISS program content is once again being restructured, and that it will be later this summer before we know what the new plans are. And we hear that our International Partners are very concerned about the impact on their plans of NASA's latest restructuring.

What is the priority of nuclear power and propulsion systems in the President's exploration initiative? For the last several years, we were told that the most appropriate demonstration of Project Prometheus's space nuclear technologies would be a scientific probe to Jupiter's moons, the so-called JIMO mission.

Now we are being told that the JIMO mission is essentially dead, that Project Prometheus is being restructured, and that the main Project Prometheus activity at present appears to be transferring money from NASA to DOE's Office of Naval Reactors.

Last year, we were told that it was important to undertake a whole series of Exploration Systems Research and Technology development projects at cost of more than \$700 million in FY 2005 alone.

Now we are being told that the funding for many of those proposed projects has been put on hold. I could go on, but I hope my point is clear. Almost 18 months after the President announced his exploration initiative, basic questions are still unanswered. And much of what Congress was told last year is no longer valid.

Yet in the absence of needed information, Congress is still being asked to support the exact funding levels for exploration proposed in the FY 2006 NASA budget request—almost \$3.2 billion—and to cut other non-exploration programs in order to free up funds for the initiative.

That is, we are being asked to make a "faith-based" vote on NASA's funding request.

Dr. Griffin, you have only been on the job for about two months, and you cannot be held accountable for anything that had gone on at the Agency prior to your arrival. At the same time, given all the changes you have made to the Exploration program since you became NASA Administrator, it would seem that you have con-

cluded that not all of the more than \$2 billion allocated for NASA's Exploration Systems program since January 2004 has been wisely spent.

That's troubling, because even a \$100 million of that Exploration Systems funding could make a significant difference to the health of NASA's aeronautics program or NASA's Earth science program.

Yet, the reality is that under the President's plan, those other programs may increasingly become bill payers for the exploration initiative in coming years and the healthy balance that should exist between all of NASA's core missions will be lost. That is certainly going to be the case if the Administration continues cutting NASA's out year funding profile in the upcoming FY 2007 budget request as it did in the FY 2006 request while at the same time attempting to hold on to the President's milestones for his exploration initiative.

Unfortunately, the results of that approach are already evident: Some 2,500 current NASA employees are at risk of losing their jobs; scientific missions are being canceled, deferred, or cut; and NASA's aeronautics program is on a path to becoming "irrelevant," in the words of one of the recent witnesses before this committee.

In addition to being a waste of the human capital and infrastructure built up at NASA over the last 40 years, I believe such actions will make it increasingly difficult to sustain support for NASA's budget in coming years as the Agency's focus is narrowed and the overall fiscal situation facing the Nation worsens. I hope we can avoid such an outcome, but I think it may require a course correction within NASA and the White House if we are to succeed.

Well, we have a lot to talk about today. I again want to welcome you to this morning's hearing, Dr. Griffin, and I look forward to your testimony.

Chairman BOEHLERT. The spirit of cooperation.

The Chair is pleased to recognize the distinguished Chairman of the Subcommittee on Space and Aeronautics, Mr. Calvert of California.

Mr. CALVERT. And in the spirit of brevity, Mr. Chairman, I will be very brief.

Today, we welcome NASA's 11th Administrator, Dr. Mike Griffin, and his first appearance before this committee. Tomorrow, we will mark up the first NASA authorization bill in a number of years in the Subcommittee on Space and Aeronautics, which I am certainly happy to Chair. And I am very hopeful that we will be able to get this bill through the House of Representatives before the August work period where we can go into conference with the United States Senate.

Dr. Griffin, you are certainly a breath of fresh air for NASA, and we are really looking forward, as you can tell, to working with you to build a better and stronger NASA together.

As you know, we are beginning a second space age, as I like to put it. The first space age was born in the Cold War. The second space age will feature space exploration while achieving synergy with commercial, civil, national security space programs. Doctor, you are in a place to lead us in the second space age, and we will work together to build a better NASA.

For NASA to develop an overall grand strategy, we must have a strategy for NASA's aeronautics research and technology as well as a multi-year plan for NASA's science programs that parallel NASA's vision for space exploration. Once we have well defined mission strategies, NASA will be able to move forward more effectively and efficiently in its core areas.

As you know, I plan on visiting all of the NASA centers in this Congress, and so far I have visited Kennedy Space Center. I plan to be at the Jet Propulsion Laboratory on July 3 to observe the climax of Deep Impact program as it collides with a comet, and for

the first time, we will have a good look inside a comet. This will be an exciting evening.

At each of these centers, I have been impressed with the enthusiasm, dedication, and the technical skills of the workforce. I spoke with a number of workers who were preparing the Space Shuttle for return-to-flight, processing components of International Space Station, conducting life science research, and testing experimental vehicles. This NASA community is comprised of a talented workforce with skills that America cannot afford to lose.

I believe that Mike Griffin is the right person to lead this talented workforce in a direction to benefit our nation and to enhance our competitiveness globally. Administrator Griffin said in a speech last week, "My feet are firmly grounded in reality, but I am also grounded in the idea that we need to change some of the definition of reality."

I look forward to working with you as we change the definition of reality and work into this second space age, and I certainly welcome your testimony today.

And I yield back the balance of my time.

[The prepared statement of Mr. Calvert follows:]

PREPARED STATEMENT OF CHAIRMAN KEN CALVERT

Today, we welcome NASA's 11th Administrator, Dr. Michael Griffin, in his first official appearance as Administrator before the House Science Committee. Tomorrow, we will mark up the first NASA Authorization in a number of years in the Subcommittee on Space and Aeronautics, which I chair. I am very hopeful that we will be able to get our bill through the House of Representatives before our August district work period.

Dr. Griffin is a breath of fresh air for NASA and we are really looking forward to working with him as we build a better and stronger NASA together. We are beginning a "Second Space Age." The first space age was born of the Cold War. This Second Space Age will feature space exploration while achieving synergy with the commercial, civil and national security space programs. Dr. Griffin is now in place to lead us in this Second Space Age as we work together to make a better NASA.

For NASA to develop an overall grand strategy, we must have a multi-year plan for NASA's aeronautics research and technology as well as a multi-year plan for NASA's science programs that parallel NASA's Vision for Space Exploration. Once we have well-defined missions and strategies, NASA will be able to move forward more effectively and efficiently in all its core areas.

I plan to visit all the NASA centers this Congress and so far, have visited the Kennedy Space Center and Dryden Flight Research Center. I plan to visit the Jet Propulsion Laboratory on July 3, to observe the climax of the Deep Impact program as it collides with a comet and we have our first look inside a comet. At each of these centers, I have been impressed with the enthusiasm, dedication and technical skills of the workforce. I spoke with a number of the workers who are preparing the Space Shuttle for the Return-to-Flight, processing components of the International Space Station, conducting life-science research, and testing experimental vehicles. This NASA community is comprised of a talented workforce with skills that America cannot afford to lose.

I believe that Mike Griffin is the right person to lead this talented workforce in a direction to benefit our nation and to enhance our competitiveness globally. As Administrator Griffin said in a speech last week, "my feet are firmly grounded in reality, but I am also grounded in the idea that we need to change some of the definition of reality."

I look forward to working with Administrator Griffin as we change the definition of reality and move into this Second Space Age.

I welcome Dr. Griffin to testify today.

Chairman BOEHLERT. Thank you very much, Mr. Calvert. And thank you for the leadership you are providing in the Subcommittee during a very important time for the Agency.

Mr. Udall.

Mr. UDALL. Thank you, Mr. Chairman. Good morning, Dr. Griffin.

I am going to hopefully—put myself in the same spirit as my chairman, Mr. Calvert, and be brief.

If I could, Mr. Chairman, I would like to ask for unanimous consent to include my entire statement in the record.

Chairman BOEHLERT. Without objection.

Mr. UDALL. Dr. Griffin, I think it may be a bit of a cliché, but I think it is worth saying that NASA is at a crossroads, and this is the focus that we want to have at this hearing is how we balance all of these competing interests. The President has given us a new long-term vision for human space flight. I support that vision, but I am not sure how all of these aspirations, as I just said, fit into the budget that has been provided to NASA.

Congressman Calvert, Congressman Gordon, and Congressman Boehlert talked about the aeronautic side of NASA. I have concerns based on what we have heard recently from non-government witnesses, and looking at the President's budget, I think those concerns are worth considering. That is one of the reasons I introduced, along with a group of bipartisan supporters, H.R. 2358, the *Aeronautics R&D Revitalization Act*, which I would like to see incorporated into the NASA reauthorization.

The concerns I have also heard from the fundamental biology and microgravity research communities, as well as from commercial organizations, and about what we are going to do in the areas of Earth and space science, I think, are worth hearing. And I look forward to your testimony today in that regard.

As I close, I do want to thank you for your willingness to start preparing for a Shuttle servicing mission to the Hubble space telescope, contingent, of course, on a successful return-to-flight of the Space Shuttle. It is one of the most significant space laboratories ever launched, and I believe we should continue to utilize it to its fullest capacities as long as it remains productive.

So again, Doctor, it is a tremendous opportunity to have you here. Thank you for your service. And I look forward to hearing your testimony and engaging further with you in the question and answer period.

Mr. Chairman, I would yield back any time I have remaining.
[The prepared statement of Mr. Udall follows:]

PREPARED STATEMENT OF REPRESENTATIVE MARK UDALL

Good morning and welcome, Dr. Griffin. I look forward to working with you in the months ahead, and I wish you all the best as you shoulder your new responsibilities.

While it can sound like a bit of a cliché to say that NASA is at a crossroads, I think it nonetheless is an accurate description of the current situation.

The President has given NASA a new long-term vision for its human space flight program—one that I support. At the same time, it's not at all clear that the President's aspirations fit the budget that has been provided to NASA.

And one result of that mismatch is that the highly productive balance that has existed between NASA's space science, Earth science, aeronautics, and human space flight activities is at risk of being seriously damaged.

The evidence of the stresses on NASA's non-exploration programs is all around us.

At a recent hearing before the Space Subcommittee, there was unanimity among all of the non-government witnesses that NASA's aeronautics programs have been

negatively impacted by the budget cuts of recent years and that the President's proposed five-year budget for aeronautics will significantly worsen the situation.

That is one of the reasons I and a bipartisan group of co-sponsors introduced H.R. 2358, the *Aeronautics R&D Revitalization Act*, which I would like to see incorporated into the NASA Authorization.

The situation facing NASA's Earth-Sun Systems program is no better. The Science Committee heard compelling testimony from a panel of respected experts that bluntly concluded that the Nation's Earth observations program is at risk. And we have heard about productive missions being threatened with termination due to budgetary shortfalls.

In addition, although we have not yet had a Space Station oversight hearing, I and my staff have been hearing from the fundamental biology and micro-gravity research community, as well as from commercial organizations.

Their message is the same.

For more than 15 years, NASA has been telling them that there would be a place for their research on the ISS. Now however, it appears that the budgetary demands of the exploration initiative are going to cause NASA to break those long-standing commitments.

While all of this has been going on, the unfortunate fact is that 18 months after the President first announced his exploration initiative, specifics on NASA's plans are still hard to come by. That concerns me, especially given the fact that the specifics we do have from NASA concern cuts to NASA's non-exploration programs.

I hope that Dr. Griffin will be able to shed some light on what NASA's plans are for both exploration and for NASA's other core missions, as well as for its workforce. We will need that information if we are to do our oversight jobs properly, and I think enough time has passed for us to be justified in asking for specifics.

Finally, before I close, I would just like to express my appreciation to Dr. Griffin for his willingness to start preparing for a Shuttle mission to service the Hubble space telescope, contingent of course on a successful return-to-flight of the Space Shuttle.

As you know, Hubble is one of the most significant space observatories ever launched, and I believe that we should continue to utilize it to its fullest as long as it remains scientifically productive.

Mr. Chairman, today's hearing is an important one for this committee, and I look forward to hearing from our witness. Thank you.

Chairman BOEHLERT. Thank you very much.

How is that for a warm welcome?

Dr. GRIFFIN. Very interesting.

[The prepared statement of Mr. Hall follows:]

PREPARED STATEMENT OF REPRESENTATIVE RALPH M. HALL

Mr. Chairman, thank you for holding this hearing on the future of NASA. On the eve of the Subcommittee markup of the NASA Authorization bill, it is useful to hear what the Administrator of the space agency thinks about the future of the organization.

Dr. Griffin, I would like to congratulate you on your new position as the 11th Administrator of NASA. You have a challenging task ahead, but I know that you are more than capable of leading this agency into a bright and exciting future. I am already pleased with the direction you have been going since taking the position on April 14.

When President Bush announced the new *Vision for Space Exploration* in January 2004, I was excited to see that NASA had a new direction and focus for the future. Our ventures into space not only keep America at the forefront of exploration and innovation, but they also are vital to our economy and our national security. This new Vision sets America on a course toward the Moon and Mars, and we should embrace this dream and work to make it a reality.

The money that we put into NASA grows exponentially when we consider the scientific and technological spin-offs that space exploration provides. Experiments conducted on the Space Shuttle and International Space Station expand health research and move us toward cures for some of our most threatening diseases. Micro-gravity experiments in the 1990s led to advances in antibiotics to fight infections. These experiments also unlocked secrets to protein growth that produced medicines to treat patients who have suffered from strokes and to prepare them for open-heart surgery. Americans suffering from osteoporosis also benefit from bone-density experiments conducted on the International Space Station in microgravity environments. These tests accelerated the clinical trials of a drug that is expected to be

on the market soon. From the development of MRI technology to microchips, the scientific partnerships between NASA and American universities and companies ensure our nation's viability, increase our nation's competitiveness, and help drive our economy.

A few weeks ago, I had the opportunity to meet with the astronauts who will be returning to flight next month on the Shuttle. Returning the Shuttle to flight is the first step toward meeting the goals of the Vision, and it helps America fulfill its promise to our international partners to complete the International Space Station. I know that NASA has made progress toward making the Shuttle as safe as possible, and I am pleased that the *Columbia* Accident Investigation Board (CAIB) approves of many of the changes the Agency has made.

Retiring the Shuttle in 2010 and moving to a newer, safer vehicle is a welcome goal. As contractors develop the new Crew Exploration Vehicle for human space flight, we need to make sure that a viable crew escape system for our astronauts is incorporated into the design of the spacecraft. As we implement the new space vision, I will work to ensure that NASA fulfills this priority and minimizes the risks for our brave men and women who fly our space missions. Our hopes and dreams ride with them, and we must do all we can, at whatever cost is necessary, to ensure their safety.

Dr. Griffin, thank you again for coming to Capitol Hill today to tell us of your plans for NASA. I look forward to working with you and your staff to reach these goals together and move America toward its destiny in space.

[The prepared statement of Mr. Weldon follows:]

PREPARED STATEMENT OF REPRESENTATIVE CURT WELDON

Mr. Chairman, Mr. Ranking Member, and Administrator Griffin, I appreciate the opportunity to submit my testimony for the record.

First, I would like to officially congratulate Administrator Griffin on his new position and thank him for taking the time to come to Capitol Hill and address the Committee's questions and concerns. I look forward to working with him to create a stronger more viable NASA.

I also look forward to the Shuttle's possible Return-to-Flight later this month. I trust the Administrator's experience and expertise will enable him to make the right decisions about the safety of the Shuttle's launch while taking into account the recommendations set forth by the Stafford Covey Return-to-Flight Task Group (SCTG).

I do support NASA's desire to further explore space and recognize the immeasurable value in learning more about our solar system, but I would be remiss if I did not voice my concerns over the projected costs of the President's *Vision for Space Exploration*. I am concerned that too much of our precious resources and funding will be diverted away from other NASA programs in favor of space exploration.

As a senior Member of this committee, over the past several years, I have witnessed the decrease and now elimination of funds for rotorcraft research. As an aggressive supporter of rotorcraft funding and research, I am greatly concerned that this important program is being neglected. NASA has cut aeronautics research by half between 1998 and 2003 and requested zero dollars for its rotorcraft research programs for FY03–FY06.

I am truly concerned about what will happen to the U.S. Aeronautic industry if the Federal Government continues to ignore rotorcraft funding. As you know, the U.S. aerospace industries are highly reliant on technologies enabled by NASA research. Aerospace business markets today make it difficult for companies to invest huge sums in high-risk, long-term R&D activities. The consequences of insufficient research and development investment are already being felt. There is a direct relationship between the viability of federal aeronautics R&D conducted by NASA, the future of the U.S. aeronautics and transportation industry, and economic growth.

I fear that our country's neglect of rotorcraft could pave the way for other nations to surpass the United States in development of a technology with the potential to change the way we travel. To this end, I have established the Center for Rotorcraft Innovation (CRI), which will provide a single, coordinated, national focus within industry and academia for cooperation with the government on rotorcraft. CRI will focus on emerging and unmet national needs in rotorcraft operations and technology, and will function as a venue where the public and private sectors can work together for the sake of the American rotorcraft industry.

In my opinion, the establishment of future rotorcraft technology, systems and infrastructure is also critical to promote national security, and emergency response. The war in Iraq clearly demonstrates how precious helicopter assets are to Ameri-

cans in harms way for the purpose of emergency evacuation, combat and logistical support.

So in closing, I would just like to again reiterate my disappointment that this important program has consistently suffered major funding cuts. I ask that the Administrator provide me with information on his vision for the future of Aeronautics funding, specifically Rotorcraft within NASA. In the meantime, I will continue to use my position as a senior member of this committee and Vice-Chairman of the Armed Services and Homeland Security Committees to advocate and fight for increased federal rotorcraft and aeronautics dollars. Thank you for you time.

[The prepared statement of Mr. Costello follows:]

PREPARED STATEMENT OF REPRESENTATIVE JERRY F. COSTELLO

Good morning. I want to thank Administrator Griffin for appearing before our committee to discuss the FY06 Budget for NASA. Today's hearing serves as an opportunity for oversight of certain departmental programs. My colleagues on the Science Committee and I have been calling for the Administration to establish a vision for the space program even before the Space Shuttle *Columbia* tragedy. Last year, when the President announced his space exploration initiative, I was pleased we were setting long-term goals for our nation's human space flight program. However, a year later many of NASA's plans and organizational arrangements for implementing the initiative are in flux. I am concerned that NASA is proceeding aggressively on the implementation of the President's exploration initiative and is making fundamental changes in its priorities without providing Congress with more specifics as we consider the FY06 budget request for NASA. While the Administration continues to bolster this initiative and state it is affordable under the budgetary plan developed by NASA, NASA's track record on the credibility of its cost estimates over the last several years is at best mixed. The President's proposal will have a high price tag and it should not come at the cost of our commitment to our children, our veterans, our seniors, and our other important domestic priorities. We currently have over a half-trillion dollar deficit and the case is going to have to be made to this committee and the American people why this proposal should be supported in the face of that deficit.

In last year's FY05 Omnibus, the appropriators gave NASA a great deal of latitude to determine the allocation of the funds appropriated to it, with the understanding that the appropriations committees would review that allocation as part of the standard Operation Plan process. I realize it is too early to draw definitive conclusions about NASA's performance on the exploration initiative because most of its efforts over the last year have been focused on developing requirements and "roadmaps" and restructuring its organization. Yet, the all of these efforts are still unclear at this point. Since Administrator Griffin has indicated that he intends to significantly reshape NASA's human exploration-related program and has suspended or terminated many of the exploration-related planning activities that were underway when he became Administrator, I am concerned NASA's commitment to building the Agency's core foundation of aeronautics and aerospace research and development as well as its missions of exploration are overlooked.

I welcome the Administrator and look forward to his testimony.

[The prepared statement of Mr. Carnahan follows:]

PREPARED STATEMENT OF REPRESENTATIVE RUSS CARNAHAN

Mr. Chairman and Mr. Ranking Member, thank you for hosting this hearing, and Mr. Griffin, thank you for joining us today to discuss the future of NASA. I am very interested in hearing your testimony.

Many on this committee have been paying attention to NASA's budgetary decisions and what these choices mean for the long-term direction of the Agency. In particular, I look forward to hearing your perspective on how or if NASA will be able to balance the President's space exploration agenda with the Agency's traditional multi-mission approach.

We are pleased to have you with us for the first time and I look forward to this morning's hearing.

[The prepared statement of Ms. Jackson Lee follows:]

PREPARED STATEMENT OF REPRESENTATIVE SHEILA JACKSON LEE

Chairman Boehlert, Ranking Member Gordon,

I want to thank you for organizing this important hearing to discuss *The Future of NASA*. I want to welcome Dr. Griffin, the new NASA Administrator and thank him for coming before this committee this morning. NASA faces a watershed moment after having endured a tremendous tragedy in the *Columbia* disaster and now trying to map its future with a return to the Moon and manned exploration of Mars.

Unfortunately, while I wholeheartedly support the work of NASA, I am deeply concerned that the President's budget does not meet all the needs for future space exploration as we move forward in this new century. A lack of necessary budget authority makes the job for a new Administrator much more difficult and brings in to question the true vision for NASA. As I have stated before, this Administration has made many bad budgetary choices, which continue to push us further into a huge deficits and mounting debt during the last four years. In addition, the President has proposed a highly questionable plan for Social Security along with an uncertain military future in Iraq that in conjunction with proposed \$1.6 trillion tax cuts will result in less funds being available for vital agencies such as NASA.

I have been supportive of President Bush's *Vision for Space Exploration* because I firmly believe that the investment we make today in science and exploration will pay large dividends in the future. Similarly, I do not want to put a cap on the frontiers of our discovery, NASA should aim high and continue to push our nation at the forefront of space exploration. However, I find it hard to be more supportive of the President's plan, when I have no real specifics as to what this plan will entail. Large missions of this sort require detailed planning and as a Members of Congress we deserve to know how exactly the President's plan proposes to accomplish its objectives so that we can set out the proper resources and provide the necessary oversight. In addition, the President stated that the fundamental goal of his directive for the Nation's space exploration program is ". . .to advance U.S. scientific, security, and economic interests through a robust space exploration program." I could not agree more with that statement; unfortunately, this President's own budget does not meet the demands of his ambitious agenda. One year after the Administration laid out a five-year funding plan for NASA that was intended to demonstrate the affordability and sustainability of the exploration initiative, the Administration submitted a budget proposal for 2006 that would reduce that funding plan by \$2.5 billion over the next four years. For example, in 2006, the Administration is seeking \$546 million less than it said would be needed for NASA in 2006 in the five-year funding plan that accompanied last year's request. In fact 75 percent of the \$2.5 billion shortfall will fall to NASA's science and aeronautics programs. This kind of under-funding for vital programs is unacceptable. Again, it is even more alarming because the President has not provided a detailed plan as to how he intends to accomplish his space exploration agenda; certainly draining money from the budget will not help that cause. I hope Administrator Griffin will be able to shed some light on the vision of NASA with the current budget shortfalls.

