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**Statement of  
Michael D. Griffin  
Administrator  
National Aeronautics and Space Administration**

**before the**

**Committee on Commerce, Science and Transportation  
Subcommittee on Space, Aeronautics and Related Sciences  
United States Senate**

Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to appear today to discuss the President's FY 2008 budget request for NASA. The President's FY 2008 budget request for NASA is \$17.3 billion. This represents a 3.1 percent increase over the FY 2007 request for the Agency, but not the enacted FY 2007 appropriation. The FY 2008 budget request for NASA demonstrates the President's continued commitment to our Nation's leadership in space and aeronautics research, especially during a time when there are other competing demands for our Nation's resources. The FY 2008 budget request reflects a stable plan to continue investments begun in prior years, with some slight course corrections. Overall, I believe that we are heading in the right direction. We have made great strides this past year, and NASA is on track and making progress in carrying out the tasks before us.

Before I outline the FY 2008 budget request for NASA any further, in the invitation to testify today you asked that I address current NASA plans for the use of FY 2007 funding. On February 15, 2007, the President signed into law a joint resolution stipulating FY 2007 funding levels for NASA and other Federal agencies. This appropriation reduces overall funding for NASA by \$545 million from the President's FY 2007 request. The FY 2008 budget request could not possibly factor the impact of such a funding reduction from FY 2007 appropriation for NASA's carefully-considered multi-year programs, and thus, several programs in the FY 2008 budget request will be impacted. The FY 2007 appropriation further directs specific reductions to human spaceflight of \$677 million -- \$577 million of that from Exploration Systems. This reduction may significantly impact our ability to safely and effectively transition from the Shuttle to the Orion Crew Exploration Vehicle and Ares I Crew Launch Vehicle. It will have serious effects on many people, projects, and programs this year, and for the longer term. As I noted during last year's Congressional hearings on NASA's FY 2007 budget request, we have a carefully balanced set of priorities to execute on behalf of our Nation. So as a result of these funding reductions in FY 2007, NASA is carefully assessing the implications to overall Exploration priorities and milestones, and will present detailed impacts after a full analysis is complete. The initial NASA Operating Plan for FY 2007, which will be finalized by March 15, will reflect the