My greatest concern at this point is that we may not allocate enough money or resources to ensure the safety of all NASA astronauts and crew. After the *Columbia* disaster, safety must be our highest priority and it is worrisome that there is not a noticeable increase in funding to address all safety concerns. Presently, NASA is working towards a resumption of Space Shuttle flights, with the date for such a launch in uncertainty at this point. However, once NASA returns the Shuttle to flight status, it is then supposed to begin the task of figuring out how to retire the Space Shuttle fleet in 2010 while continuing to fly the Shuttle safely up to the very last flight. I am concerned that pressure to retire the Shuttle by a fixed date to free up resources for other activities, coupled with the need to fly up to 28 Shuttle flights to assemble the Space Station, could—if not handled properly—lead to the types of schedule and budgetary pressures that were cited by the *Columbia* Accident Investigation Board (CAIB) as contributing to the *Columbia* accident. I hope this concern is paramount at NASA as we move forward in the future.

As Members of this committee know, I have always been a strong advocate for NASA. My criticism of the President's budget and its relation to the vision for NASA is intended only to strengthen our efforts to move forward as we always have in the area of space exploration and discovery. NASA poses an exciting opportunity to charter a new path that can lead to untold discoveries. As always I look forward to working with the good men and women of NASA as we push the boundaries of our world once again.

[The prepared statement of Mr. Green follows:]

PREPARED STATEMENT OF REPRESENTATIVE AL GREEN

Chairman Boehlert and our Ranking Member, Mr. Gordon, I appreciate the opportunity that you have provided us to speak to the newly appointed Administrator of NASA, Dr. Michael Griffin. First and foremost, Administrator Griffin, let me extend my congratulations.

As a Member of the Science Committee, I have had the distinct pleasure of following NASA's progress as it has moved towards its Return-to-Flight mission scheduled in mid to late July. I have also followed NASA while it has re-defined itself behind President Bush's *Vision for Space Exploration*. Let me reiterate my support for NASA.

With Johnson Space Center only moments away from the 9th Congressional District of Texas, I must admit that NASA is an entity near and dear to the interest of my district. I remember the ebullience that our nation felt when Neil Armstrong walked on the Moon in 1969. Our young people need to witness similar achievements that will drive them into advanced careers in science, engineering, and math, and I truly believe that the *Vision for Space Exploration* will be one giant step towards that goal.

I am however concerned with such a focused approach because NASA has successfully accomplished a broad mission including aeronautics, Earth science, and additional space research programs that do not revolve around this *Vision for Space Exploration*. I must say I am cautious about NASA's return-to-flight because of the inherent risks to our brave astronauts. As we eagerly await the return-to-flight mission, I am seeking the assurance that NASA has done everything in its power to ensure the safety of its crews. The *Vision for Space Exploration* is a superior ambition, however we cannot afford another devastating accident that leads to setbacks and losses of life.

Now that you have had two months in your position as Administrator, I look forward to hearing your vision for NASA. More specifically, I would like to learn how you intend to balance and restructure NASA in a way that continues all of its important missions and accomplishes an aggressive research and exploration agenda that makes the safety of our astronauts a top priority.

Chairman BOEHLERT. Mr. Administrator, as both Mr. Gordon and I noted in our opening statements, many fundamental questions facing NASA remain to be answered. Let me go through a list of pending items that we reviewed at the February hearing with then Acting Administrator Gregory. For each of these, I would like you to tell me and the Committee when we will get the answer to the question. You may have mentioned some of these in your testimony, but I would like to go through the list, nonetheless, to create a single place in the record we can all go back to to measure our progress.

The research—can you tell me when you are going to have the research agenda for the International Space Station and its proposed final configuration?

Wait. Make a statement first.

Dr. GRIFFIN. No, sir. I wanted to take your questions. You were—

Chairman BOEHLERT. Are you sure? I—

Dr. GRIFFIN. No, that is fine, sir.

Chairman BOEHLERT. All right. Fine.

Can I repeat that? I will go through the list.

Dr. GRIFFIN. Please do.

Chairman BOEHLERT. The first one, you have got that, right? The—when do you plan to have the research agenda for the International Space Station and its proposed final configuration? I will do them one by one and let you respond.

Dr. GRIFFIN. Okay. Oh, I am sorry.

We are reworking the research agenda of the Space Station, as has been pointed out. We are looking at—the question is difficult

to answer, because, in part, it ties up with how much research on the Station do we want to do while we are trying to build and finish developing it.

As was pointed out in your earlier statement, or someone's earlier statement, we must retire the Shuttle by 2010. We must, as soon as possible thereafter, deploy the CEV, the Crew Exploration Vehicle, which will replace the Shuttle and which will be our means of ferrying astronauts back and forth. And so, to some extent, the research that we would do on the Space Station, if we were otherwise unconstrained, must take a back seat to getting the necessary systems online to allow us to develop and utilize the Station.

I can't specifically give you an answer as to when we will have the research agenda for the Station fully defined.

Chairman BOEHLERT. Can you hint?

Dr. GRIFFIN. Yes. Yes, sir, I can hint.

I made a couple of notes on this. We are trying to rebalance the portfolio. The high-priority areas are going to be space radiation health and shielding, advanced environmental control and monitoring, advanced EVA activities and the support of those, human health encounter measures, life support systems, medical care for exploration, and human factors, medical research with human subjects and microgravity validation of the environmental control and life support systems.

We expect to refine those as a result of the Shuttle and Station Configuration Options Team examination that is underway today. Within the next few weeks, we will be briefing, discussing configuration options within the Administration, and then, in short order, with you here on Capitol Hill, with this committee and with others.

Our uncertainty today—so I—so in a briefer answer to your question, I would say later this summer. Later this summer.

Chairman BOEHLERT. Later this summer.

Dr. GRIFFIN. The situation that we find ourselves in that results in this lack of full definition is that, as we sit here today, the one thing we are certain of is that we cannot fly 28 Shuttle flights to assemble the Station and still retire the Shuttle by 2010. There are not 28 flights available in our manifesting sequence, if we wish to retire by 2010. Therefore, what we are looking at is a redefined program of Shuttle flights that we can execute with a high degree of confidence over the next five years. And that necessarily results in replanning the research agenda.

Chairman BOEHLERT. You know, I was so anxious to get to these questions, we all are, that I neglected to give you the opportunity for an opening statement. We want to welcome you with open arms before this committee and give you the chance to share with us some of your thoughts before we proceed with the questions.

So the Floor is yours, Mr. Administrator.

STATEMENT OF HONORABLE MICHAEL D. GRIFFIN, ADMINISTRATOR, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Dr. GRIFFIN. Well, thank you, Chairman Boehlert. I am—I will just make a few brief remarks, and then I believe I will enter into

the record this statement as well as the more—longer, more formal statement.

I do want to thank you for inviting me to appear before you. As both you and Ranking Member Gordon have pointed out, I have been here many times before as a private citizen. I have forged, I think, excellent working relationships with this committee, and I certainly hope that that won't change in testifying before you in a new capacity as NASA Administrator.

And we do have many challenges to overcome. We need to work closely with this committee and the entire Congress to carry out the President's vision for exploration and our other programs. You have many—you have raised many questions. I have made significant changes in the last 2½ months that I and my staff believe are necessary to get us on the right track. And I look forward to answering as many of the questions that Ranking Member Gordon and yourself have raised today as I possibly can.

So with that introduction, let me enter, if I might, this oral statement into the record. Your staff and you can pursue it at your leisure, and with your permission, then, we can move directly to your questions, which I will try to answer as—

Chairman BOEHLERT. Well, without objection, so ordered. Your entire statement will be made part of the permanent record for our perusal, quite frankly, close examination.

[The prepared statement of Dr. Griffin follows:]

PREPARED STATEMENT OF MICHAEL D. GRIFFIN

Mr. Chairman and Members of the Committee, thank you for this opportunity to appear today to discuss NASA's plans for the future as represented in the President's FY 2006 budget request for NASA.

On January 14, 2004, President George W. Bush announced the *Vision for Space Exploration*. The President's directive gave NASA clear objectives as well as a new and historic focus. The fundamental goal of this directive for the Nation's space exploration program is “. . .to advance U.S. scientific, security, and economic interests through a robust space exploration program.” In issuing this directive, the President committed the Nation to a journey of exploring the solar system and beyond, returning humans to the Moon, and sending robots and ultimately humans to Mars and other destinations. He challenged us to establish new and innovative programs to enhance our understanding of the planets, to ask new questions, and to answer questions as old as humankind. NASA embraced this directive and began a long-term transformation to enable us to achieve this goal.

In June 2004, the President's Commission on Implementation of the United States Space Exploration Policy, led by E. C. “Pete” Aldridge, Jr. (the Aldridge Commission), reported its findings and recommendations to the President. The Aldridge Commission emphasized the crucial role that technological innovation, national and international partnerships, and organizational transformation must play if we are to implement the President's vision for an affordable and sustainable space exploration program. NASA is committed to making the necessary transformation to achieve the *Vision for Space Exploration*.

On December 21, 2004, the President signed a new national policy directive that establishes guidelines and implementation actions for United States space transportation programs and activities to ensure the Nation's continued ability to access and use space for national and homeland security, and civil, scientific, and commercial purposes. NASA will play a significant role in implementing this directive, fostering and enabling the development of space transportation capabilities for human space exploration beyond low-Earth orbit with the Crew Exploration Vehicle (CEV), consistent with the goals of the *Vision for Space Exploration*.

The President demonstrated his commitment to the *Vision for Space Exploration* by making it a priority in his FY 2005 budget request, and Congress responded positively by providing funding for NASA at the level requested by the President. The President has reaffirmed his commitment to the Vision by again making it a priority

in his FY 2006 budget request in a very challenging budget environment. The \$16.46 billion requested for NASA reflects an increase of 2.4 percent over FY 2005.

While today's hearing concerns the President's FY 2006 budget request for NASA, I must also use this opportunity to update the Committee regarding the difficult choices that need to be made in executing NASA's FY 2005 budget, and my guiding philosophy in dealing with these challenges.

A detailed FY 2005 Operating Plan update was recently provided to all of the Committees in Congress which oversee NASA. With this FY 2005 Operating Plan update, NASA is fully funding—within our FY 2005 budget—the \$762 million increase for returning the Space Shuttle safely to flight, consistent with the recommendations from the *Columbia* Accident Investigation Board (CAIB), over \$400 million in Congressionally-directed items, \$291 million for Hubble servicing, and over \$500 million in necessary programmatic cost increases, notably to cover cost growth in several space science missions, including the Mars Reconnaissance Orbiter, scheduled to be launched this August, and the New Horizons mission to Pluto set to launch in early January 2006.

Identifying offsets needed to fund these items has created some difficult choices for the Agency. Given a choice, I generally favor eliminating lower-priority programs rather than reducing all programs in the face of budget difficulties, because this allows for the more efficient execution of the programs which remain. Thus, we must set clear priorities to remain within the budget which has been allocated.

Allow me to be as clear as possible on what the impact of these costs means to other programs. The Agency has adopted a “go-as-you-can-pay” approach toward space exploration. Several NASA missions and activities will need to be deferred or accomplished in other ways in order to ensure adequate funding for the priorities of the President and the Congress in FY 2005. NASA cannot do everything that we, and our many stakeholders, would like to accomplish. Several missions will have to be delayed, deferred, or canceled in order to pay for the missions where the priorities were set by the President and Congress. We have tried to be sensitive to the priorities of the affected research communities, and have listened carefully to their input. For example, we seek to impart a new balance among planetary science, Earth science, solar physics, and astronomy within the overall science program by revisiting our Mars exploration program strategy and mission sequence and the schedule for advanced space telescopes such as the Space Interferometry Mission (SIM) and Terrestrial Planet Finder (TPF).

NASA Priorities

Over the past year, NASA has made great strides in implementing the *Vision for Space Exploration* and meeting other national priorities:

- *Shuttle Return-to-Flight*—We are making final preparations for the Space Shuttle return-to-flight planned for mid-July.
- *International Space Station*—The ISS began its fifth year of continuous human presence on-orbit.
- *Exploring Our Solar System and the Universe*—The Mars rovers, Spirit and Opportunity, have exceeded all expectations and made unprecedented discoveries; the Cassini/Huygens mission is providing stunning views of Saturn and Titan; the Genesis mission, despite its hard landing, has returned primordial samples from space; new missions have been launched to Mercury and to comets; and amazing discoveries continue with Hubble, Chandra, and Spitzer.
- *Laying the Groundwork for the Future*—We awarded initial contracts in preparation for a major milestone in 2008 with the mapping of the Moon in unprecedented detail by the Lunar Reconnaissance Orbiter (LRO).
- *Aeronautics*—We are continuing to execute a portfolio of focused, results-oriented technology demonstrations of next-generation aircraft along with aviation safety, security, and airspace systems. NASA, with its industry partners, recently demonstrated the feasibility of significantly reducing the sonic boom from supersonic aircraft, and, last November, NASA's hypersonic X-43A demonstrated that an air-breathing engine can fly at nearly 10 times the speed of sound.
- *Earth Science*—We have completed deployment of the Earth Observing System and are supporting investments in the Global Change Science and Technology Program and the next generation Earth observing satellites for numerous applications, including improved weather forecasts, earthquake prediction, resource management, and other hazard warnings.

NASA's Proposed FY 2006 Authorization Bill

On June 17, 2005, NASA transmitted its proposed FY 2006 Authorization Bill to the Congress. I look forward to working closely with the House Science Committee and Senate Commerce Committee this year to enact this important legislation.

Through NASA's proposed FY 2006 Authorization Bill we are requesting a set of critical tools and authorities to implement the *Vision for Space Exploration* consistent with the recommendations of the Aldridge Commission. The provisions requested are an integral complement of critical tools and authorities that will better equip NASA to address the challenges we face in implementation of the *Vision for Space Exploration*.

As the United States implements the *Vision for Space Exploration*, the Administration recognizes the value of effective cooperation with Russia to further our space exploration goals. At the same time, it is essential that we appropriately maintain U.S. nonproliferation policy and objectives in our relationship with Russia. Such a balanced approach must include the *Iran Nonproliferation Act of 2000* (INA), which contains certain restrictions that complicate cooperation with Russia on the International Space Station (ISS), and will also have an adverse impact on cooperation with Russia on our future space exploration efforts related to human space flight.

Over the last several months, NASA has been participating in an interagency coordination process related to INA in an effort to develop a solution to this issue that would provide NASA with needed flexibility while still meeting our nation's nonproliferation objectives. The interagency group has proposed a legislative solution in the form of an amendment to the INA, which sustains the Act's nonproliferation core, while allowing for continued NASA-Russian cooperation on the ISS and human space flight endeavors.

It is expected that this approach will be delivered to Congress in the very near future. To that end, the Administration looks forward to working with Congress to ensure that the *Vision for Space Exploration* is able to succeed while remaining fully consistent with broader U.S. national security and nonproliferation goals.

In the Authorization bill, we are also requesting authority to award prizes through Centennial Challenges. With this authority the Agency will award prizes to stimulate innovation in basic, advanced, and applied research; technology development; and, through prototype demonstrations that have the potential for application for the aeronautics and space activities of NASA. Instead of soliciting proposals for a contract or grant, Centennial Challenges will identify a challenge, the prize amount to be awarded for achieving that challenge, and a set of rules by which teams will compete for that prize. Centennial Challenges will help NASA meet technology challenges while encouraging creativity and innovation in the private sector, particularly in exploration.

NASA is placing a new emphasis on building an agile workforce, with the right mix of permanent civil servants, other-than-permanent civil servants, and contractors. As a result, we are seeking a set of critical workforce management tools needed as the Agency engages in a major transformation and restructures itself to achieve 21st Century goals. Specifically, the Agency is seeking the authority to re-hire annuitants without a salary offset to accommodate short-term emergency or critical program needs; the ability to offset the expense of short-term health care coverage for employees who are involuntarily separated from the Agency and request extended coverage (as currently authorized by law); provide incentives for permanent employees who voluntarily convert to a time-limited appointment to minimize the need for other, less desirable workforce reshaping actions; and provide additional hiring flexibilities under collaborative research activities to further enhance our partnerships.

Furthermore, NASA seeks the ability to realign real property assets with Agency missions by expanding the current enhanced-use lease authority beyond the current two center pilot projects, and allowing NASA to retain the proceeds from the sale of real and personal property.

Lastly, the proposed legislation requests intellectual property, financial management, and administrative improvements to support NASA's mission.

Affordability and Sustainability

In his February 2nd State of the Union Address, the President underscored the need to restrain spending in order to sustain our economic prosperity. As part of this restraint, it is important that total discretionary and non-security spending be held to levels proposed in the FY 2006 Budget. The budget savings and reforms in the Budget are important components of achieving the President's goal of cutting the budget deficit in half by 2009, and we urge the Congress to support these reforms. The FY 2006 Budget includes more than 150 reductions, reforms, and terminations in non-defense discretionary programs, of which three affect NASA programs. The Agency wants to work with the Congress to achieve these savings.

To achieve the *Vision for Space Exploration*, NASA is proceeding, as directed by the President, to plan and implement a sustainable and affordable, integrated robotic and human exploration program, structured with measurable milestones, and executed on the basis of available resources, accumulated experience, and technology readiness. Last year, we provided a long-range roadmap through 2020 to outline this program:

- The Space Shuttle will be retired by 2010. Prior to its retirement, it will be utilized primarily for the assembly of the ISS. Our top priority will be to make each flight safer than the last one.
- The new CEV and its associated launch system will transport crews on exploration missions, and will also be capable of ferrying astronauts to and from the Space Station. The CEV will be developed in the latter part of this decade and deployed operationally as soon as possible. The CEV will conduct missions in Earth orbit, including missions to the ISS, but its primary mission will be to support exploration of the Moon and other destinations.
- Robotic missions will continue to increase our understanding of our home planet and will continue the exploration of the solar system, traveling to the Moon and Mars in anticipation of later human visits, as well as to other destinations such as Mercury, Saturn, Pluto, asteroids, and comets. Observatories will be deployed to search for Earth-like planets and habitable environments around distant stars, and to explore the universe to understand its origin, structure, evolution, and destiny. The President's Budget requests increased funding for these areas over the coming years, with Science investments growing from 33 percent to 38 percent of the Agency's total budget.
- Human explorers will return to the Moon, possibly as early as 2015—with the CEV as the first core element of a new exploration architecture. Major development of the other elements in the exploration architecture will commence later this decade and will accelerate upon the retirement of the Space Shuttle. These exploration elements will include launch vehicles, in-space transfer systems, lunar landers, and surface habitation systems. Critical research and technology investment decisions will be guided by the development requirements of these elements.

These human and robotic explorers will enable our exploration and scientific plans. A recent report released on February 3, 2005, by the National Research Council, entitled *Science in NASA's Vision for Space Exploration*, states, "Exploration done properly is a form of science. Both robotic spacecraft and human space flight should be used to fulfill scientific roles in NASA's mission to explore." To that end, NASA has initiated an Exploration Systems Architecture Study (ESAS), which will provide the analytical support for a number of key near-term decisions for NASA, the White House, and Congress. The ESAS is a 90-day study that is examining many of the larger questions associated with the *Vision for Space Exploration*. Some of the topics the ESAS is reviewing include the requirements for returning to the Moon and extending human exploration to Mars, as well as possibilities for accelerating the development of the Crew Exploration Vehicle (CEV). This team is expected to complete its work in July and we will keep Congressional Committees informed as this study effort progresses.

This study effort will focus on four primary areas:

- Complete assessment of the top-level CEV requirements and plans to enable the CEV to provide crew transport to the ISS and to accelerate the development of the CEV and crew launch system.
- Definition of top-level requirements and configurations for crew and cargo launch systems to support the lunar and Mars exploration programs.
- Development of a reference lunar exploration architecture concept to support sustained human and robotic Lunar exploration operations.
- Identification of key technologies required to enable and significantly enhance these reference exploration systems, and a re-prioritization of near-term and far-term technology investments.

NASA is also currently examining alternative configurations for the Space Station that meet the goals of the Vision and the needs of our international partners, while maintaining safety as our highest priority. In May 2005, we initiated the Shuttle/Station Configuration Options Team (SSCOT). This team is conducting a 60-day study of the configuration options for the ISS and assessing the related number of flights needed by the Space Shuttle before it retires no later than the year 2010. The scope of the Shuttle/Station Configuration Options Team study spans ISS as-

sembly, operations, and use and considers such factors as international partner commitments, research utilization, cost, and ISS sustainability. This team is expected to complete its work in June, with those results integrated into the ongoing Exploration Systems Architecture Study (ESAS).

NASA Priorities in the FY 2006 Budget Request

The President's FY 2006 budget request for NASA reaffirms the funding strategy outlined above. NASA's FY 2006 request endeavors to provide a balanced portfolio of programs to meet the needs of our national priorities in aeronautics and civil space. It maintains focus on key priorities, milestones, and schedules for the Vision introduced in the FY 2005 budget.

To support the Administration's goal of reducing the deficit, NASA's budget was reduced \$0.5 billion in FY 2006 below the level planned in the 2005 budget for FY 2006. In addition, returning the Shuttle safely to flight will cost \$0.4 billion more in FY 2006 than previously estimated. To address these and other items, we proposed a budget that provided \$0.4 billion (11 percent) less for Exploration Systems than previously planned for, \$0.3 billion (five percent) less in Science, \$0.1 billion (11 percent) less in Aeronautics, and \$0.2 billion (four percent) more in Space Operations. These changes were not easy, but in the end, we made the decisions to protect the priorities outlined above.

Science

The FY 2006 budget request of \$5.5 billion for the Science Mission Directorate will support 55 missions in orbit, 26 in development, and 34 in design phase. By 2010, the Science budget will increase by 23 percent over current levels.

The FY 2006 budget includes \$858 million for Mars and Lunar robotic exploration. The Mars rovers, Spirit and Opportunity, have far exceeded all goals with their unprecedented discoveries and longevity. Last year, the rovers found definitive evidence of an ancient body of water on the Red Planet, and they continue to gather data more than a year after their successful landing. We recently awarded contracts for six instruments to be flown on the 2008 LRO that promises unprecedented mapping of the Moon's surface. The 2008 LRO will be the first step in revolutionizing our understanding of the Moon, in much the same way that our Mars missions have transformed our understanding of Mars. As mentioned earlier, to simplify the management chain-of-command among mission directorates, our FY 2005 Operating Plan update transfers management responsibility for the Lunar Exploration program, including LRO, to the ESMD. This will help to maximize the exploration and science benefits of this important program.

The budget also includes \$218 million to maintain competitive efforts for the Explorer Program, \$56 million for the Beyond Einstein program to study the universe, \$234 million for studying the Sun in the Living With a Star program, and \$136 million for competitive opportunities in the Earth System Science Pathfinder program. With our international partners, we also continue to add to the constellation of Earth-observing satellites that monitor our planet while extending our reach and presence further into the solar system. NASA launched Aura to look back at Earth and give us a better picture of our atmosphere and changing climate, and the entire Earth Observing System continues to return trillions of bytes of information about our dynamic Earth. In the future, NASA plans to develop a "sensor-web" to provide timely, on-demand data and analysis to users who can enable practical benefits for scientific research, national policy-making, economic growth, natural hazard mitigation, and the exploration of other planets in this solar system and beyond.

NASA will continue to expand its exploration reach with an armada of existing and new space observatories operating in many different wavelengths and looking at different parts of our exotic universe. The three "Great Observatories"—Hubble, Spitzer, and Chandra—will continue to bring wondrous images to our eyes and exciting new scientific discoveries. Missions such as Kepler will provide a new understanding and knowledge of the planets orbiting stars far from our solar system.

This budget also includes \$372 million to continue developing the James Webb Space Telescope for a 2011 launch and provides \$93 million in development funds for the Hubble Space Telescope. This investment in the Hubble, together with the synergistic use of the other two Great Observatories, and combined with the greatly increased capability of ground-based assets and the emergent science of optical interferometry, will ensure many years of new scientific discoveries.

NASA's decision in January 2004 not to service the Hubble Space Telescope was a very difficult one, given the Hubble's record of spectacular successes. That decision was made at a time when significant uncertainty remained regarding the technical solutions and risks associated with return-to-flight. After the two successful Space Shuttle flights needed to achieve our return-to-flight objectives, NASA will have

learned a great deal more regarding the risks and operations of the vehicle than was known when the previous decision was made. I am committed to reassessing this earlier decision after return-to-flight, based on the relative risks to the Space Shuttle as well as the costs and benefits to our nation's astronomy program. As a result, we are continuing our efforts to preserve the option for a Shuttle servicing mission for Hubble. Consistent with this ongoing activity, NASA's FY 2005 Operating Plan update has fully funded the \$291 million identified in the Conference Report accompanying the FY 2005 Consolidated Appropriations bill and has consolidated the funding and management responsibility within the Science Mission Directorate. NASA will use the balance of the FY 2005 funds to maintain options for HST servicing and de-orbit. NASA has also begun the analysis of how a de-orbit module for the Hubble Space Telescope could be added to the manifest of such a Space Shuttle servicing mission. I will make a decision regarding a Shuttle servicing mission for Hubble following the success of the first two Return-to-Flight missions. In the interim, the Agency will keep all stakeholders apprised as this work progresses. NASA remains committed to a world-class, affordable program of space-based astronomy.

Preparing for Exploration

The FY 2006 budget request of \$3.2 billion for the ESMD includes \$753 million for continuing development of the CEV, the vehicle that will serve as the core element for future exploration beyond Earth orbit. The CEV promises safer travel for astronauts into space, continuing U.S. human access to space after retirement of the Shuttle. The CEV will first conduct missions in Earth orbit, but its primary mission will be to support exploration of the Moon and other destinations. Our earlier plans called for operational deployment of the CEV not later than 2014. However, we are now seeking programmatic alternatives to allow development of the CEV to be completed as soon as possible. Acceleration of the CEV program will be accomplished by down-selecting to a single contractor sooner than originally planned, and by deferring other elements of the Exploration Systems Research and Technology plan not required for the CEV or for the early phases of human return to the Moon.

The first CEV missions to Earth orbit will include docking with the ISS. NASA's Exploration Systems Mission Directorate will be responsible for developing and acquiring both crew and cargo services to support the International Space Station, and funds have been transferred to that Directorate. We plan to leverage our nation's commercial space industry to meet NASA's needs for ISS cargo logistics and potentially crew support.

Going forward, the Agency will need a launch system for the CEV, one which does not at present exist. Two possibilities exist by which we might obtain such a vehicle. The first is to develop a launch system derived from Shuttle components, specifically the SRB with a new upper stage. The second option is to upgrade the proposed heavy-lift versions of EELV with a new upper stage. As NASA Administrator, I must be a responsible steward of our funds, and a key aspect of the Agency's analysis of alternatives will be to capitalize on existing technical and workforce assets in a cost-effective and efficient way. NASA's goal is to develop a CEV capable of operating safely soon after the retirement of the Space Shuttle.

The FY 2006 budget request included \$919 million (a 27 percent increase) for Exploration Systems Research and Technology (ESR&T) that will enable designs for sustainable exploration; though, as mentioned, elements of that program will now be deferred to accelerated the CEV. Other ESR&T elements include \$34 million for a revamped technology transfer program and \$34 million for the Centennial Challenges prize program. The Agency continues to seek the support of the Congress for authorization to enable larger prize awards.

This budget also includes \$320 million for a restructured Prometheus Nuclear Systems and Technology Theme for space-qualified nuclear systems. The technology and capabilities being developed by the Prometheus Nuclear Systems and Technology Theme are critical for enabling the power and propulsion needs of the *Vision for Space Exploration*. As part of the Agency's effort to define an Exploration Systems Architecture, NASA will examine alternative nuclear systems, including surface nuclear power, nuclear thermal, and nuclear electric systems. NASA will restructure Prometheus for space-qualified nuclear systems to support human and robotic missions with clear priorities focused on near-term needs. We expect to make program decisions to focus our nuclear technology efforts on our highest priorities for near-term applications as part of the Exploration Architecture study, to be completed this summer. In addition, the FY 2006 budget request provides \$806 million for Human Systems Research and Technology, which has been restructured so that its programs are now linked directly to exploration requirements for human missions to the Moon, Mars, and beyond.

Aeronautics Research

NASA's FY 2006 request for the Aeronautics Research Mission Directorate is \$852 million, a significant portion of the government's overall investment in aeronautics research. To make the most of this investment, NASA's technical expertise and facilities for aeronautics research are becoming more focused and results-oriented. NASA's current aeronautics research is focused on enhancing the public good. NASA is also working to maintain a strong basic aeronautics research program and to establish a series of far-reaching objectives, each of which, if enabled, could significantly transform civil aeronautics. The results from the basic research, technology development, and demonstrations achieved by NASA's Aeronautics efforts will be transitioned for use by both Government and industry. The President's FY 2006 request increased the vital research of the Aeronautics program in Aviation Safety and Security and in Airspace Systems. These two priority programs are fully funded to ensure timely results critical to meeting national goals. NASA works closely and constructively with other Executive Branch agencies to enhance our nation's aeronautics capability. In this vein, NASA, along with the Departments of Defense, Homeland Security, Commerce, and Transportation, is a principal member of the interagency Joint Planning and Development Office (JPDO), which was chartered by the Century of Aviation Revitalization Act to oversee research and technology efforts for the Next Generation Air Transportation System. NASA is working closely with industry consortia and other government agencies to develop advanced aircraft demonstrations, such as those that would expand the capabilities of high-altitude, long-endurance, unmanned aerial vehicles, which could have numerous commercial, scientific, and homeland security applications.

At this time, NASA is also working with other U.S. Government departments and agencies and industry to assess its facilities for aeronautics research. NASA will need to consider the possibility of closing some under-utilized aeronautics facilities, while modernizing some others to become state-of-the-art facilities.

As we move forward, a broader national dialog on aeronautics R&D goals may be appropriate as we enter the second century of aviation. These discussions should include a range of stakeholders and customers, including the Congress. This process could lead to a national consensus for aeronautics R&D goals.

Education

NASA's FY 2006 budget request includes \$167 million for the Office of Education to support programs in science, technology, engineering, and math education. NASA will establish clear goals, metrics, and monitoring capabilities for its education initiatives in the coming months to ensure that these funds will achieve the greatest benefit.

Space Shuttle and International Space Station

The FY 2006 budget request of \$6.8 billion for the Space Operations Mission Directorate (SOMD) reflects the first step in the *Vision for Space Exploration*: returning the Space Shuttle safely to flight and resuming flight operations. Going forward, all SOMD expenditures will be consistent with the retirement of the Space Shuttle by 2010, while maintaining operational safety of flight throughout the program. The FY 2006 budget includes \$4.5 billion for the Space Shuttle program. The budget also provides \$1.9 billion for the ISS. NASA currently is examining configurations for the Space Station that meet the goals of the *Vision for Space Exploration* and needs of our international partners, while requiring as few Shuttle flights as possible to complete assembly.

A key element in the future of the ISS program is the purchase of alternate cargo transportation services to supplement the Space Shuttle, and the development of new crew transportation capabilities to replace Shuttle when it retires. Because the ESMD has the mission to develop and acquire such crew and cargo capabilities for the ISS and beyond, I have transferred management responsibility for the activities and budget of ISS Cargo/Crew Services to ESMD from SOMD, as stated in the May update to NASA's FY 2005 Operating Plan. The budget request before the Congress provides \$160 million for these services in 2006.

As a top Return-to-Flight (RTF) priority, NASA has made dozens of changes to the External Tank (ET) design to reduce both foam and ice debris from shedding during ascent. These changes include an improved bipod design that now excludes using foam and a new design for the area around the liquid oxygen feed line bellows. Each of these changes incorporates electric heaters to eliminate an unacceptable debris risk to the Orbiter caused by ice buildup on the ET. The new designs are presently installed on the ET for *Discovery's* flight (STS-114) and will be included on all those to be used in the future.

We have also made more than 100 major modifications and upgrades to *Discovery* and its supporting systems, including new cabling and wiring for sensors placed in the wing leading edge of each wing, a digital camera for monitoring any debris impacting the underside of the Orbiter, and a boom extension for the Shuttle's robotic arm that will enable us to inspect nearly all the outside areas of the Orbiter's Thermal Protection System after achieving orbit. Additionally, technicians at KSC have installed the redesigned Forward Reaction Control System Carrier Panels and the Reinforced Carbon-Carbon Nose Cap. Technicians have also installed 88 new sensors in the leading edge of each wing, of which 66 will measure acceleration and impact data and 22 will measure temperature profiles during *Discovery's* ascent to orbit. These data will be down-linked to the ground to be used as a cue for pointing to areas in the thermal protection system needing further inspection by the boom mounted sensor system. These are just several of the extensive changes we have made to the hardware to mitigate the effects of debris shedding from the External Tank. *Discovery* and its propulsion elements are now at the launch pad undergoing the final tests and checks required prior to launch, currently scheduled to occur not earlier than July 13, 2005.

Transforming NASA

The CAIB was clear in its assessment that the lack of open communication on technical and programmatic matters was as much a cause of the loss of *Columbia* as the shedding of the foam. We have understood and embraced this assessment, and are absolutely and completely committed to creating an environment of openness and free-flowing communication by continuing to assess our leadership practices.

For the last three decades, NASA and the Nation's human space flight program have been focused on the development and operation of the Space Shuttle and the Space Station. In its final report, the CAIB was very forthright in its judgment that these goals are too limited to justify the expense, difficulty, and danger inherent in human space flight, given the limitations of today's technology. The CAIB was equally forthright in calling for a national consensus in the establishment of a program having broader strategic goals. The *Vision for Space Exploration* proposed by the President is that program, and NASA has embraced this new direction. But to effect these changes, NASA must engage in a major transformation—taking the capabilities we have throughout the Agency and restructuring them to achieve these 21st Century goals. This is an enormous challenge, but we have begun to transform our entire organization to foster these changes and to enhance a positive, mission-driven culture.

- *Embracing Competition*—NASA is embracing competition as a way to elicit the best from NASA's Centers, industry, and academia. The Agency is using competitive processes to encourage more cost-effective, innovative solutions to the scientific and technical challenges presented by the Vision. Over the past year, competitive selections in exploration have demonstrated increased collaboration between NASA's Centers and industry and academia. The engine of competition is the primary force behind the American economy, the greatest the world has ever known, and we plan to make greater use of this engine than has been the case at NASA in the past. NASA plans to pursue appropriate partnerships with the entrepreneurial and commercial space sector to the maximum practical extent.
- *The Role of the Centers*—While competitive processes are crucial to maintaining NASA at the "cutting edge" of science and technology, we must acknowledge that the NASA Centers and other federal research and development laboratories exist, and have existed for decades, precisely because industrial competition does not serve to accomplish all of our national goals. In order to accomplish the national goals set forth by the President and Congress, NASA must set realistic priorities within limited resources. NASA Centers will have an important role in definition of the architecture and requirements for exploration beyond low-Earth orbit, and for the systems engineering and integration functions used in building the systems of that architecture. We will continue to assess the skill-mix that we require, the number of people we require, their location, and how we are organizing ourselves to fulfill our obligations to the President and Congress. To begin to create some of the workforce flexibility necessary for the future, NASA has offered voluntary separation incentives (buyouts) to employees in positions identified with excess competencies. To the extent that NASA's workforce needs revitalization, NASA is proposing legislative initiatives to the Congress as part of the Agency's draft FY 2006 Authorization Bill. Congress's enactment of the NASA

Flexibility Act of 2004 is also helping the Agency toward that end, and additional authorities will provide even more aid in managing the Agency's workforce.

- *Improved Decision-making*—NASA recently transformed its organizational reporting in order to provide more integrated decision-making. NASA field Center Directors now report directly to the Administrator, and I am drafting a position description for a new Associate Administrator who will manage the internal activities of the Agency. The Office of Education reports directly to the Director of Strategic Communications, who is also in charge of Public Affairs, External Relations, and Legislative Affairs, in order to provide a more integrated picture of what NASA is doing and can do for its stakeholders and public. NASA's new Office of Program Analysis and Evaluation has been created in order to provide analyses and assessments for strategic planning and budgeting decisions, independent cost estimates, evaluation of projects at major milestones, and feedback from the Centers on their capabilities and work climate. This is to ensure that the acquisition strategies, if done as planned, are executable, have exit and entrance criteria, contain clear approval milestones, and involve independent reviews.
- *Improving Financial Management*—For the past two years, NASA has received a disclaimer of audit opinion on its annual financial statements due largely to two issues—financial system conversion, and accounting for property, plant and equipment, and materials and supplies. In FY 2003, NASA converted the 10 separate NASA Center accounting systems and the associated 120 subsidiary systems, along with over 12 years of historical financial data, into a single integrated agency-wide core accounting system. Problems associated with this conversion have been greater than expected and are taking longer than expected to correct. I regard improvement of NASA's financial management as one of my priorities.
- *Capital Asset Management*—The management of NASA's capital assets, valued at \$37.6 billion (83 percent of NASA's assets on the balance sheet), is a significant challenge for the Agency. Historically, the management systems to provide proper valuation and tracking of assets have not been sufficient to meet the rigors of review without significant compensating controls and manual effort. Another challenge we are facing is that the costs of many facilities that could be deemed "national assets" were being born as direct charges to our projects causing an unequal competitive base among our field centers. Through the Integrated Asset Management (IAM) project we are steadily creating the proper controls to provide tracking and valuation needed to account for the many types of assets that exist within NASA. Realistically, the successful completion of the IAM project will take time. We are validating the requirements for asset management methods to ensure they comply with audit requirements while we simultaneously update existing tracking systems to modern platforms. For our "national assets" we plan to create a new funding structure aimed at ensuring the Centers have a chance to compete on an equal footing. Placing the national asset funding in a separate, carefully managed account will help create a level playing field and encourage broad scale use. A great deal of attention is being placed on asset management to ensure that the new methods and systems we devise provide a robust and enduring solution to the challenges the Agency has faced in resolving this significant issue.

The Nation's Future in Exploration and Discovery

The aftermath of the tragic loss of the Space Shuttle *Columbia* on February 1, 2003, brought us to a watershed moment in the American civil space program. Choices had to be made. The President has put forth a choice, a strategic vision for the space program. That vision has been enunciated with exceptional clarity, and has been subjected to considerable public debate for over a year. While differences of opinion exist, the President's proposal has attained broad strategic acceptance. As a nation, we can clearly afford well-executed vigorous programs in robotic and human space exploration, Earth science, and aeronautics research.

For America to continue to be preeminent among nations, it is necessary for us to be the preeminent space-faring nation. It is equally true that great nations need allies and partners in this journey. That is what the *Vision for Space Exploration* is about.

As President George W. Bush said, "We choose to explore space because doing so improves our lives and lifts our national spirit. So let us continue the journey."

(Budget authority, \$ in millions)		FULL COST							
By Appropriation Account	Initial Operating Plan	April Operating Plan	May Operating Plan						
By Mission Directorate	FY 2005	FY 2005	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	
By Theme									
Science, Aeronautics, and Exploration	9,334.7	9,335.0	9,051.0	9,661.0	10,549.8	11,214.6	12,209.6	12,796.1	
Science*	5,527.2	5,527.0	5,554.0	5,476.3	5,960.3	6,503.4	6,853.0	6,797.6	
Solar System Exploration	1,858.1	1,858.0	1,787.0	1,900.5	2,347.7	2,831.8	2,998.9	3,066.1	
The Universe	1,513.2	1,513.0	1,475.0	1,512.2	1,531.5	1,539.4	1,495.0	1,406.7	
Earth-Sun System	2,155.8	2,156.0	2,291.0	2,063.6	2,081.2	2,132.2	2,359.0	2,324.8	
Exploration Systems**	2,684.5	2,684.5	2,356.0	3,165.4	3,707.0	3,825.9	4,473.7	5,125.5	
Constellation Systems	526.0	526.0	422.0	1,120.1	1,579.5	1,523.7	1,990.9	2,452.2	
Exploration Systems Research and Technology	722.8	722.8	766.0	919.2	907.3	989.2	1,050.3	1,078.5	
Prometheus Nuclear Systems and Technology	431.7	431.7	270.3	319.6	423.5	500.6	614.0	779.0	
Human Systems Research and Technology	1,003.9	1,003.9	897.7	806.5	796.7	812.4	818.5	815.8	
Aeronautics Research	906.2	906.0	962.0	852.3	727.6	730.7	727.5	717.6	
Aeronautics Technology	906.2	906.0	962.0	852.3	727.6	730.7	727.5	717.6	
Education Programs	216.7	217.0	179.0	166.9	154.9	154.7	155.4	155.4	
Education Programs	216.7	217.0	179.0	166.9	154.9	154.7	155.4	155.4	
Exploration Capabilities	6,704.4	6,830.0	7,114.0	6,763.0	6,378.6	6,056.7	5,367.1	5,193.8	
Space Operations	6,704.4	6,830.0	7,114.0	6,763.0	6,378.6	6,056.7	5,367.1	5,193.8	
International Space Station	1,676.3	1,676.0	1,676.0	1,856.7	1,835.3	1,790.9	2,152.3	2,375.5	
Space Shuttle	4,543.0	4,669.0	4,964.0	4,530.6	4,172.4	3,865.7	2,815.1	2,419.2	
Space and Flight Support	485.1	485.0	474.0	375.6	370.9	400.0	399.7	399.1	
Inspector General	31.3	31.0	31.0	32.4	33.5	34.6	35.2	37.3	
TOTAL	16,070.4	16,196.0	16,196.0	16,456.3	16,962.0	17,305.9	17,611.9	18,027.1	
Year to year increase				2.4%	3.1%	2.0%	1.8%	2.4%	
Emergency Hurricane Supplemental	126.0								

*Science Mission Directorate reflects the combination of the former Space Science and Earth Science Enterprises.

**Beginning in FY 2006, Exploration Systems moves from Exploration Capabilities to Science, Aeronautics and Exploration. Exploration Systems Mission Directorate reflects the combination of the former Biological & Physical Research and Exploration Systems Enterprises.

Totals may not add due to rounding.

Dr. GRIFFIN. Thank you.

DISCUSSION

TIMETABLE FOR INFORMATION

Chairman BOEHLERT. Let me continue on with my series of questions on when.

When do you expect that we will have some report on the number of flights the Space Shuttle will make before its retirement, the purpose of those flights, and the expected date of the final flight?

Dr. GRIFFIN. Again, sir, later this summer.

Chairman BOEHLERT. Later this summer we are going to be in the August recess, so—

Dr. GRIFFIN. No. Okay, we will be discussing—we are examining—as I sit here, a team of bright and dedicated engineers with substantial experience in the business and on Space Station, in particular, are looking at all of the available options by which we might complete the assembly of the Space Station consistent with our obligations to our partners and our research agenda while remaining within the requirement to retire the Shuttle by 2010. I just mentioned that there will not be available 28 flights, and so we must work with less, and we must make some determination as to what amount of work is left over for the new system to complete.

We will be—we are close to the end of that exercise. During the month of July, we will be discussing those alternatives within the Administration, and as soon as we can do so, with your committee and other Members of Congress.

Chairman BOEHLERT. So is it fair to say the September time frame would be a—

Dr. GRIFFIN. Absolutely not later than that, sir.

Chairman BOEHLERT. All right. Thank you very much.

And when might we have a description of the means, other than the Space Shuttle, that might be used to ferry crew and cargo to the International Space Station?

Dr. GRIFFIN. Again, in that same time frame, because that depends upon the results of a parallel study on exploration systems architecture, and I think you know that the President has required that the so-called Crew Exploration Vehicle, which will provide the fundamental building block for returning astronauts to the Moon, must also be capable of ferrying astronauts to and from the Space Station. And so again, later this summer—

Chairman BOEHLERT. That same time frame for a description of the launch vehicle for a CEV?

Dr. GRIFFIN. Absolutely, yes, sir.

Chairman BOEHLERT. All right. And now this one is a sticky wicket, but the plan for the operation of the International Space Station in the event that the *Iran Nonproliferation Act of 2000* is not amended.

Dr. GRIFFIN. That will take longer. If—we are in—for the Administration, we are planning to seek recommendations for that act to allow us to utilize the Station together with our Russian partners. If that act is not amended, then, at present, the only plan we really have for utilizing the Space Station would be while the Space Shut-

tle is docked at the Station. At times other than that, after 2006, the United States would not be able to keep astronauts—

Chairman BOEHLERT. April 2006 you are saying?

Dr. GRIFFIN. April 2006. That is correct, sir. So if the act is not amended and NASA would not be able to have U.S. astronauts on board the Station, other than when the Shuttle is there.

Chairman BOEHLERT. And the Shuttle can be there a couple of weeks?

Dr. GRIFFIN. A couple of weeks.

Chairman BOEHLERT. All right. A description of any heavy-lift vehicle the Administration intends to develop, the intended uses of that vehicle, and whether the decision to develop that vehicle has undergone, or is undergoing, an interagency review.

Dr. GRIFFIN. All of the architecture that we intend to put forward this summer will undergo interagency review. That is an unequivocal statement. For heavy-lift vehicles capable of returning us to the Moon, I have made no secret of the fact that I believe a Shuttle-derived architecture wherein we retire the orbiter and utilize the remaining elements of the Shuttle structure, the engines, the tanks, the rocket boosters, will provide us a 100 metric ton class payload capability. And the—but from where we are today, that is the shortest path to such a capability.

Chairman BOEHLERT. Of the intended purpose of lunar missions and the architecture for those missions?

Dr. GRIFFIN. And sir, later this summer, certainly not later than September. That is a study that is ongoing. And I realize—I fully respect Mr. Gordon's remarks, and yours, that it has been now almost 18 months since the President's announcement of the vision for exploration and that it might well be said that we owe you, and have owed you for some time, those plans and those architectures. I do take responsibility for that.

Chairman BOEHLERT. Well, it is an agency in transition. We understand that.

Dr. GRIFFIN. It is in transition, and we do not believe that the problem needs to be as complicated as some have said, and we are—we have been working since I arrived, and we are working today in order to be able to provide you with those top-level plans, architectures, approaches, and budgets later this summer.

Chairman BOEHLERT. Well, one of your great skills is your ability to take complicated matters and provide some simplification, and we are looking forward to that.

How about the project goals for Project Prometheus?

Dr. GRIFFIN. I have—if I have an ability to simplify things, it is because I must to remain within my own limitations, but thank you.

Project Prometheus is extremely important. The utilization of nuclear power in space for electric power and propulsion has no stronger advocates than I, and I know that this committee knows that, because I have said that in prior testimony. However, in a world of limited resources, as I looked at our program going forward, I could not justify placing as the first goal of Project Prometheus, the development of a nuclear electric propulsion system to send a scientific mission to Europa. There are—that mission was at \$11 billion and counting for cost estimates before we got off the

drawing board, and I, in the face of competing priorities, simply could not endorse that. Moreover, the nearest term need that we have for nuclear capability in space will be surface power on the Moon in the middle or toward the end of the next decade.

So to the extent that we wish to devote resources to exploring Europa, and I do, and we will be submitting such a program, I chose not to link the exploration of Europa with the development of nuclear electric propulsion to do so. And to the extent that I believe in the importance of nuclear power and propulsion in space, and I do, I have chosen to devote our early resources to the development of lunar power—sorry, surface power for lunar missions.

Chairman BOEHLERT. Let me, before turning to Mr. Gordon, whose indulgence I appreciate, but these are really consensus questions.

Dr. GRIFFIN. I understand, sir.

Chairman BOEHLERT. And we are all searching.

The final thing is when might we expect a plan for managing the cost overruns for the James Webb Space Telescope?

Dr. GRIFFIN. Again, sir, I was apprised of those potential cost overruns last month. Within 48 hours of having been so apprised, we, at NASA, chartered a special team to review those costs with the action to reduce them where possible or where they are real, to recognize them and to replan the rest of the program around them. The James Webb Space Telescope is the centerpiece of our astronomy program going forward, no question about it, but we need to make sure that we have an executable program with realistic dates. When we have that information, again, not later than the end of this summer, I will bring it to this committee.

Chairman BOEHLERT. It is very apparent that you have a lot of busy days ahead, and we don't expect you to wave a magic wand and perform miracles, but I hope you can appreciate the desire on the part of this committee, on both sides, to get answers to some of these basic questions that guide us as we go forward with charting the course for the future of NASA.

Dr. GRIFFIN. Sir, I could not more fully understand and appreciate the need to do that. And I—we are with you in this search for answers. And as rapidly as we can provide responsive and reasonably complete answers, this committee will have them.

Chairman BOEHLERT. Thank you very much.

Mr. Gordon.

BUDGET FIREWALLS

Mr. GORDON. First of all, let me say, Mr. Chairman, thank you for getting those questions on the record. I think it is important for us to, in our mission of oversight, and quite frankly, I say that we haven't done as good a job of oversight as we should have in the past, because we haven't gotten those kinds of answers. And I think, Dr. Griffin, your suggestion of September is realistic and reasonable. You have got a lot to review. But I will also point out, that is only a few days before the beginning of the fiscal year, which is again why I would suggest that there not be major redefining of NASA and of some of the goals there until you have a chance to get through this. So I would hope that you keep that in mind.

And let me move forward with my questions.

Dr. Griffin, in my opening statement, I mentioned a number of changes that have been made to NASA's exploration program since you arrived. I did that not to question your decisions but to make the point that a lot is in flux within NASA's exploration program. And a lot of what Congress and the industry was told last year is no longer relevant. Unfortunately, NASA has a history of such changes. The Space Station program seemed to change almost every year since its initiation in the mid-1980s, and I understand you are now considering restructuring it again. In 1994, NASA announced its single stage to orbit launch vehicle program with much fanfare. A few years later, the program was canceled before the X-33 test vehicle even flew.

Then NASA announced that it was instead going to initiate the space launch vehicle within the goals of developing a next-generation reusable launch vehicle and other advanced technologies. A few years later, NASA canceled the space launch initiative and said that its new plan was to build an Orbital Space Plane. Well, the Orbital Space Plane program last year was also canceled.

Then last year, NASA announced its plan to develop a Crew Exploration Vehicle, using a spiral development approach. This program apparently, the CEV program, is being restructured and the acquisition approach changed. And many other changes are apparently being made to the exploration program. That may be the best thing to do, and I think it probably is, Dr. Griffin, but given NASA's record, it is hard to take that on faith.

So, Dr. Griffin, you are not going to have a lot of room to maneuver when it comes to the budgets, which you will likely see over the next few years. So how do you plan to ensure that your exploration program is not subject to the same errant changes that we have seen from NASA in the past? In other words, what are you going to do differently? And also, do you feel that it is necessary to set up firewalls? Or what are you going to do in these tough budget times to stop poaching into other areas of NASA's budget? Or do you think that is necessary? And is it inevitable that will happen?

Dr. GRIFFIN. Let me answer the last question first, sir, if I might.

I don't believe that we are allowing the manned space flight program to poach onto other areas. I have committed, often and publicly, that I intend to, want to, and will protect NASA's science program from the demands of human space flight, and frankly, vice versa. If the James Webb Space Telescope overruns, it is the problem of the astronomy folks, not the Shuttle folks. They have their own problems.

Mr. GORDON. Do you see setting up firewalls or what, other than just good faith? And how do you intend to try to do that?

Dr. GRIFFIN. Well, I don't think, sir, that we need legal firewalls, because the preservation of flexibility, in the event of an emergency, is always important, as, for example, in recovering returning to flight from *Columbia*, we—NASA did not receive a supplemental as we did in the *Challenger*—the aftermath of the *Challenger* disaster. And so, if we were to return-to-flight, there was no alternative but to reprogram funds. And this committee, and others, were very helpful in allowing us to do that.

So I think the avoidance of—

Mr. GORDON. There was a process—

Dr. GRIFFIN. Pardon, sir?

Mr. GORDON. There was a process there—

Dr. GRIFFIN. There was.

Mr. GORDON.—that allowed you to meet those emergencies.

Dr. GRIFFIN. And I would use that process again. So I would rather avoid legal restrictions on flexibility, and I would rather rely on working with this committee to establish the correctness and the utility of the decisions that are being made. You mentioned that you didn't want to appear to be questioning my decisions. On the contrary, sir, I think you should. If I make decisions that cannot stand up to the light of day, I think they should be questioned.

Mr. GORDON. Well, we may do that in September once we hear them.

Dr. GRIFFIN. Yes, sir.

You asked what we will be doing different.

First of all, I hope never again to let the words "spiral development" cross my lips. That is an approach to acquisition for large systems, very relevant to DOD acquisition requirements, but I have not seen the relevance to NASA, and I have preferred a much more direct approach, and that is what we will be recommending and implementing.

What else will be different? I hope that you will see, as we bring it forward, a very straightforward plan to replace the Shuttle and a very straightforward architecture for lunar return. That, on the face of it, will seem to you that if we are to do these things that the approach being recommended is a logical, clean, simple, straightforward approach.

We—you mentioned, sir, in your opening remarks, the—postponing the arrival date at Mars in order that we can do the proper things now, and I agree. The money that is being spent that is being tagged with exploration initiative funding in these early years is really, almost entirely, for the completion of the Space Station and for the development of the Crew Exploration Vehicle. That is what is being done with the money that is being provided. And in fact, we need all of it that we can get in order that we not have, in my view, a strategically undesirable gap between the retirement of the Shuttle and bringing online the CEV.

I don't think it is too soon to undertake the redefinition of what we are doing in NASA that you have mentioned. I don't think we need a year to take a deep breath, because in the course of that year, we would be spending a lot of money. There are many things, which were on the table when I walked in the door at NASA, that needed to be reexamined, and I felt, honestly, sir, that the soonest that we could do that and stop spending money in directions that we felt were unprofitable and unpalatable, the soonest that I could do that would be none too soon.

We have submitted to this Congress the—a revised operating plan for 2005. We will be putting forward a budget amendment for fiscal year 2006 to reflect some of these changes in priorities.

Chairman BOEHLERT. Thank you very much.

Mr. Calvert.

Mr. CALVERT. Thank you, Mr. Chairman.

RETURNING TO FLIGHT

Obviously, the hot topic on the news today is returning to flight. And last evening, there was a report that indicated there were some problems but that they anticipate returning to flight soon. I just thought we would ask your current assessment of the plans to return the Shuttle to flight. And do you still anticipate that we will be able to do that launch on July 13?

Dr. GRIFFIN. Let me start with the end.

Yes, sir. We have several days of slack available between today and launch on July 13. We look like we are in pretty good shape there. We have a flight readiness review, the formal flight readiness review, tomorrow and Thursday, which I will be attending. In fact, I will be leaving this evening for Kennedy Space Center. I have participated in every technical review that was appropriate for me to do since coming on board as Administrator. And I believe I have acquired a pretty good picture of where we are with respect to the technical requirements to return-to-flight. I have been tremendously impressed with the work that the team has done in executing those improvements, and I think, based on what I know now, we are ready to go. The flight readiness review for the next couple of days will either uncover an exception to that statement or will endorse it. And we will all see.

Mr. CALVERT. That is good to hear.

THE CENTRIFUGE

One of the questions that you answered indicated an obvious situation that we are not going to be able to fly the 28 Shuttle missions that were anticipated to finish the International Space Station to some degree that some folks would like to happen. I was wondering, with regard to the Centrifuge, when do you see the future of that, and are we going to be able to move forward with human exploration without performing that research that the Centrifuge was to provide? Or is there another way to get that Centrifuge up there?

Dr. GRIFFIN. Well, the—in the fullness of time, there is always a way to get anything up there. The Centrifuge accommodation module was—is being considered as to whether or not it should be flown, given the focus of Station research on the effects on the human organism of microgravity. Centrifuge can't, of course, accommodate a human. It can accommodate tissue or small animals for fundamental, cellular-based, life science research. That sort of research at the cellular level is not directly applicable and would not be for many years to problems of flying humans on voyages back to the Moon or Mars. And so in that sense of reorienting the Station's mission to focus on human exploration rather than fundamental life science research, the Centrifuge accommodation module is in—[inaudible].

FINANCIAL MANAGEMENT

Mr. CALVERT. One other question I have that—I know that you have only been there a couple of months, but as you know, for the last three of the four years, NASA has been unable to produce auditable financial statements. Auditors have highlighted a num-

ber of weaknesses with NASA's financial statements, as you know. So what is your assessment, so far, of this situation, and what do you have in mind to fix it?

Dr. GRIFFIN. The situation is deplorable. It is unacceptable that NASA cannot meet the standards for financial acumen to which it holds its contractors. We—I was apprised of this during my preconfirmation visits here on the Hill and scarcely a week has gone by that I have not been reminded of it. We have provided additional personnel and additional budgetary resources to address the issue. We have, in fact, invited leading financial management experts from other federal agencies to review our plans and have incorporated their suggestions. I have empowered the CFO to execute these plans and take actions that should produce a long-term financial health of the Agency.

We are trying to—we have three core priorities that we are trying to achieve. The first exercise is to generate a clean opinion from our auditors, just to simply know where all our money is and have our auditors agree that we do. With regard to developing our budget, we want to resolve issues of how we control our funding distribution, how we should standardize our financial data structure, and how we are going to standardize our budget formulation process. And finally, we need to standardize our management reporting methodology and financial management metric. We—our major challenges are to reconcile the fund balance with treasury accounts, to provide an auditable evaluation of our property plant and equipment and environmental liabilities, and to improve our financial data integrity and compliance with the Federal Accounting Standards board and OMB and Treasury requirements.

We know the challenge in front of us. We are getting the best external and internal help that we can to execute it. I take it very seriously.

Mr. CALVERT. Thank you, Doctor, and I look forward to working with the Chairman to have, maybe, a hearing about this later on and be more specific on this problem.

Dr. GRIFFIN. Yes, sir.

Chairman BOEHLERT. Thank you very much.

Mr. Udall.

Mr. UDALL. Thank you, Mr. Chairman.

Dr. Griffin, if we could, I would like to focus on the aeronautics side to the equation and also ask you a couple of questions about Hubble.

AERONAUTICS

As I mentioned in my opening statement, there has been a steady drumbeat of task force reports and testimony that make a compelling case that NASA's aeronautics program is at serious risk. The five-year funding trend contained in the President's 2006 budget, I think, could render the aeronautics side of the equation irrelevant. Could you just comment, as the NASA Administrator, on what you are planning to do, if anything, to reverse that decline?

Dr. GRIFFIN. Well, the President's budget for aeronautics is what it is. And what I am committed to do is utilizing that budget in the most effective way possible. I absolutely believe in the impor-

tance of aeronautics for NASA and for this nation, and I understand that we have stakeholders in industry, in DOD, with the FAA, and even internally within NASA, all of whom to which the aeronautics program is of first rank.

I think we need to focus our efforts going forward more than they have been. I think NASA does its best when our aeronautics programs are focused around key technical demonstrations, which are of a groundbreaking nature. We have had much in the aeronautics community, which is of a business-as-usual, keep-funding, keep-programs-alive nature, and I am looking to restructure. I have been, in fact, one of the voices, noting that the last time the Nation had a strategic plan in aeronautics, it was issued by the Office of Science and Technology Policy, and the date it carried was 1982. I have the report. I am in full support of this committee's and the House's recommendation that we have a new aeronautics strategy.

Mr. UDALL. Do I hear you say, then, that you more aggressively promote the aeronautics side of the NASA mission?

Dr. GRIFFIN. Within the context of the President's budget, I absolutely will. I am a strong supporter of our aeronautics program. I think we need to be looking at what we can do with almost \$1 billion in funding rather than complaining constantly that it isn't enough.

Mr. UDALL. But if I could, I would ask you, and I think you would have a lot of support on the Committee, to push for additional funding. I think the flat-line trend puts us further behind the eight ball, and it is my opinion that the results, the economic return, on the aeronautic side, is equal to that of the space side. Could we count on you to push for—within the context of your responsibilities, additional funding, at least to keep pace with inflation?

Dr. GRIFFIN. Sir, my first priority will be to effectively—to utilize effectively the money that we are given. I will be working with this committee and other executive agencies to do that.

Mr. UDALL. Let me turn—and I think this conversation will continue, if I might conclude in that way—

Dr. GRIFFIN. Sure.

Mr. UDALL.—because I do think the aeronautics side is crucial across the whole series of fronts.

HUBBLE SPACE TELESCOPE

Let us turn to Hubble. Again, I want to thank you for your willingness to revisit the Hubble policy. I know you have asked a team out at Goddard to start planning for such a mission. Could you talk about what they are doing? And then would you talk about your comment that after the first two successful return-to-flight missions, and I am going to presume, as we all do here, that these are going to be successful return-to-flight missions, what are the criteria you are going to use to decide whether to proceed with the Hubble servicing mission?

Dr. GRIFFIN. There are some detailed test objectives to be accomplished on these flights that have to do—that do affect our ability to execute Hubble Servicing Mission 4, SM-4, as it is known. They have to do with available crew time for EVA, other EVA guidelines, use of the manipulator arm for tile inspections. What we do with

regard to those procedures, they need to be worked out before we can fully commit—before I could responsibly commit to you that we should undertake the servicing mission. What I have said in prior testimony and in public remarks is that by this fall, when we have completed those two missions, we will know those answers. And if those answers are favorable, then I will recommend that we execute Hubble Servicing Mission 4 with the Shuttle and restore the Hubble to health and to a stable orbit for, you know, the next half dozen years or more.

Mr. UDALL. Doctor, do you have any cost estimates on the Hubble servicing mission and any sense of how much might be funded by the science account in the fiscal year 2006?

Dr. GRIFFIN. I don't have those estimates currently, no, I am sorry. We can provide those to you for the record. I have also not looked at, yet, the structure of what that mission might consist. Much of the cost depends on the assumptions that go into the mission, and we have not flown—all of the missions we have flown of that vein beforehand, of course, were prior to the loss of *Columbia*, and we need to think through how we would intend to do this mission.

Chairman BOEHLERT. The gentleman's time has expired.

Let me ask you, Mr. Administrator, and come closer to the microphone, because we are anxious to hear what you have to say.

Dr. GRIFFIN. Oh, I am sorry.

Chairman BOEHLERT. Is it still the operative plan within NASA, as you undergo this strategic review in your workforce, that there will be no layoffs, at least until 2007, if then?

Dr. GRIFFIN. I believe that is where we are at present.

Chairman BOEHLERT. Okay. Thank you very much.

Mr. Rohrabacher.

Mr. ROHRABACHER. Thank you very much, Mr. Chairman.

And I would like to welcome the new Administrator. Thank you very much.

THE IRAN NONPROLIFERATION ACT

Let me note that our Chairman compared you to the man from La Mancha, which I found very disturbing, Mr. Chairman. In fact, after considering that of the four top NASA executives, that all four of them are leaving, will be gone shortly, I think that we should compare you more to Conan the Barbarian rather than the man from La Mancha. So—but we—but our governor in California has already secured himself that designation. So we will be searching for an appropriate title that will exemplify your Administration.

Let me note that you have started very, very well. And you have been bold. You have been making decisions. You have been setting up a process in order to make the decisions that can't be made now. And you can count on all of us here on both sides of the aisle to be working with you.

A little disagreement with my—with the Ranking Member. I would suggest that you actually take as much money from the Mars part of the program and spend it on meeting the current challenges. Spending money too soon in such a long-term project as going to Mars, spending money would be wasteful rather than trying to meet the challenges we have now and then using new tech-

nology in the years ahead, rather than trying to develop technology today for something that may not be applicable because of changes in the future.

I would like to specifically talk to you right now about, and get your reaction to, something that I see as your ultimate short-term challenge, and you mentioned it in terms of the Shuttle and the Space Station. And the greatest impediment to you, which I can see, of actually meeting that challenge of making sure that the Space Station project is finished and reaches its potential, and plus our—that we know about in terms of the limitations of the Shuttle. And I guess what I am talking about is the Iran Nonproliferation Act. And let me note, Mr. Chairman, that I was very deeply involved in the wording of the Iran Nonproliferation Act in dealing with this particular challenge that we face right here. And I will say that it was a worthy effort at the time to make sure that we pressured the Russians not to participate in the developing of a nuclear facility in Iran. That strategy has, however, not worked. Clearly, it has not worked. Unfortunately when the Nonproliferation Act was put into place in the year 2000, both during the Clinton Administration and during this Administration, what needed to happen was some type of an overture to the Russians that would give them an alternative. Neither Administration did its job in the past, and now you, after two months as being leader of NASA, are faced with this very serious time period when we have to make decisions and we have to move forward and decisions have to be made.

And so you aren't to blame. I would put the blame on the Clinton Administration as well as the Bush Administration for not doing this, but now we have got this decision to make.

Do you believe, and you have background with—but we know that the Defense Department has been able to work with the Russians all along, even with the Nonproliferation Act. Do you believe that we should now shift into more of a policy with NASA that is more like what you have in the Department of Defense and just realize that the Nonproliferation Act is not working and Space Station has got to be completed?

Dr. GRIFFIN. Well, yes, sir, broadly speaking, I do support that. And as I said earlier, the Administration is just releasing, I, in fact, signed today jointly with Secretary of State Rice, a letter to this committee requesting that we do amend the act. It is worthy of note that it is, today, possible for the Defense Department, through its contractors, to buy Russian engines for Defense Department purposes, but if we would seek to use one of those engines to support the International Space Station program, it would not be possible under the act, and—as it exists today, and that is an interesting—

Mr. ROHRABACHER. Well, you need not be burdened with things that were so weighty, let us say, as the Nonproliferation Act, which was not, as I say, followed through on. It was not handled correctly by those who preceded you, as well as the rest of the Administrations, both the Clinton and Bush Administrations. Is there any other way out that you see?

Dr. GRIFFIN. Other than an amendment of the Act, no, sir. As I pointed out earlier, the only approach that we can take would be

to cease buying Progress and Soyuz services from Russia and to restrict our astronaut time on the Space Station to periods when the Shuttle is present.

I would also point out that while, you know, we have alliances and differences with Russia, that among the best things to have come from our space program over the last 15 years is the space cooperation that we have enjoyed with Russia. And if the act is not amended, that will come to a halt in April of 2006.

Mr. ROHRABACHER. Well, it was a worthy goal. We tried, Mr. Chairman, to make sure that we used all of the leverage we had, including space cooperation with the Russians to try to get them out of this nuclear power plant down in Iran. It did not work. There is no reason for us not to be realistic, and I applaud you and the Administration now for being realistic, although I think the Administration shares a great deal of blame for bringing us to this point.

Dr. GRIFFIN. Well, sir, none of us like this position. And the fact is that for the next several years, as the Space Station development and its partnership go forward, the United States is in the position where we cannot effectively utilize the Space Station without our Russian partners. This strategic dependence, in a critical area, is why I have spoken up so strongly since coming into this new position for narrowing the gap between Shuttle retirement and Crew Exploration Vehicle deployment. That is why I have subordinated other important priorities within NASA to that priority, because I believe—I absolutely believe that it is strategically essential that the United States have its own access to space, dependent upon no other nation.

Mr. ROHRABACHER. Thank you very much.

Thank you, Mr. Chairman.

Chairman BOEHLERT. Thank you. And without objection, the letter to the Chair and the Committee, signed by Secretary Rice and you, Mr. Administrator, will be put in the record at this juncture.

[The information follows:]

JUN 27 2005

Dear Mr. Chairman:

Thank you for your letter regarding your views on NASA's current plans for the International Space Station (ISS) and the potential purchase of goods and services from Russia that may be prohibited by the Iran Nonproliferation Act of 2000 (INA).

As the United States implements the Vision for U.S. Space Exploration, the Administration recognizes the necessity for effective cooperation with Russia to further our space exploration goals. At the same time, it is imperative that we maintain appropriate nonproliferation policy and objectives in our relationship with Russia.

Over the last several months, the Department of State and NASA have been participating in an interagency coordination process related to INA. The interagency group has proposed addressing the issues you have raised via an amendment to the INA, which is still being vetted within the Administration and is expected to be delivered to Congress in the very near future.

The proposed amendment will seek a balanced approach which maintains U.S. nonproliferation principles and objectives, while also maintaining the U.S.-Russia space partnership. Significantly, the proposed amendment intends to sustain the INA's core nonproliferation provisions in Sections 1-5.

We look forward to beginning a dialogue with your Committees to ensure that space policy and nonproliferation issues are adequately addressed. We would like to acknowledge your commitment and leadership on this important

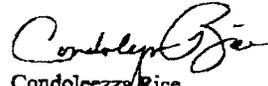
The Honorable
Sherwood Boehlert, Chairman,
Committee on Science,
House of Representatives.

issue and would be pleased to discuss our ongoing efforts in greater detail, at your convenience.

Sincerely,



Michael D. Griffin
Administrator
National Aeronautics and
Space Administration



Condoleezza Rice
Secretary of State

Chairman BOEHLERT. In effect, it says that within the Administration, a proposed amendment is still being vetted, and we can anticipate something in the short-term. So thank you.

Dr. GRIFFIN. I think the details of the wording, that is correct, but with the broad principle that we need an amendment. I believe that is accepted.

Mr. ROHRABACHER. Thank you.

Dr. GRIFFIN. Thank you, sir.

Chairman BOEHLERT. Mr. Honda.

Mr. HONDA. Thank you, Mr. Chairman.

And welcome, Mr. Griffin. It is good seeing you again.

Dr. GRIFFIN. It is good to see you, sir.

CENTER WORKFORCE

Mr. HONDA. A lot of the questions I wanted to ask were asked already. And I think your responses were clear and very forthright, and I appreciate that.

And I look forward to September where we get more information from you in terms of what the timeline on the calendar is going to look like for our programs.

The previous Administrator had set up the budget in such a way that it appeared that our different centers would be operating as if they were R&D outsourced agencies. And I heard you say that—and I read that you had said that you are changing the direction and trying to retain the core competence of those engineers and scientists that we have at these centers so that they can do what we do best and what NASA's mission has been set out in—originally.

Understanding that and seeing that and looking at the proposed budget for NASA for 2006, what is it in the budget that you see right now that needs to be revisited or looked at in terms of policy refinement in our budget for authorization so that you can move forward with the mission that you laid out and that you see that needs to be done in the near future? Not only the mission, but also in terms of how we are going to be able to maintain the staffing that we currently have without compromising our core competencies and the direction that you would like to take NASA.

Dr. GRIFFIN. Yes, sir. I feel like I am becoming repetitive with this answer, but we have yet another team of senior folks within NASA—

Mr. HONDA. I remember that. Yeah.

Dr. GRIFFIN.—who are looking at exactly the question you raised of how do we need to restructure our fiscal year 2006 plans in order to preserve core competencies within the NASA centers. Those results, also, will be available within the next few weeks. In fact, we must have them within that time in order to present—prevent other undesirable actions.

Philosophically, there are—there is probably no one you will have before you who is a stronger supporter of the broad principles of competition and industrial capability than I. I have run businesses, which had to make money. I have been an entrepreneur.

But all of that said, federal research centers and laboratories are not operating businesses. They don't exist for that purpose. They exist to make investments on behalf of the American people that it has been determined by the Congress are necessary to be made. And they don't operate, and should not operate, on the principles of short-term gain or next quarter profitability. So we will not be running our NASA federal centers as if they were our outsourced laboratories for R&D. We will be making strategic assignments of missions—mission areas and work to those centers in order to preserve the core competencies that we feel we have to have going forward to execute NASA's science missions, the vision for exploration, and aeronautics.

They won't be, necessarily, the exact same missions that we had been performing in the past or even are performing today. During my round of center visits, including to Ames and other aeronautic centers, I have pointed out that in fairness, the research centers, as opposed to the mission and flight operation centers, the research centers should be on the cutting edge of change. They should be on the very edge of the frontier of what it means to be doing research and development for space and aeronautics. Just as today we no longer have manufacturers who produce slide rules, today we may well not need every wind tunnel that exists within NASA. But the role of research within NASA, to keep this Nation on the cutting

edge of space and aeronautics technology development, cannot be denied, and it is uniquely NASA's, and I support it totally.

FFRDC

Mr. HONDA. Thank you, Mr. Chair. If I may, a quick question.

Then have you reached any conclusions about the recommendation to convert centers to alternative structures, such as the FFRDC?

Dr. GRIFFIN. I have worked at NASA centers, and I have worked at FFRDCs. Both are excellent investments, in my opinion, of federal tax dollars. I do not fundamentally see any gain to be achieved by having NASA convert federal centers to FFRDCs, and the doing of so—such—so doing would, in fact, create pension and retirement system liabilities that I don't believe this Congress is prepared to take on in the current budget environment.

Mr. HONDA. Thank you, Mr. Chairman. And just as a personal comment, this program and these projects have been in such turmoil in the last few years that a lot of these—being repeated, and if we are talking about Don Quixote de La Mancha, he had more than one or two windmills he had to hit, and sometimes it looked like the same ones. And I think that people's lives and people's projects that are affected sometimes require repetition for the—to replace the kinds of sentiments that had been growing for these past few years, and I, for myself, do appreciate your leadership.

Chairman BOEHLERT. The gentleman's time has expired.

Mr. HONDA. Thank you.

Dr. GRIFFIN. Thank you, sir.

Chairman BOEHLERT. Dr. Ehlers.

Mr. EHLERS. Thank you, Mr. Chairman.

SAFETY AND RISK

Let me first say, Mr. Administrator, how pleased I am that you are in this position. NASA is at a very crucial juncture, and you are the type of person and have the right background to solve the multitude of problems that we have been talking about this morning, and I appreciate your willingness to take on this almost impossible task.

I would like to join my colleagues who have expressed their support for the Hubble servicing mission. I won't go into a lot of details on that, but I would simply point out we have done it several times before with far less safety concerns than we are facing right now, and we completed the missions safely.

I worry, frankly, and this is not just relating to the Hubble repair mission, that we have become so safety conscious after the *Columbia* accident that we may be needlessly eliminating our space exploration efforts. We have to recognize, as American people, you cannot guarantee absolute safety, but I think at this point, you are certainly very close to exceeding the safety standards that every American has when they enter their automobile and drive through traffic in this country. They don't stay at home because there might be an accident. And similarly, I don't think you should stay on the ground, or your astronauts should stay on the ground, because there might be an accident. They recognize full well, and I have

discussed this with them the risks involved. They understood that full well when they became test pilots, the many who have served in that capacity. And I suspect we are going in a direction where we are trying to make our spacecrafts safer than the test aircrafts that they flew in the past. So I just—I am just urging some common sense and not an atmosphere of fear that I think has pervaded a lot of—that has infected a lot of people since the *Columbia* accident.

I certainly hope you are able to do the Hubble repair mission and, of course, do it as safely as possible, but not be Earth-bound by it by fear of what might happen.

VOYAGER AND CEV

The second point I would like to make is Voyager I, which I think has reached a very crucial juncture in its voyage. And I understand that there is some talk of terminating that particular mission. You, of course, can't terminate Voyager I. It is still going to be out there transmitting the data, but that, for financial reasons, we are not going to continue recording the data. I, once again, would plead with you to keep that effort going. It seems foolish to wait all of these years for it to reach the—and then somebody pull the plug. So I hope—and I would be happy to work with you and I am willing to try to help you identify other things that could be cut instead. But I plead with you to keep Voyager I going. And—I shouldn't say that. It is going to keep going, but keep collecting data, and even if we may have to slow down the analysis for financial reasons, at least collect it and let future generations of scientists have that information.

My final point is I think the highest priority you have, other than these two aspects, is development of the Crew Exploration Vehicle. And I think when you mentioned earlier the need for research, that is clearly an area where we need, I think, some very new ideas, some very basic, fundamental research, to try to come up with new approaches, particularly if we are hoping to travel to Mars some time in the future. We have to develop better propulsion systems. And the CEV is a golden opportunity to really look at some new ideas that have developed since the Shuttle was developed. And so I wish you well in that. And I really think you were correct when you say it is a very high priority. I think it has to be your highest priority, other than the various satellites that are out there now.

I would appreciate any comments or reaction you might have to any of these points.

Dr. GRIFFIN. Sir, with regard to to the preservation of operating satellites, we are—we have heard the voice of the community and the Congress in this topic. We are doing a fresh, top-down review on what satellites will be kept in operation and which ones will not. And I assure you that I also think it is rather dumb to be turning off Voyagers I and II. Nonetheless, you will hear our final answers on that a little bit later this year.

With regard to the priority of the CEV, in my view, it is right behind—it is my number two priority, after flying the Shuttle safely in the remaining years of its operation. So I support your remarks.

Mr. EHLERS. Thank you.

Chairman BOEHLERT. Thank you very much.

The gentleman's time has expired.

Mr. Miller.

Mr. MILLER. Thank you.

LIFE SCIENCE RESEARCH

Administrator Griffin, I am pleased to see you here. A couple of years ago, the investigation into the Shuttle disaster concluded that one of the problems was that NASA had contracted out too much expertise, that there was not the nucleus of expertise in-house at NASA, that they needed to be at each other's elbows to do the job that they needed to do. I asked Sean O'Keefe if he embraced that finding, since it did appear to be contrary to deviate from the Administration's orthodoxy about contracting out, and I never got an answer, although, when he got through not answering, the light was red. So I am very pleased to have heard you embrace that idea that we do need to maintain that nucleus of expertise within NASA and that you will push for that in future budgets.

I do have a couple of questions about other programs. You did say earlier that you thought that there was not an immediate need for life science research into longer-term human travel into space, because we aren't going to do it right away. But what is going to be the effect of a break in research in that? If we don't have continuous research, how easy is it going to be to pick back up after having essentially stopped the life science and the biomedical research that we had been doing and need to do at some point before we do longer-term space travel?

Dr. GRIFFIN. Well, sir, in response to that question, I believe the answer is fairly obvious to any of us who have ever been grad students in our lives. Most of the kind of research, fundamental research that we talk about is done in universities or in programs where universities are part. And it will, if we are not able to fund all of the work in fundamental life science, the researchers who were doing it will go elsewhere to other occupations, other research endeavors that are being funded, and we will have to put the program back together later.

Mr. MILLER. Okay.

Dr. GRIFFIN. That is just a fact. But I cannot responsibly prioritize microbiology and fundamental life science research higher than the need for the United States to have strategic—its own strategic access to space.

Mr. MILLER. Well, I am not happy with that answer, but it was an answer.

Dr. GRIFFIN. Yes, sir. And I am sorry, I am not happy with it either, but I don't know what else to do.

SPACE GRANT PROGRAMS

Mr. MILLER. One additional question about this space grant program. It is hard not to look at NASA's request and Congress's appropriations and not come to the conclusion that Congress values the space grants program more highly than NASA does. I think Congress, in fiscal year 2003, appropriated \$24,100,000 for the

space grant program. The request the next year from NASA was \$19,100,000, and it kind of goes on every year. What is your take on the space grant program? Do you support that program? Do you think it is important in providing the kind of flow of expertise that we need? Is there something we ought to be doing instead of the space grant program?

Dr. GRIFFIN. I would have to take that question for the record, sir. I am actually not familiar with the program, and in the two and one-half months I have been on board, have not had the opportunity to become so. So we will take a look at it, and I will get you a responsive answer, but it will have to be for the record.

Mr. MILLER. Okay. Thank you.

INFORMATION FOR THE RECORD

The National Space Grant College and Fellowship Program (Space Grant) continues to be a critical component in our education portfolio, particularly with regard to addressing workforce needs of both NASA and the national aerospace industry. Our experience is that the Space Grant program also has been very effective in developing a national network of affiliated organizations, now comprised of over 550 colleges and universities, 80 industry affiliates, 40 government affiliates, and 180 non-profit and other educational organizations. This network is a critical strategic element for preserving and cultivating our future workforce expertise in disciplines needed for future space exploration.

The focus of NASA education is best presented in terms of its three major strategic outcomes: (1) Strengthening NASA's and the Nation's future science, technology, engineering and mathematics (STEM) workforce; (2) Attracting and retaining students in STEM disciplines through a progression of educational opportunities for students, teachers and faculty; and (3) Engaging Americans in NASA's mission through partnerships and alliances.

The Space Grant Program has and is expected to continue to assist NASA in achieving these outcomes in several ways:

- **Student Pipeline:** Program fellowships and scholarships support an average of 2,200 students each year of which 21 percent are under-represented minorities and 43 percent are women; the research component involves over 5,000 students each year; and, the higher education component involves over 20,000 students each year.
- **Faculty Competitiveness:** The research infrastructure building effort contributes to the development of faculty through the travel grants, seed research grants, release time, and research collaborations with NASA Centers and industry.
- **Pre-service Education:** The pre-college efforts focus on enhancing the knowledge of students and teachers through teacher preparation and development, curriculum development informed by NASA content, and dissemination activities.
- **Student Research:** The fellowships and scholarships emphasize student internships and research experiences and mentoring components, with consortia reporting an average of 1,500 collaborative efforts each year with NASA Centers and with industry.
- **Under-represented and Under-served Participation:** 20 percent of the over 550 academic affiliate organizations are minority-serving institutions. Additionally, over 20 percent of the Space Grant fellowships and scholarships are awarded to under-represented minorities.
- **Elementary and Secondary Participation:** The pre-college component places an emphasis on teacher preparation and development. Each consortium is directed to align pre-college components with the state's STEM standards and existing state systemic reform efforts.
- **Informal Education:** The public service component emphasizes promoting an understanding of STEM disciplines through the dissemination of NASA content (materials and information), and the stimulation of an interest in STEM disciplines and the NASA mission through public service activities.

We look forward to sustaining this program with a focus on alignment to NASA strategic education outcomes in the areas of workforce, pipeline, and public benefit.

With our increased emphasis on partnerships and alliance, we value the many now long-standing affiliations, which have developed through Space Grant over the last 18 years and look to build on those relationships.

Chairman BOEHLERT. Mr. Hall.

Mr. HALL. I thank you, Mr. Chairman.

It is not necessary that I be happy. It is probably not possible when I hear all of these suggestions that we are going to have 28 or 38 missions by 2030, or even talk about our new vehicle by 2010. I think about George Burns, at the age of 100, saying he didn't buy green bananas. So I don't think it is going to happen really quick, but I am glad to see you with your hand on the throttle. And we—a lot of us are very happy to see him reach down into the maze of men and women that could be considered for this to see you come up with it. I am not sure you are going to make it, but I am pretty sure that I am going to be trying to help you and support you.

Dr. GRIFFIN. Thank you, sir.

Mr. HALL. And Congressman Rohrabacher referred to you as the man from La Mancha. I guess the areas that you are battling are real, however. We know they are, and the results are consequential, rather than comical. You have a lot of work to do and some very difficult things to change. I just—you have—you know, for one thing, the trip to Mars, you are faced with the Will Rogers look-alikes throughout this country who say they are less interested in going to Mars than they are of being able to make a trip to the grocery store. And that is a pretty—thing that most people can relate to, but the hard and cold facts are we need to go to Mars. We have to go to Mars for a lot of reasons. And this group—these—we—it is obvious that we are aware of those reasons and are pretty supportive of them.

We know that NASA wrestles with all of these thorny issues, that we have got to move ahead with authorizing legislation to keep you going. And the bill that Chairman Calvert and I introduced just yesterday, I think, provides a framework for moving forward and ensuring that Congress has the information it needs to make a more detailed policy because in years ahead you are going to have to make and be having to lead.

I think that on safety—this hasn't been talked about very much here today, but I know it is on everyone's mind. We—as you know, we had \$15 million set aside. We had requested that and had been set aside to study for the future safety of the astronauts themselves, and I understand that you all have handled that and that you—that either under the previous Administration, or your Administration, have been working for safety with full plating with the hulls of some of the birds we have and space suits and other survival equipment, that that has been wrapped into that and going in the future planning that I have asked you about so many times. So you know pretty well, and because it is still a fragile mission, you know the reason I am asking them, and you know the question I am going to ask, and you can just answer it without me asking it, but to make it a little easier for you, I would like to get it on record. This is your first appearance here, official appearance here, as the Administrator. You have been here many times before, but you know I am concerned, as we all are, about crew safety, and

I know that you have down-selected the Crew Exploration Vehicle to two contractor teams, is that correct?

Dr. GRIFFIN. That is correct, sir.

Mr. HALL. And in their proposals, did they address crew safety as an issue? And if so, how? And if not, will this be included in future iterations of these contracts themselves?

Dr. GRIFFIN. Oh, crew safety has been addressed, and as we go forward to a further down-select early next year to a single contractor to build the CEV, we will absolutely make certain that crew safety is a top priority.

Mr. HALL. But you are underway, and you are of record, and you are giving leadership in that thrust?

Dr. GRIFFIN. In every possible way that I can, sir.

Mr. HALL. Because wouldn't you hate to be Administrator, and would we hate to be Members of Congress, if we had another tragedy and we weren't already traveling that road to get that type of operative procedure for our future astronauts?

Dr. GRIFFIN. Sir, we are endeavoring with our plans and designs for the new Crew Exploration Vehicle to make it as safe as we can, as simple as we can, and have it as soon as we can.

Mr. HALL. Until 2010, and then have the module in that bird that would be an escape vehicle.

Dr. GRIFFIN. Well, we would hope there would be an escape system for launch aborts and things like that. Yes, there will be.

Mr. HALL. I thank you. And I thank you for what you have done. And I thank you for the way you are doing it. And I admire you for the way you are doing it.

I yield back my time.

Dr. GRIFFIN. Thank you, sir.

Chairman BOEHLERT. The gentleman yields back four seconds.

Mr. Green.

Mr. HALL. Well, let me finish then.

Chairman BOEHLERT. Mr. Green.

Mr. GREEN. Thank you, Mr. Chairman.

And I also thank you, as well as the Ranking Member, for this opportunity to visit with our outstanding head of our space program.

I will tell you, sir, that as you sit there alone, that table looks very large. Normally, we have several people there at the table, but it appears to me that you are up to the task, and I compliment you.

I would like to segue from Congressman Hall's comments about crew safety to another area of crew safety. It is my understanding that the *Columbia* Accident Investigation Board gave us 15 recommendations that were to be adhered to, or should be adhered to before we return to space flight. I understand that 12 of the 15 have been met, but we have three that are outstanding. Those three include the debris issue, which was a key issue with reference to the demise of *Columbia*, repair tools, and repair techniques. Mr. Bill Parsons has said that the space—return to space right now bears an acceptable risk. And my question has to do with this term "acceptable risk", given that we still have the debris issue, we still have the repair tools and repair techniques, and we are looking at a launch window of possibly early July, July 13

through July 31. Will you please comment on the term “acceptable risk”?

Dr. GRIFFIN. Yes, sir. I believe that Mr. Parsons was commenting on the acceptable risk of returning the Shuttle to flight in terms of the corrections and improvements that have been made after the loss of *Columbia* to address the causes of that loss. Now I have—as I said earlier, I have participated in every significant technical review that has been held on this topic since I was nominated to this office.

Let me give you my assessment, if I might.

We have—and our independent advisors from outside have agreed, we have tremendously reduced—we believe that we have tremendously reduced the amount of debris, which is shed, or will be shed, by the external tank on this next Shuttle mission, as compared to all prior Shuttle missions. Now we believe that. This is a test flight. These next two flights are test flights. It needs to be fully understood that they carry the risk of test flights, because we cannot—we simply do not have the capability to assess the efficacy of our improvement without returning to flight. But we believe it is much improved.

So when we say “acceptable risk”, we mean that the risk of an accident due to debris, which was the approximate cause of the Shuttle *Columbia* loss, has been reduced to a level that is consistent with other risks associated with the Shuttle space flight system. And there are many.

Mr. GREEN. Just as a quick follow-up, will we have repair tools and repair techniques available to us prior to the next launch?

Dr. GRIFFIN. No, sir, we will not. We—those three recommendations in the *Columbia* Accident Investigation Board’s report were, of course, well intended and serve as admirable goals. The ideal state would be to have no debris coming from the tank. We have not been able to achieve that. The ideal state would be to have repair tools and repair techniques, which could deal with a flaw in the tile, the Shuttle’s entry heat system, heat protection system once we are on orbit. We don’t know how to do that. We have spent quite a lot of money on it. Some have estimated hundreds of millions of dollars trying to comply with that recommendation. We don’t know how to do it. So at this point, we must say that we have reduced the level of risk due to debris damage to an acceptable level, in Mr. Parsons’ words the other day, or we must say that we don’t want to fly the Shuttle again because we do not have a better technical approach to dealing with it than the one we have put forward.

Mr. GREEN. Thank you, Mr. Chairman. I yield back the balance of my time.

Chairman BOEHLERT. Thank you. You are generous: two seconds.

Mr. Administrator, when you say “debris,” are we talking foam now or foam and ice?

Dr. GRIFFIN. Broadly speaking, foam and ice. If you wish to make it more specific, then I—everything that I have learned in the past two and one-half months causes me to believe that we have reduced the risk of damage from foam debris to a negligible level. Okay. That will not be a factor. And again, we cannot back that assertion up without a test flight, but we are going into the flight

of STS-114 with the belief that foam debris risk is not a significant factor.

Chairman BOEHLERT. What about the risk of ice?

Dr. GRIFFIN. We have greatly reduced the risk of damage by falling ice, in particular by putting a feedline—a heater on the locks, forward locks feedline bellows. There are other spots on the external tank and its propulsion system where ice can accumulate and from which it can be liberated and strike the orbiter. We believe that risk is minimal. Well, we believe it is well less than one in 100 based on our analyses, but it is not zero. And—

Chairman BOEHLERT. But it would lead you to conclude the acceptable risk?

Dr. GRIFFIN. The—we have concluded that it is an acceptable risk in comparison to other risks, which we assume when we fly the Shuttle.

Chairman BOEHLERT. Thank you very much, Mr. Administrator. Mr. Sodrel.

Mr. SODREL. Thank you, Mr. Chairman. And thank you, Administrator Griffin, for being here this morning.

I know there are various kinds of risks to astronauts. One certainly is trauma, which the question has been asked here. The other is longer-term. I have got an e-mail here I would like to read to you from a constituent in my District and ask your comment.

It says in order to ensure the safe return of astronauts from exploration missions, we must have effective countermeasures and an autonomous support system. This requires an aggressive basic and applied research program in flight aboard the International Space Station and on the ground. It is particularly compelling because the countermeasures that are available today will not adequately protect our astronauts. In fact, I understand the longest—that the astronauts that spent the longest time in orbit experienced both muscle deterioration and loss of bone density. But anyway, it says, in short, that we must maintain orbital science and grant research and apply them directly to exploration missions. I wonder if it had had any significant impacts on space life scientists has been the denying of funding of proposed research that received high acclaim and peer review. We scientists believe the values and principles encompassed within peer review. The process needs to be upheld by all research agencies, including NASA.

So I guess first, my first question is how much weight is given to peer review? And the second part is what are we doing with regard to protecting the astronauts long-term?

Dr. GRIFFIN. Well, with regard to the role of peer review in selecting science experiments, it remains unchanged within NASA and absolutely follows the guidelines that your constituent is suggesting. However, the purpose of peer review is to determine which experiments, in comparison to other suggestions, are worth doing and ultimately to help us with prioritizing our overall research agenda. But there will always be more good ideas that could be suggested for funding and would pass the peer review process than we have the budget to support. And so at some point, there must be a cut-line established below which we simply can't afford to fund those priorities.

Now that does not make them without a value, but it does mean that we don't have the money to support them. We must choose. We must choose whether minimizing a strategically significant gap in space access to the United States is more important or less important than doing the kind of research of which, you know, your constituent speaks.

I have been very clear in my choice that the most important priority facing us, as we conduct our program of human space flight, is to fly the Shuttle safely. The next most important thing is to bring online its replacement. It, in my view, serves no purpose to conduct even very high quality research into human space life sciences unless we are flying humans. And if we have a long and strategically significant gap in such human space flights, I think we have got the priority order in the wrong way. But with all due respect to your constituent, I do understand the priority choices, which must be made, and I have made mine.

Mr. SODREL. So you feel like we are doing enough to protect the astronauts in the long-term, as well as the short-term?

Dr. GRIFFIN. I believe we must eventually do more to protect astronauts in the long-term, but at present, we are not conducting long-term flights.

Mr. SODREL. Thank you.

I yield back the balance of my time.

Chairman BOEHLERT. Ms. Johnson.

Ms. JOHNSON. Thank you very much, Mr. Chairman.

LESSONS LEARNED FROM THE INTERNATIONAL SPACE STATION

I apologize for being late. I had an engagement I couldn't change, and I might have missed a great deal of your testimony, but welcome, and I read about your beginning. And I would like to—well, over the years, I have touted the space program as being one of the most successful research programs in our history with both treatment and commercial items.

What did we learn from the International Space Station?

Dr. GRIFFIN. Well, ma'am, that is a very broad question. We have learned much from the International Space Station so far and have a significant amount to go. Some specific things that we have learned, I have often said that one of the best benefits of the program has been the enduring quality of the international partnership which has developed. We have learned to work with other nations in space and to find ways to resolve differences and make the program work. We have learned a tremendous amount about assembling and integrating large structures in space and sustaining them for years at a time, frankly, through some pretty severe difficulties following the loss of *Columbia*. It is the goal of this Administration, it is my goal, to put us on the path to a lunar return and the establishment of a lunar outpost and missions to Mars. We will not be able to execute those missions without learning how to sustain operations in space for months and years at a time, and a place where we can learn to do that is the Space Station.

WORKFORCE

Ms. JOHNSON. Thank you. A year ago, as we were listening to testimony, one of the urgent things was making sure that we had the talent in-house, the numbers available to do the work. Have—and I noticed you have gotten rid of a lot of people. Have you brought new ones on?

Dr. GRIFFIN. Ma'am, we haven't gotten rid of a lot of people. I am not sure we have gotten rid of anyone. I have reassigned some senior managers from existing roles in the Agency, or will be reassigning them, to other roles within the Agency, if they choose to accept those roles. I am in the process of assembling a management team that I feel I can most efficaciously work with as we go forward, as I think you would expect of any senior manager. We are looking very closely across the Agency at how we preserve the core competencies that we need within the government.

Ms. JOHNSON. You have ended your associations primarily with private industry as well as universities, and most especially with universities. I thought we were attempting to attract and prepare staff for the future. What was the rationale for that? I know you said you want to do it in-house, but I am just trying to—

Dr. GRIFFIN. Ma'am, we have not ended our associations with universities and private industry by any stretch of the imagination. Eighty percent, or more, of NASA's budget is outsourced and will continue to be so.

Ms. JOHNSON. Okay. I am reading the wrong material.

When you go to—what—I understand that the—in getting to Mars, it is going to be a journey, so it is going to probably take a while. What do we need to do before you start to go to—other than raise a lot of money, what—you are going to use what you have learned from the International Space Station. What else do we need to do, and what are we looking for?

Dr. GRIFFIN. We need to develop a replacement for the Shuttle, which is capable of flying to the Moon and later on to Mars. We need to develop—to redevelop a heavy-lift launch vehicle, something in the 100 metric ton class. We need to gain broad operational experience going to and living on the Moon for significant periods of time before it would be wise, in my opinion, to take the step to Mars. We need to develop space nuclear power and propulsion systems in order that we can go to Mars and remain there in effective ways.

Ms. JOHNSON. Do you feel—

Dr. GRIFFIN. Those are the broad categories of things that I think are important.

Ms. JOHNSON. Okay. Do you feel that you have now—or you have your eye on the appropriate skills to bring in-house for that?

Dr. GRIFFIN. Yes, ma'am, I do. I think NASA has most of the critical skills it needs to acquire and maintain in order to execute this mission, and where we don't have them, we know what to do to get them.

Chairman BOEHLERT. The gentelady's time has expired.

Ms. JOHNSON. Thank you very much. I appreciate it, Mr. Chairman. Good luck, and I will try to be of support.

Dr. GRIFFIN. Thank you.

Chairman BOEHLERT. Thank you.

Mr. McCaul.

Mr. MCCAUL. Thank you, Mr. Chairman.

MANNED SPACE FLIGHT VS. UNMANNED SPACE FLIGHT

Dr. Griffin, it is an honor to have you here today. You certainly have a challenge in front of you that I agree with the Committee. You are doing a great job getting started, and I wish you well.

I have about 15,000 NASA employees and contractors on the Houston end of my District. I have been through the Johnson Space Center. It is very impressive. Most of the questions have already been asked, but I do want to ask a more fundamental question, and that is I support the President and his vision, space exploration to the Moon and Mars and beyond. But there are those critics who say that we shouldn't take the risk and that we should do that with unmanned vehicles. And I was hoping that you could possibly articulate or advocate why it is important for us to engage and have manned space flights to the Moon and Mars and beyond as opposed to unmanned space flights.

Dr. GRIFFIN. Well, sir, I think both are important, and I have spent significant portions of my career in both pursuits. But let me answer your question as to why I believe it is important.

I believe that if the United States is to be the world's preeminent nation going forward in the 21st century and the centuries beyond, that it must be preeminent in space, exactly as was the case centuries ago when small island nations or other small nations, such as Britain, Portugal, had dominant roles in the global structure of their day because of their maritime preeminence.

Space is—mastery of the art of space flight, both human and robotic, is the most important thing that America can do to assure that we will always be a great nation, in my opinion. When one looks at that, there are broad regimes of activity. There are activities that we undertake today in low-Earth orbit, both human and robotic, and they are very significant.

Beyond low-Earth orbit, the next places that we can go are the Moon, Mars, and the near-Earth asteroids. If we don't go there, eventually other nations will, and eventually may not be too long. I have pointed out in other testimony that since we last flew our own people in space on our own machines, two other nations have done so. I do not find that acceptable. Space will be explored and exploited by humans. The question is which humans from where and what language will they speak. It is my goal that Americans will be always among them.

Mr. MCCAUL. I thank you for your eloquent testimony.

I yield back the balance of my time.

Chairman BOEHLERT. Ms. Jackson Lee.

Ms. JACKSON LEE. Welcome, Dr. Griffin. It is a pleasure to engage you, and I thank the Chairman and the Ranking Member for this very crucial hearing. I hope we will have an opportunity, as I might imagine you would like, for members to engage on a regular basis. I, frankly, believe that we have to be a team if we are going to be successful.

I consider the astronauts brave and patriotic Americans willing to risk their lives on behalf of American excellence and at the direc-

tions of the Commander in Chief. I don't believe one astronaut would tell you that they are not willing to accept this mission or any other mission. And that is why I believe it is crucial for the executive, in this instance, you, but even more crucial for this body, which is considered part of the people's house, closest to the people of the United States, to be diligent, technically and philosophically, on this question of space exploration. Now I happen to be a very strong supporter of human space exploration, including the mission to the Moon. But at the same time, my neighbors are astronauts. My neighbors are the Johnson Space Center. My neighbor was Ron McNair, who attended church in my Congressional District, and his wife, a friend, and still a very zealous and wonderful supporter of NASA's mission.

So I pointedly ask a number of questions that you have already asked and answered, and I have reviewed your testimony, and I, too, apologize for being at another meeting. But I do want to probe more extensively your very forthright recognition that we don't have the tools or the techniques that we would totally like to have as it relates to space debris, and I think space debris is anything. It is the foam, or as I understand, any amount of debris that you encounter in going into space. Can you calculate—this question has—might be considered asked and answered, but I think we need to hear it more times than not, where you place this risk, this acceptable risk, as compared to the advantages or the importance of space exploration. Might you also give us the vision of the NASA Administration and the President of the extent of human involvement in the space exportation in the mission to the Moon and the presence of humans on the Moon, the advantage of their presence on the Moon? I am trying to give you a series of questions so that you can answer them.

The other point that I want to acknowledge, and I think I understand this, I want to applaud the bringing in-house of technical and planning and strategic decisions for NASA, meaning that you are looking for the world's best scientists, the Nation's best scientists in dealing with decisions in-house, and I think that is absolutely imperative. One of the questions—one of what I glean from the Gehman Administration is the line of command. Who was telling whom to do what? Can you tell me, is that where you are trying to go to make sure that strategic decisions, whether it is on safety or otherwise, are within the bounds of NASA? And if you are going that direction, I am with you.

Let me conclude in this direction.

I hope that you will join us and encourage this committee to hold a full, extensive hearing on the question of safety. And I am going to ask you. I would like you to just answer that yes or no in your answers, of the importance of this committee having oversight, being an investigatory mold to be helpful on the question of safety, safety on human space shuttle, but safety as well in the International Space Station, which I think is extremely important as a scientific tool for what it has done for America.

And lastly, this question of training in-house. I hope that we can work together on our Hispanic-serving and historically black colleges. I would like to work with NASA on direct programs generating physicists, chemists, biologists, and others that can be di-

rected toward your institution who happen to be from the minority community.

And I thank you for your presence, and I hope you can summarize my questions.

Dr. GRIFFIN. I will try. Thank you.

DEBRIS HAZARDS

With regard to debris hazards and being all encompassing with—in our definition of debris whether it is on ascent or while we are on orbit, yes, you are right. Orbital debris might—what we call MMOD for micrometeoroid and orbital debris hazard, is one of the more significant hazards to space flight in the Shuttle. And when I spoke earlier of reducing our ascent debris hazard down to a level consistent with other risks, this was one of the other risks. Going forward, in order to make space flight as safe as possible, the best thing we can do is to continue with the protocols we are already implementing regarding minimizing—absolutely minimizing the generation of new orbital debris. And then the other factor is in the replacement vehicle for the Shuttle, the CEV, we must have a design which is, as much as possible, robust in the face of orbital debris, and that is a significant concern that I have.

THE VALUE OF HUMANS ON THE MOON

Now humans on the Moon I think is quite significant. I have never heard it put better than Norm Augustine in his report in 1990 where he pointed out that an instrumented payload on the top of Mount Everest simply did not have the same value as Tenzing and Hillary ascending that mountain. Others have tried to come up with similar approaches, but I think Mr. Augustine put it best. The value of humans on the Moon is the value that we bring anywhere we go. The ability to make broad judgments, to make big picture assessments, to decide what details are important and what ones are not important so that we can deploy our robotic assistance on the proper tasks.

STRATEGIC DECISION-MAKING

With regard to our strategic decision-making in NASA, yes, we are refining our—in fact, our—what we call our strategic management handbook, as I speak, trying to simplify our chain of command and make our decision processes more transparent and more specific.

If you decide to hold a hearing on safety of space flight, whether Shuttle or International Space Station, you may count on me to be a strong supporter of that hearing, and I look forward to working with you on it.

THE ROLE OF HBCS

Regarding the development of in-house capability for our scientific and engineering staff, I welcome, with open arms, efforts to engage Hispanic or historically black colleges and universities, as I do all of our colleges and universities. We are, as a nation, facing a crisis, clear and documented in our ability to entice young people

to embark on careers—on technical careers: science, mathematics, engineering, all branches of those. Our—in many cases, in our graduate institutions, foreign enrollment surpasses domestic enrollment, and the problem is that they go back home. They don't stay here. We need to address this. I have—I could not more strongly support that.

Chairman BOEHLERT. Thank you very much.

Mr. Feeney.

Mr. FEENEY. Thank you very much, Mr. Chairman.

LAUNCH VEHICLE DETERMINATION

And Dr. Griffin, I want to join the chorus of the members of the Committee to welcome and congratulate you to the Administration head at NASA. I have been very impressed by your background, been very impressed by the fact that you hit the ground running. Even though you came from the outside, you had in your mind a very visionary way of taking a complete inventory of NASA's resources and capabilities and opportunities and challenges long before you were appointed by President Bush. And I have been, frankly, amazed at how quickly, dispensing with any need for on-the-job training, you have stepped forward. You have reorganized both personnel and mission. You have made some very critical, decisive judgments that are going to be criticized by a lot of us. But you have done so with a sort of confidence and the level of expertise and background that gives me confidence that we are exactly doing what we need to be doing. And there are going to be 535 visions for NASA in Congress. And the fact of the matter is, we are going to have to rely on you to bring those together on behalf of the people of the United States. And I have complete confidence in your ability to do that job.

I was especially delighted to hear you say that priorities one and two for your term involve human space flight, because, while there are lots of priorities in science, microbiology for example, as mentioned earlier, all of these are important, but prioritizing is the job that you have to do and the budgetary folks have to do. And the truth of the matter is, there are a lot of places that can do research. There are a lot of universities. There are a lot of foundations. There are a lot of private sector folks, but there is only one place that can move Americans into low, middle, and high-Earth orbit and to explore the solar system, and for now, that is the Federal Government.

I join Dana Rohrabacher and others in hoping that, with respect to low-Earth orbit, NASA gets out of the business pretty quickly. We have commercial-viable options that can do that. But for now, return to the International Space Station by the Shuttle and then, number two, the CEV are clearly, in my view, the most important priorities, and you have got them right. And I congratulate you.

With respect to the new CEV, and by the way I want to thank you for trying to find a way to shorten the window. The original proposal talked about a window from 2010 to 2014 where we would have no capability as a Nation to send humans into space. And you determined what that CEV ought to look like, and you have to select the type of vehicles for launch. The CEV is an important thing to design, as Ralph Hall talks about, in a safe way, the heavy-lift

obligation for, not just people, but equipment, the supplies needed to go to the Moon and potentially to Mars someday, the ability to go back and forth to the Shuttle. For reasons of safety, reliability, scheduled costs, the development of the Shuttle-derived vehicles, I think, had some real opportunities, and you have expressed a clear preference for those Shuttle-derived launch vehicles.

On the other hand, back in December, you had the President's space transportation policy, which had a presumption, as I understand it, in favor of the use of the evolved expendable launch vehicles. I wonder if you could tell us how those presumptions, yours versus the transportation policy organization, how you expect them to be resolved, who you expect to be involved in the decision-making, what sort of considerations ought to be a factor into that, and also, what sort of capabilities we want the CEV to have that may combine the usage, ultimately, of both the EELV and the Shuttle-derived opportunities.

Dr. GRIFFIN. Thank you, sir.

Let me answer the last question first, I think.

We have, within NASA, looked extensively at all of the means that we might bring to bare for the two major—or I would say the three major categories of things that we launch. And those three categories are science missions, which go on expendable launch vehicles, and then we will be requiring a Shuttle replacement, the CEV and its associated launch system. And then finally to go to the Moon, as I have indicated before, we need capability in the 100 metric ton class.

I am, of course, aware of the space transportation policy that you mentioned. The—I don't believe that that transportation policy creates a presumption of the use of one system or another. What it requires NASA and the DOD to do is to coordinate on their requirements in an effort to achieve the most efficacious—

Mr. FEENEY. If I may interrupt.

Dr. GRIFFIN. Yes, sir.

Mr. FEENEY. DOD has a presumption here at a minimum, don't they?

Dr. GRIFFIN. I have not yet had an opportunity—I have spoken with General Lord, head of U.S. Space Command, and General Lord was quite clear that he understands and agrees with my stated preference of—for NASA to pursue a Shuttle-derived solution. He would like us to launch our expendable vehicle traffic on DOD systems as much as possible, and with that, we concur. NASA has no desire to spend extra money developing systems that already exist. But where systems don't exist, then we need to look at the lowest cost and highest reliability, safest path forward, and that is what we are doing.

Chairman BOEHLERT. The Chair would like to recognize the ever patient Dr. Schwarz.

Here is the situation on the Floor. We have a series of votes, and they are eight minutes and 46 seconds to go. Dr. Schwarz, you will get your two cents in, and—

Mr. SCHWARZ. How about 46 seconds worth?

Chairman BOEHLERT. All right. Go to it.

U.S. PREEMINENCE IN SPACE

Mr. SCHWARZ. Okay. This is a—just lob a softball up there, but I think people would like to know, as we talk about other nations and consortia who have programs, perhaps not as ambitious as ours to go to a Jovian moon, but other programs, what are the other countries and other consortia who you would consider our competition in these enterprises, because I think that is not commonly known, and people should know who the competition is out there and why we, perhaps, if not have fallen behind, have fallen back from our previous lead?

Dr. GRIFFIN. Yes, sir. We—the United States has partners in its space endeavors, and it has competitors. And in many cases, just as in industry, the partners and competitors are the same people. We ally or we compete on different ventures, according to what we perceive our needs to be. Our chief competitors for preeminence in space are Russia, the European Space Agency, the Chinese, who are coming along quite nicely, and the Indian Space Agency is making strong initiatives. We partner with any and all of those nations in various venues, and I expect that to continue in the future. But we also compete with them. And it is, again, my goal to see to it that America is always in the lead in that competition. That matters greatly to me.

Dr. SCHWARZ. Thank you, Dr. Griffin.

Thank you, Mr. Chairman.

Chairman BOEHLERT. Thank you. And Mr. Administrator, we want to help you achieve that goal. Let me say, in your maiden appearance before this committee as Administrator, you have appeared many, many times before and have been an invaluable resource to us, quite successful. I appreciate the candor of your responses to the many questions. I appreciate your trying to give us some guidance as to when we might expect further answers to specific questions. I think it has been a very productive hearing. I hope you share that view. We are partners in this endeavor. We want to make it work.

Dr. GRIFFIN. I do share that view, sir. If I could just have one more moment.

We need your help. We do need to work together. We need the help of this committee and this Congress in carrying out our mission. We need your help with an authorization request and with relief on the *Iran Nuclear Nonproliferation Act*, pardon me. We cannot be successful without you, and we know that.

So thank you for having me here today.

Chairman BOEHLERT. Of the cynic society, I just want to tell you, we are from the Congress. We are here to help.

This meeting is adjourned.

[Whereupon, at 12:05 p.m., the Committee was adjourned.]

Appendix 1:

ANSWERS TO POST-HEARING QUESTIONS

ANSWERS TO POST-HEARING QUESTIONS

Responses by Michael D. Griffin, Administrator, National Aeronautics and Space Administration

Questions submitted by Representative Bart Gordon

Q1. Do you intend to pursue competitive procurements for all of the required elements of the exploration program, or are you planning to use sole-source agreements or other non-competitive means for some of the elements? If the latter, which elements will not be competitively procured?

A1. We anticipate full and open competition on all the elements of the exploration program except where competition may not be safe or feasible. In those cases, we will utilize sole-source agreements as necessary. Final decisions will be part of formal Acquisition Strategy Meetings.

Currently, the only sole-source procurement we are planning involves those parts of the Crew Launch Vehicle (CLV) that are derived from existing Shuttle hardware. Also, we plan to use in-house capabilities extensively to develop technologies for the Crew Exploration Vehicle (CEV) and lunar sortie missions.

Competitions are currently planned for the CEV, the CLV Upper Stage, and crew and cargo services to and from the International Space Station. The CEV currently has two contractors in phase 1 of a two-phase program with a competitive down select scheduled for spring 2006.

It should be noted that the Acquisition Strategy for the Constellation Program is still a work-in-progress and details could change, but this reflects our current baseline.

Q2. What exploration capabilities do you intend to develop in-house at NASA, and which ones do you plan to have industry develop? How did you go about making those decisions?

A2. NASA considers many factors when determining which tasks will be retained in the Agency and which will be performed by contractors. These factors include criticality to fulfilling the Vision, available Agency workforce, existing talent pools, future developments in the marketplace, and budget and schedule concerns. The capabilities that we will keep "in-house" are those that are considered core NASA capabilities, such as Systems Engineering and Integration and many technology capabilities as well. For example, the Liquid Oxygen, Liquid Methane engine will be developed primarily at NASA Centers, with NASA's Glenn research center leading the activity. This will be done to invigorate the technology capabilities at our NASA Research Centers and to utilize our civil service work force.

We will go to industry for many other capabilities. Goods and services provided by industry will be competitively procured. For example, NASA will work in partnership with a contractor team to develop new space suit capabilities for the CEV and lunar exploration vehicles.

Q3. Under what circumstances, if any, do you envision using U.S. funds to pay non-U.S. companies or organizations for exploration-related technologies, products, or services instead of by means of no-exchange-of-funds cooperative agreements with non-U.S. space agencies?

A3. NASA will pursue opportunities to cooperate with its international partners, as the President directed us to do in the *Vision for Space Exploration*. We plan to purchase transportation services from our partners in support of the International Space Station if commercial capabilities are not available when needed. We are seeking international cooperation on the lunar robotic precursor missions and potentially with lunar surface systems such as rovers, habitats, and power, systems but no firm plans or agreements are yet in place.

Under the U.S. Federal Acquisition Regulations, it is possible that foreign firms with unique capabilities could compete and win some NASA-sponsored contracts and grants for exploration-related activities. In such cases, NASA would first explore whether the proposed activities could be accomplished on a cooperative no-exchange of funds basis with NASA's foreign government counterpart as an alternative to funding a foreign firm.

Q4. You have talked about accelerating the Crew Exploration Vehicle [CEV] and its launch vehicle, as well as starting development of a heavy lift booster to launch cargo. How do you plan to reconcile those desires with the realities of the exploration program's current five-year budget plan? Are you prepared to defer work on other parts of the exploration initiative to accelerate the CEV and heavy lift

booster? If so, what activities would you defer? Or would you get the money from somewhere else? And if so, where?

A4. The Exploration Systems Architecture Study (ESAS) team has identified our architecture for the development of the CEV, the Crew Launch Vehicle (CLV), and initial lunar landing sorties. To meet the challenge of accelerating the CEV and all of its associated systems, and to provide adequate resources for this priority, ESMD's technology programs were carefully assessed as part of the Exploration Systems Architecture Study (ESAS). ESMD can currently afford this acceleration, with no new funding sources from outside the Directorate. This can be accomplished by shifting funds from lower-priority or longer-term technology needs, including a total of \$785 million in FY 2006, including \$292 million reflected in the FY 2006 budget amendment and \$493 million identified as a result of actions taken in the FY 2005 Operating Plan September update. We have been able to shift funding from Research and Technology projects that were more focused on future capabilities that are not required for near-term objectives. For example, closed loop life support systems funded by ESMD have been deferred in the near term, because they are not required by the early lunar sortie missions. As we begin to focus on long-duration lunar outposts, funding for closed-loop life support systems and other essential technology will be increased at the appropriate time to support those missions.

Q5. *NASA recently decided to phase out the involvement of the consultant Behavior Sciences Technology (BST) after just 16 months of what was expected to be a three-year campaign. BST was brought in as a result of the findings in the Columbia Accident Investigation Board (CAIB) report that focused on the role that the NASA culture played in creating the environment that contributed to the Shuttle accident.*

- *Why has the contract been canceled?*
- *Do you believe that no more work is needed to improve the NASA culture? If so, why?*

A5. The BST effort was reviewed by the Office of Program Analysis and Evaluation in cooperation with the Office of Institutions and Management. Working in collaboration, those offices defined the refocused effort that is being implemented after consultation with the Office of the Administrator. We feel NASA has benefited from the activities involved in this effort. After significant experience with the BST contract and dedicated work at several field centers, we decided to place internal focus on those parts of the BST culture change effort, which offered the most significant benefits while curtailing other aspects.

While we did find many aspects of the BST activities to be beneficial, there was never an expectation that culture could be fixed like a machine. Attention to safety and strong internal communications is an on-going, continuous effort. NASA is dedicated to pursue this effort in the most efficient and effective manner possible. Similarly, there are many different ways we can improve our ability to consider alternative views and make effective, informed decisions. With our *Strategic Management Handbook*, we are setting up a streamlined set of Councils that will facilitate informed decisions by senior leaders. The leaders and members of the councils will be responsible and accountable for those decisions. With the new Office of Program Analysis and Evaluation, NASA is ensuring that there are internal checks and balances built into the decision-making process.

Q6. *You have stated your firm intention to terminate the Space Shuttle program in 2010.*

Q6a. *How do you respond to the concern that setting such a strict deadline creates the same kind of schedule pressure that the Columbia Accident Investigation Board (CAIB) identified as a contributing factor to the Shuttle accident?*

A6a. NASA will not be driven by schedule pressure to fly the Shuttle when it is not ready to fly, even if that means fewer flights prior to retirement.

Q6b. *Two alternatives to a hard deadline are (1) to firmly define how many Shuttle launches are needed and then operate the Shuttle until those launches are completed—however long that might be; or (2) to operate the Shuttle until a replacement means of crew transport has been developed. What do you see as the pros and cons of each of these approaches?*

A6b. NASA conducted a study to re-evaluate the Space Shuttle mission plans for completion of the International Space Station in light of the February 2004 *Vision for Space Exploration*, in particular, the number of Shuttle flights required by FY 2010. The Station-Shuttle analysis has become the basis for the number of remain-

ing flights to be planned for the Shuttle program. Shuttle costs exceed \$4 billion per year to operate, and retiring the Shuttle is a key source of funds for developing exploration systems. Extending Shuttle operations for a finite or indefinite period would correspondingly defer exploration goals, given current resource constraints.

The *Vision for Space Exploration* calls for the Space Shuttle to be retired by 2010 with its primary focus being to complete assembly of the International Space Station. NASA has developed a proposed plan to execute this mission and meet our international partner obligations using eighteen Space Shuttle flights over the next five years.

NASA is also pursuing alternative means of crew and cargo access to the International Space Station in the post-Shuttle era, including soliciting crew and cargo services from potential commercial providers. In addition, our international partners have, or are developing, a number of vehicles to provide crew and cargo access to the International Space Station, including the Russian Soyuz (crew) and Progress (cargo), the European Space Agency's Automated Transfer Vehicle (cargo), and the Japanese H-2 Transfer Vehicle (cargo). The Crew Exploration vehicle will also be capable of servicing the International Space Station.

Q7. How many flights of the Space Shuttle were budgeted for in the five-year budgetary plan (FY 2006–2010) for the Space Shuttle that was submitted as part of the FY 2006 NASA budget request? How was the Space Shuttle five-year budget estimate arrived at?

A7. There was a great deal of uncertainty associated with the outyears of the FY 2006 budget request for Shuttle. NASA was still working toward Return-to-Flight, and had not yet addressed all issues raised by the *Columbia* Accident Investigation Board (CAIB). In addition, NASA had not yet determined how many times the Shuttle was going to fly before its retirement in 2010. The President's FY 2006 Budget request stated, "NASA is examining configurations for the Space Station that meet the needs of both the new space exploration vision and our international partners using as few Shuttle flights as possible." The five-year budget estimate was an estimate, based on the Shuttle budget in the FY 2005 budget request.

Questions submitted by Representative Mark Udall

Q1. You have said that you plan to revisit the possibility of a Shuttle mission to service Hubble because after the Shuttle completes two successful Shuttle return-to-flight missions, the Shuttle will then be "essentially a new vehicle." If that is so, it sounds as though no extensive "recertification" of the Shuttle [as called for by the Columbia Accident Investigation Board] would be required if the decision was made to fly the Shuttle for a year or so past the proposed 2010 retirement date. Is that an accurate assessment? If not, what would still need to be recertified?

A1. All the Criticality 1 systems and subsystems on the Space Shuttle have been assessed against the 2010 retirement date and found to be within their hardware certification limits. Certification assessments for certain lower criticality hardware will continue through 2006. Consistent with the policy direction given in the *Vision for Space Exploration*, the Space Shuttle program has not assessed any certification activity that may be required to continue flying past 2010.

Q2. NASA plans to place some of its Earth observing sensors on spacecraft built by other agencies instead of building its own satellites. For example, NASA plans to put Landsat-type sensors on the first NOAA–DOD NPOESS satellite instead of launching a dedicated Landsat spacecraft.

Q2a. What is the status of the NPOESS program? How easy is it going to be to add Landsat sensors to the first NPOESS?

A2a. NASA is a partner in the NPOESS program. The NPOESS development is governed by the NPOESS Executive Committee (ExCom) which has members from the Department of Commerce, the Department of Defense and NASA. Official NPOESS Program status should be obtained from the host agency for NPOESS; the Department of Commerce.

The complexities of manifesting a Landsat-like sensor on the NPOESS have been analyzed in coordination with NASA, the NPOESS IPO and the NPOESS prime contractor, Northrop Grumman Space Technology. Analysis indicates that accommodating a Landsat-like sensor on the NPOESS spacecraft would entail significant technical challenges.

Q2b. To what extent are you concerned that the government may be following a strategy of “putting all your eggs in one basket” with respect to Earth observations research and operations?

A2b. We have a diversified approach to Earth observations, research, and applications. We have other partnerships for measurements not destined for NPOESS. We are pursuing a four-partner approach for ocean altimetry among NASA, CNES, NOAA, and EUMETSAT with the intent that the research agencies (NASA, CNES) will build the ocean surface topography mission, NOAA and EUMETSAT (the operational agencies) will operate it, and then NOAA and EUMETSAT will continue ocean altimetry measurements via inclusion in their future operational satellite systems.

Reducing risk to long-term data continuity is the principal reason for seeking to acquire selected Earth observations through NPOESS. The NPOESS Preparatory Project (NPP), built by the Goddard Space Flight Center (GSFC) with instruments provided by GSFC and the IPO, will serve as both a risk reduction for the NPOESS project and also provide climate data. NPOESS is the next generation series of polar weather satellites, whose continuous operation is secured via multiple copies and flight-ready or on-orbit spares. NASA research satellites, on the other hand, because they are research missions, tend to be one-of-a-kind, with limited or no on-orbit redundancy or stand-by copies on the ground. The idea is to migrate measurements that have proven their value in NASA research missions to NPOESS operational systems so their continuity is assured. The challenge is in this transition phase where the operational system taking on the key measurements is itself a new system. NPOESS is a ‘block change’ upgrade of the NOAA-operated, NASA-built POES series that have comprised the civilian polar-orbiting weather satellite system for many years. NASA is staying in the Earth observation business, continuing its role of creating new Earth observation technologies and research.

Q2c. What if NPOESS runs into cost or technical problems—has NOAA committed to you that it will keep the Landsat sensors on NPOESS no matter what?

A2c. The NPOESS management structure is governed by the NPOESS Executive Committee (ExCom) which has members from the Department of Commerce, the Department of Defense and NASA. The manifest of a Landsat-like sensor on the NPOESS platform and the resulting NPOESS implementation strategies and contingencies will be governed by the NPOESS Executive Committee.

Q3. The American Geophysical Union (AGU) released a statement in May that concluded that NASA’s Earth and space science programs are “at risk.” The statement said, “There are indications that Earth and space sciences have become a lower priority at NASA” and that NASA’s FY 2006 budget plan reduces science research by \$1.2 billion over the next five years relative to the previous plan. Is the AGU correct in its assessment? What is your response to the statement?

A3. While the FY 2006 President’s budget shows a smaller rate of increase in the budget for NASA’s Science Mission Directorate, these programs are still growing significantly. The overall NASA science programs budget runout shows a 24 percent increase from FY 2006 through FY 2010, at which science will grow from 33 percent to approximately 38 percent of the NASA budget, enabling the Science Missions Directorate to continue to support 55 operational missions, 26 missions in development, and 34 in formulation.

Q4. On page 2 of your testimony, you state that NASA “has adopted a ‘go-as-you-can-pay’ approach toward space exploration.” The 1990 Augustine Commission used the same phrase to describe its approach to human exploration beyond low Earth orbit, but it meant something very different from what NASA’s current approach seems to be. The Augustine Commission defined science as NASA’s highest priority and stated that human exploration beyond low Earth orbit [or “Mission from Planet Earth” as they termed it] should only be funded after the other core missions of the Agency such as space and Earth science were adequately funded, and that the pace of the human exploration initiative should be determined by how much extra funding was made available. Do you agree with the Augustine Commission’s definition of “go-as-you-can-pay”? If not, how would you define it and why shouldn’t NASA follow the approach recommended by the Augustine Commission?

A4. While NASA strives to stay within budget and ensure adequate support for Earth and space science, as called for by the Augustine Commission, NASA’s mission has changed since 1990. On January 14, 2004, President George W. Bush an-

nounced the *Vision for Space Exploration*. This bold initiative places a renewed emphasis on human exploration of the solar system while continuing to ensure a balanced portfolio of scientific research. Implementation of the *Vision for Space Exploration* will be enabled by scientific discovery and will enable new compelling scientific opportunities. In addition, the Vision offers an opportunity to stimulate mathematics, science and engineering in America's grade, undergraduate and graduate studies programs.

Q5. *NASA officials indicated to us earlier this year that substantial job cuts were assumed in the budget projections contained in your FY 2006 budget. Specifically, we were told that the number of budgeted civil service full time equivalents (FTEs) will drop by almost 2,500 over the next year and a half.*

- *Do you still anticipate that level of personnel cuts?*
- *If so, what are the details of those cuts by Center and by discipline?*
- *If not, what is your current best estimate, and why has it changed?*

A5. The NASA workforce has been impacted by significant budget reductions in our aeronautics programs, cancellation of programs, and investment changes to the research and technology portfolio of the Exploration Systems Mission Directorate. We have taken specific actions to try to alleviate this problem. For example, starting in November 2004, NASA implemented employee buyouts to rebalance the workforce and in January 2005 established hiring guidelines to emphasize filling vacancies from within the Agency. We are also making significant changes that will help ensure that NASA's Centers have a productive future. Contractors will continue to play a key role, but we need to ensure that the Federal Government maintains the in-house intellectual core capacity to sustain NASA's exploration, science and aeronautics missions. Our goal is to ensure that NASA Centers are productive contributors to the Agency's agenda and that we have the people and tools necessary to accomplish the long-term goals of space exploration. With that in mind, we will be making changes at Headquarters as well.

In September, NASA initiated an Institutional Requirements Review (IRR) the scope of which includes corporate G&A, corporate service pools, and all Headquarters-based operations. Our goals are to keep corporately funded requirements within overall corporate budget guidelines, reduce the total workforce at Headquarters commensurate with its appropriate role and overall size of the Agency, and consolidate required personnel at the Headquarters building. We aim to (1) gain operational efficiencies; (2) align ourselves to a management model that has Headquarters in charge of architecture, strategy, policy, compliance, and general management with field Centers executing programs and projects; and (3) set an example for the rest of the Agency of the willingness of Headquarters to make hard decisions that benefit NASA in the long run.

Assuming we can achieve additional buyouts in the next few months and redirect some of our in-house capacity to performing core activities related to exploration, science, and aeronautics missions, NASA has approximately 950 civil servants in the field without program coverage in FY 2006.

Center	Uncovered Capacity
ARC	246
GRC	268
LaRC	181
MSFC	226
Total	921

We will continue to address this problem and structure the workforce to ensure the success of the exploration vision, as well as NASA's other missions in science, aeronautics, education, space operations and exploration. However, changes to our skill mix and, therefore, the workforce will be required.

The NASA Office of Human Capital continues to work with center management on the workforce strategies. We will continue to identify center work assignments

based on our strategic planning for the exploration systems. We are in the planning stages of offering a final buyout program to employees.

If we are unable to cover all of the NASA civil service positions, NASA is planning to conduct a Reduction in Force (RIF). Our Office of Human Capital is working with human resource offices at the centers to ensure readiness for a RIF, should it become necessary. However, a RIF is a last resort, and we will exhaust all other reasonable possibilities before undertaking such an action.

With changes to NASA's mission, it is important that we manage our workforce issues to ensure that we have the right skill mix to successfully execute the vision for space exploration and maintain the important work in other areas such as our aeronautics, space operations and science portfolios. We will have an integrated, Agency-wide approach to human capital management.

Questions submitted by Representative Brian Baird

Q1. Last year, the Exploration Systems Mission Directorate (ESMD) issued contracts to firms from the Explorations Systems Research and Technology and Human Systems Research and Technology programs. In April, NASA announced it was "indefinitely deferring" the expected Broad Agency Announcement for these two programs. The Agency promised "additional insight into our revised plans."

A1. The Exploration Systems Mission Directorate did issue contracts last year for Exploration Systems Research and Technology but none for Human Systems Research and Technology. The Broad Agency Announcement planned for 2005 was canceled in anticipation of the change in direction being outlined by new Administrator Michael Griffin.

Q1a. In issuing these contracts, NASA was hoping to attract interest from non-traditional sources. In many cases, these are smaller firms that have a harder time with uncertainty in funding and planning than the usual government sources.

Does NASA intend to honor the contracts that it has already signed?

A1a. The Exploration Systems Research and Technology projects have been realigned to support the Exploration Systems Architecture Study's (ESAS) recommended requirements including accelerated development of the new Crew Exploration Vehicle (CEV), the Crew Launch vehicle (CLV) and the lunar lander. This realignment has resulted in a focused and phased, requirements driven Research and Technology program in which some projects are curtailed, some modified or delayed, and some added. On going projects are streamlined to deliver technology capabilities when needed to meet the accelerated development schedules for the CEV, launch systems and lunar lander. In FY 2005, 80 tasks and activities are being discontinued since they do not directly support ESAS architecture or schedule requirements. NASA, however, is continuing to investigate innovative procurements for commercial resupply of crew and cargo to the ISS and encouraging other innovative approaches (Centennial Challenges) to assist our exploration objectives.

Q1b. What steps is the Agency taking for the disposition of these contracts?

A1b. The first step was to notify Congress via the FY 2005 Operating Plan September update, which included the modifications. The next step is to provide affected contractors with termination notices following consideration by the Committees of the Operating Plan. NASA will also provide the contractors with two months of FY 2006 funding for closeout costs. Additional closeout costs will be negotiated on a case-by-case basis.

Q1c. What is your timetable for the disposition of those contracts?

A1c. Notification of effected contractors is projected by late-October.

Q1d. When are we likely to know NASA's intentions to resume procurements in these programs?

A1d. ESMD does not anticipate any new Broad Agency Announcements in these programs. Our future research will be directed, with the intention of focusing our efforts and funding on near term technologies designed to accelerate the development of the crew exploration vehicle and lunar sortie missions. Much of this directed research will be at NASA Centers. Industry and universities will provide capabilities and expertise that is not resident at the NASA Centers.

Questions submitted by Representative Sheila Jackson Lee

Q1. Dr. Griffin, as a long-time supporter of NASA, my greatest priority at this point is safety. The Columbia Accident Investigation Board led by Admiral Gehman was able to determine the cause of the accident and was a solid first step in establishing new safety procedures for future space exploration missions. Since last year, I have called for such a commission to be formed to investigate safety aboard the International Space Station. Will you support the formation of such a commission?

A1. I share your passion for conducting NASA's space and aeronautics missions safely and let me assure you that we do not take for granted the health or safety of our astronauts and pilots who are needed to help us explore humankind's remaining frontiers. After the investigation of the *Columbia* accident, our stakeholders challenged us to address each recommendation provided by the *Columbia* Accident Report. You may be familiar with the extensive planning undertaken by the Shuttle program to address its cited deficiencies since the overwhelming share of public scrutiny was focused on the Shuttle's return-to-flight. Much less apparent, but nonetheless just as important, were the lessons that NASA wove into the fiber of many other programs across all our centers. The International Space Station drafted its own implementation plan for supporting the continuation of flight of the ISS entitled, NASA's Implementation Plan for International Space Station Continuing Flight. This document, available at http://www.nasa.gov/pdf/110883main_Station_CFT_Rev2.pdf, demonstrates NASA's commitment to the application of lessons learned from the *Columbia* Accident Investigation Board recommendations and observations in support of safe continuing flight of the International Space Station.

The Aerospace Safety Advisory Panel (ASAP) is my source of expert consultation on safety matters as well as a representative of our external stakeholders. In order to assure that ASAP is satisfied with the approaches we are taking to ensure safety; we have methodically provided its members with copies of the plan at each step of its iteration. NASA briefed the ASAP about the plan during its development. Consistent with your request for a review of safety aboard the ISS, I have asked Vice Admiral Joe Dyer, Chairman of the Aerospace Safety Advisory Panel (ASAP), to review the ISS plan again independently, and to verify that this important program has properly implemented the CAIB findings into its own planning. As you know, the ASAP is an independent group of industry and non-NASA government leaders and safety experts that advises me Administrator on safety matters with an emphasis on human space flight. Congress originally chartered this panel after the Apollo fire, and the panel has been effective over the years in helping NASA focus on safety related design, operational and cultural issues. I have asked Admiral Dyer to complete his review by the end of the calendar year, and I look forward to sharing the results of his study with you and your staff.

Q2. I am especially concerned to learn that the Stafford-Covey Return-to-Flight Task Group, the independent oversight panel chartered by NASA to certify that the 15 safety recommendations of the Columbia Accident Investigation Board are met, has stated that three of these recommendations remain incomplete in advance of a proposed July launch. Will you delay the launch to make certain that the problems faced by Columbia have been completely resolved?

A2. NASA's Return-to-Flight process has been guided by the fifteen Return-to-Flight recommendations of the *Columbia* Accident Investigation Board and the Space Shuttle program's own internally generated "raise the bar" actions. NASA's implementation of the Board's Return-to-Flight recommendations has been independently assessed by the Return-to-Flight Task Group. NASA's overall Return-to-Flight progress has been documented in the periodically updated *Implementation Plan for Space Shuttle Return-to-Flight and Beyond*.

On August 17, 2005, the Return-to-Flight Task Group released its Final Report. In it, the Task Group unanimously closed out all but three of the Board's Return-to-Flight recommendations. The Task Group could not reach consensus on whether NASA's actions fully met the intent of three of the Board's most challenging recommendations: External Tank Thermal Protection System Modifications (3.2-1), Orbiter Hardening and Impact Tolerance (3.3-2) and Thermal Protection System On-Orbit Inspection and Repair (6.4-1). The Task group noted NASA had made substantial progress relative to these recommendations, and emphasized that, "The ability to fully comply with all of the [Board's] recommendations does not imply that the Space Shuttle is unsafe." The first two Return-to-Flight missions, STS-114 and STS-121, will provide the data and flight experience needed to address the remain-

ing open issues in these recommendations. This work will be documented in future updates to the *Implementation Plan*.

NASA made the decision to proceed with the launch of STS-114 on July 26, 2005 based on Return-to-Flight Task Group's assessment, the totality of improvements made to the Space Shuttle system during Return-to-Flight, and the vetting of all these improvements through a rigorous and multi-layered engineering review process.

Post-flight analysis of STS-114 indicated that, except for one event, the thermal protection system on the External Tank performed within expected parameters. Most of the small foam shedding events that were observed with the upgraded imagery and sensor capabilities developed during Return-to-Flight posed little or no threat to the Orbiter. The one event of concern was the loss of an approximately one-pound piece of foam from the area of the External Tank's liquid hydrogen protuberance air load (PAL) ramp. NASA commissioned two teams (one lead by the Space Shuttle propulsion manager, the other an independent "Tiger Team" reporting directly to the Associate Administrator for Space Operations) to analyze these foam loss events and recommend any forward work that would have to be done prior to the launch of the next mission, STS-121.

As of September 2005, NASA is reviewing flight opportunities for future missions given the effects of Hurricane Katrina (which caused extensive damage to the area around the External Tank manufacturing facility near New Orleans) on ongoing foam loss troubleshooting and normal processing activities. NASA is targeting the May 2006 launch window as the next opportunity to launch STS-121.

Q3. It has come to my attention that the NASA Education Office has been merged into the Strategic Communication Office. How will this affect NASA's education program? Furthermore, how will this affect NASA's assistance and work with minority serving institutions?

A3. As directed by the NASA Administrator, the Office of Education is now part of the Strategic Communications component at NASA Headquarters. Under the direction of the Chief of Strategic Communications, the Office of External Relations, the Office of Legislative Affairs, the Office of Public Affairs, and the Office of Education are now working more closely than ever regarding our regular and ongoing communications with our stakeholder communities. This ensures that more timely and consistent information is provided to the distinct stakeholder communities serviced by each office. Specifically, the Office of Education, its functions, and all programs previously in place remain intact. Program operations under the Chief of Strategic Communications will have no adverse affect on NASA's assistance to and work with the minority serving institutions (MSIs). NASA's education programs will continue to provide opportunities for MSI faculty and students to participate in the Agency's research and education programs.

Q4. NASA officials indicated to us earlier this year that substantial job cuts were assumed in the budget projections contained in your FY 2006 budget. Specifically, we were told that the number of budgeted civil service full time equivalents (FTEs) will drop by almost 2,500 over the next year and a half.

- *Do you still anticipate that level of personnel cuts?*
- *If so, what are the details of those cuts by Center and by discipline?*
- *If not, what is your current best estimate, and why has it changed?*

A4. The NASA workforce has been impacted by significant budget reductions in our aeronautics programs, cancellation of programs, and investment changes to the research and technology portfolio of the Exploration Systems Mission Directorate. We have taken specific actions to try to alleviate this problem. For example, starting in November 2004, NASA implemented employee buyouts to rebalance the workforce and in January 2005 established hiring guidelines to emphasize filling vacancies from within the Agency. We are also making significant changes that will help ensure that NASA's Centers have a productive future. Contractors will continue to play a key role, but we need to ensure that the Federal Government maintains the in-house intellectual core capacity to sustain NASA's exploration, science and aeronautics missions. Our goal is to ensure that NASA Centers are productive contributors to the Agency's agenda and that we have the people and tools necessary to accomplish the long-term goals of space exploration. With that in mind, we will be making changes at Headquarters as well.

In September, NASA initiated an Institutional Requirements Review (IRR) the scope of which includes corporate G&A, corporate service pools, and all Headquarters-based operations. Our goals are to keep corporately funded requirements within overall corporate budget guidelines, reduce the total workforce at Head-

quarters commensurate with its appropriate role and overall size of the Agency, and consolidate required personnel at the Headquarters building. We aim to (1) gain operational efficiencies; (2) align ourselves to a management model that has Headquarters in charge of architecture, strategy, policy, compliance, and general management with field Centers executing programs and projects; and (3) set an example for the rest of the Agency of the willingness of Headquarters to make hard decisions that benefit NASA in the long run.

Assuming we can achieve additional buyouts in the next few months and redirect some of our in-house capacity to performing core activities related to exploration, science, and aeronautics missions, NASA has approximately 950 civil servants in the field without program coverage in FY 2006.

Center	Uncovered Capacity
ARC	246
GRC	268
LaRC	181
MSFC	226
Total	921

We will continue to address this problem and structure the workforce to ensure the success of the exploration vision, as well as NASA's other missions in science, aeronautics, education, space operations and exploration. However, changes to our skill mix and, therefore, the workforce will be required.

The NASA Office of Human Capital continues to work with center management on the workforce strategies. We will continue to identify center work assignments based on our strategic planning for the exploration systems. We are in the planning stages of offering a final buyout program to employees.

If we are unable to cover all of the NASA civil service positions, NASA is planning to conduct a Reduction in Force (RIF). Our Office of Human Capital is working with human resource offices at the centers to ensure readiness for a RIF, should it become necessary. However, a RIF is a last resort, and we will exhaust all other reasonable possibilities before undertaking such an action.

With changes to NASA's mission, it is important that we manage our workforce issues to ensure that we have the right skill mix to successfully execute the vision for space exploration and maintain the important work in other areas such as our aeronautics, space operations and science portfolios. We will have an integrated, Agency-wide approach to human capital management.

Q5. When do you expect the first humans to set foot on Mars? What is that estimate based on, and can that be done within a NASA budget that is flat or at best keeping pace with inflation? If so, how?

*A5. When the President unveiled the *Vision for Space Exploration* on January 14, 2004, he announced a plan to extend human presence across the solar system and beyond. NASA's exploration architecture lays out our plans for developing launch, transportation, landing and habitation systems that will enable a return to the Moon by 2018, followed by sustained human presence on the Moon while preparing for later Mars missions. This architecture will be affordable and will institute a "go as you can afford to pay" budget approach. We're not far enough along in the planning to say exactly when the first human flight to Mars will be, however we will already have much of the architecture, including the heavy lift vehicle, a versatile crew capsule and propulsion systems, needed to get there. In addition, experience from missions to the Moon will lay the groundwork for using Martian resources. A lunar outpost, just three days away from Earth, will provide us with the needed practice of "living off the land" that will be required for the longer missions to Mars.*

Question submitted by Representative Michael E. Sodrel

Q1. Administrator Griffin, in your answer to my question as to whether or not NASA was doing enough to ensure astronaut health in long-term missions, you stated

that NASA will need to do more in the future, but NASA was not endeavoring to have long-term human flight at this time. Shortly after answering my question, you referenced the Administration's goal of visiting Mars. If I am not mistaken, flight to Mars will take years just to traverse the distance. While I can understand why many resources will be committed to developing a vehicle capable of distance flight, I would hope engineering plans would also seek to alleviate or mitigate physical stress on the human flight crew. When placed in zero gravity for extended periods, tremendous physical changes take place in the human body such as accelerated skeletal aging, muscle atrophy and inexplicable biochemical signaling disturbances that lead to anemia and immune dysfunction in crew. Vigorous life science research will be necessary to assist engineers in solving such problems involved in long-term human flight. Would you agree that maintaining a life science program at NASA is essential to obtaining stated goals of NASA and the President?

A1. Four types of missions are currently planned for NASA: 1) Long duration, up to six months in Low Earth Orbit; 2) short duration, 9–14 day missions to the Moon starting in 2018; 3) longer duration stays (up to six months) on the Lunar surface, and 4) a long duration mission to Mars later in the century. Physiological changes develop in astronauts in microgravity and become more profound on extended duration missions.

Current research is directed toward the validation of countermeasures protecting human health on the International Space Station (ISS). Medical standards for addressing the affects of space flight are being developed, as are prototypes of medical care. Also critical, environmental health and radiation protection research is being conducted on ISS and in the Brookhaven National Laboratory facility. Significant resources are directed toward developing life support technology and autonomous medical care without which longer missions such as Mars will not be possible.

NASA Life Sciences has provided significant contributions to our understanding of the physiological changes and human adaptation to microgravity. ISS continues to provide invaluable data on the exposure of humans to microgravity and the time course of these changes, information which is also needed for Mars. The National Space Biomedical Research Institute has been created to address space physiology, psychosocial issues, and medicine, and to link with the Johnson Space Center and other members of the Space Life Sciences community to address these issues. Obviously, NASA will also continue to rely on the contributions of the National Institutes of Health research in relevant areas.

Appendix 2:

ADDITIONAL MATERIAL FOR THE RECORD

PREPARED STATEMENT OF MICHAEL D. GRIFFIN

Review of President's FY 2006 Budget

Thank you, Chairman Boehlert, Ranking Member Gordon and Members of the Committee for inviting me to appear before you for today's hearing. You have invited me to appear before your committee as a private citizen on several past occasions to discuss our nation's space program. Today, I'm testifying before you in a much different capacity—as NASA Administrator. When I previously appeared before you, I would use phrases such “*they* (meaning NASA) should do X or Y.” I now need another choice of pronouns. *We* at NASA have a lot of work to do. *We* have many challenges to overcome. *We* need to work closely with this committee and the entire Congress in carrying out the many challenges before us, and we will need your help in this great endeavor.

In your invitation, you asked me to address my guiding philosophy and plans for setting priorities for NASA's programs in human space flight, space science, Earth science, and aeronautics, as well as its workforce and infrastructure. That's a tall order for a five minute summary, so this might take a little longer.

The Science Committee has already received testimony this year from NASA's Deputy Administrator, Fred Gregory, concerning NASA's FY 2006 budget request, you've held focused hearings on NASA's aeronautics R&D and Earth science programs, and few weeks ago your committee held the first-ever Congressional hearing with a live feed from astronaut John Phillips onboard the International Space Station. I will try to focus my testimony today on my guiding philosophy and priorities, and will update the Committee on where we are and where we are going. It has been a busy time for me personally as well as for the entire NASA team. We have a lot of work ahead of us.

In presenting the *Vision for Space Exploration* last year, the President defined a focus for our nation's space program in a journey of exploration that will be carried out over the next several decades. In heading down this path, the first steps we take are critically important, and decisions need to be made in a timely manner.

The first step is to return the Space Shuttle to flight, and to fly each mission thereafter as safely as possible. This is my top priority as NASA Administrator. Last week I participated in an engineering review of the risk to the Shuttle due to foam and ice debris, which we believe to have been greatly mitigated since the loss of *Columbia*. I met with the Stafford-Covey Return-To-Flight Task Group this morning to hear the concerns of the panel members. Given the level of complexity of the issues involved, we need their point of view. We need these complex issues to be discussed openly and accurately.

Tonight, I leave for Kennedy Space Center for the Flight Readiness Review of the STS-114 mission with the Space Shuttle Discovery commanded by USAF Colonel Eileen Collins. At this review, the NASA team will determine if we're ready to fly when the next launch window opens in mid-July. I look forward to a healthy, open dialogue about Space Shuttle safety issues and NASA's ability to return the Space Shuttle to flight. Members of the Science Committee are invited to Kennedy Space Center for this launch, but let me caution everyone involved that the entire NASA Space Shuttle team has a lot of hard work to do, and many things can happen between now and the date of launch.

Following a safe return-to-flight, we will turn our sights to the construction of the International Space Station and, after its completion, the retirement of the Space Shuttle by 2010. To this end, a team of experts within NASA are investigating a range of realistic ISS configuration and Shuttle manifest options before we retire the Shuttle in 2010. I met again with the team earlier this morning, and I hope to present NASA's proposed plan for the ISS configuration and Shuttle manifest to you and our international partners later this summer. Let me emphasize to everyone that this is a proposal that requires further discussion. I visited with many of our partners a few weeks ago during the Paris Air Show. We shared with each other our thoughts on the International Space Station and other areas of cooperation in space exploration. I look forward to continuing an open dialogue with our international partners on how best to use the Space Station as a testbed for future space exploration activities, and how to realize tangible benefits from the fruits of this research.

Even as a testbed, the Space Station will not answer all of the questions that need to be answered before we begin to explore the Moon and Mars. However, if a problem occurs on the Space Station, the crew is only a few hours away from a safe return to Earth, while they will be three days away when on the Moon, and many months away from home during the long journey to Mars.

The loss of the Space Shuttle *Columbia* has made us acutely aware that one of the major impediments in fully utilizing the Space Station's capabilities is that we need a more robust logistics capability for crew and cargo than the United States or our international partners have readily available or on the drawing board. For this reason, we plan to leverage our nation's commercial space industry to meet NASA's needs for ISS cargo logistics and possibly crew support. I spoke in some depth on this topic at last week's Space Transportation Association breakfast about my guiding philosophy in dealing constructively with the emerging commercial space industry. I want to thank Congressmen Hall and Calvert for taking part in that event.

To meet the need for crew rescue support for the Space Station, NASA will require the help of this committee in helping to resolve certain restrictions placed on cooperation with Russia in the *Iran Nonproliferation Act of 2000*. This Administration recognizes the value of effective cooperation with our international partners on the Space Station. At the same time, we must appropriately respect and maintain our nation's nonproliferation objectives. Over the last several months, NASA has participated in an interagency coordination process and is proposing a legislative solution in the form of an amendment to the *Iran Nonproliferation Act of 2000* that would provide NASA with the necessary flexibility while maintaining our nation's nonproliferation objectives.

If a solution is not found, we believe that U.S. astronauts will need to cease maintaining permanent presence aboard the Space Station in April 2006, in accordance with previous agreements between NASA and Russia concerning crew rescue support for the ISS using the Russian Soyuz vehicle. We do not believe this situation was the intent of Congress back in 2000, but this is the consequence we are facing today. I also should note that NASA did not plan to rely so extensively on the Russian Space Agency in carrying out the Space Station program, but this is the situation in which we find ourselves today. The Administration expects to deliver this proposed legislative solution to the Congress in the very near future. We will need this committee's help in dealing with these restrictions.

In the future, I believe that we need to ensure that the United States does not fund our space program so heavily reliant on others. Toward this end, NASA must accelerate the development of the Crew Exploration Vehicle, which will be capable of ferrying our astronauts to and from the Space Station, and of conducting voyages to the Moon and Mars. We have a team of some of the best engineers and managers drawn from across the Agency looking at ways to accelerate the development of the Crew Exploration Vehicle, and we hope to soon share with the Congress our plans for the overall space exploration architecture, the CEV, and the transportation system needed to launch it.

Another major initiative underway concerns how we as an Agency consisting of ten field centers plan to organize our workforce and facilities to carry out our exploration, aeronautics, and science missions. Having visited all of the NASA centers within the past few weeks, I firmly believe that more authority should be delegated to program managers at these centers, while NASA headquarters should focus on policy, budget, and program executive functions. Frankly, NASA headquarters staffing has grown too large over the last several years.

Another of the things I realized during my tour of NASA's field centers is that some outdated facilities need to be modernized, closed, or mothballed. We will conduct a study, across the Agency, to determine which facilities belong in which category. This analysis of our assets will require close coordination with our DOD, FAA, and industry stakeholders.

NASA is facing difficult choices in balancing the needs of the Agency's civil servant workforce with the missions the Agency conducts on behalf of the Nation along with the budget available. We have not yet decided whether any involuntary layoffs of NASA's civil servants will be needed in the future, beyond those already announced at Langley Research Center due to an A-76 competition. Thus, we are conducting an assessment of the Agency in organizing the work to be done and workforce needs. I plan to have interim answers in the coming weeks, but this will be a difficult problem for the next several years. As a team, we are trying to be sensitive in balancing the needs of the workforce, NASA's mission requirements, and our budget constraints. I hope to keep NASA's workforce and the Congress informed as much as humanly possible.

However, I need to be straightforward with all concerned. NASA cannot afford everything on its plate today. We must set clear priorities and remain within the budget NASA has been allocated. We are taking a "go-as-you-can-afford-to-pay" approach toward space exploration, but at several field centers, NASA has a gross mismatch between the work to be done, the size of the civil service workforce, and the budget available. We are working through these issues and trying to consult every-

one as much as possible, but difficult decisions will be required, and these decisions must be made in a timely manner.

Another set of major, upcoming decisions that we at NASA need to address concern how best to manage several space astronomy missions under development. Congress has been clear in its priorities for the Agency. NASA is making plans for a servicing mission to the Hubble Space Telescope, but we need to complete two successful Shuttle test flights before we can assess the relative risks of another Shuttle mission to the Hubble. This assessment should be completed this fall. At the same time, we are conducting an assessment of significant cost growth purported for the James Webb Space Telescope, a high priority mission under development within NASA's astronomy portfolio. I have called for a special review of the program to report back in late July. In the meantime, we have decided that NASA will accept the European Space Agency's offer to launch the Webb Space Telescope spacecraft on an Ariane V rocket as their contribution to the overall mission.

However, the problems facing both of these space telescopes jeopardize the budgets for other advanced astronomy and space physics missions currently under formulation. Again, NASA simply cannot afford everything on its plate.

Another priority is the acceleration of the Crew Exploration Vehicle. In order to accelerate development of the CEV and its associated launch vehicle, while keeping within NASA's budget guidelines, NASA will need to defer the development of some other space exploration-related technologies, ISS research, and space nuclear systems that are only needed after the CEV comes on-line in the post-2010 timeframe.

Within the Science Mission Directorate, NASA is seeking a better balance in how priorities are set between Earth and space science missions. NASA has a robust science agenda—with 55 missions in orbit, 26 missions in development—including the Lunar Reconnaissance Orbiter to map the Moon's surface in great detail—and 34 missions in the design phase. However, due to cost growth and the extended life on several missions, NASA will need to defer some missions.

One of those missions which we hope to extend is the Tropical Rainfall Measuring Mission (or TRMM), a research satellite which has exceeded our expectations in being used operationally with hurricane forecasts. NASA is working closely with NOAA, the Japanese Government, and others in the interagency process to determine the legal liabilities and safety measures necessary in extending this mission. NASA and NOAA need to continue to work closely together, especially in transitioning NASA-developed sensors, research, and other capabilities to operations. Likewise, NASA also needs NOAA's operational sensors to enable further Earth Science research.

In aeronautics research, NASA needs to focus its technical expertise and facilities on results-oriented programs for our nation. The Administration supports the call for the development of a national aeronautics policy in H.R. 2862, the FY 2006 appropriation bill for NASA that recently passed the House of Representatives. NASA must work closely with a broad range of stakeholders and customers, including the Congress, Defense Department, and FAA in developing this national aeronautics policy. But again, I need to be straightforward with you. This policy needs to set clear, realistic priorities to focus NASA's limited resources, and not simply be a laundry list of unrelated projects.

To conclude, I would like to note that next week our nation will celebrate our Independence Day, a day of fireworks and celebration. That same day, NASA satellite operators working on the Deep Impact mission will be hard at work trying to create their own fireworks display, 80 million miles from Earth, by smashing a small spacecraft into the comet Temple 1 at 23,000 miles per hour to discover what's inside. It's a difficult mission. . . even for rocket scientists.

The men and women of NASA appreciate the risks our nation is willing to make for the noble purpose of exploration and science. Meriwether Lewis observed in his journal two hundred years ago on July 4th, 1805: "We all believe that we are now about to enter on the most perilous and difficult part of our voyage, yet I see no one repining; all appear ready to meet those difficulties which wait us with resolution and becoming fortitude."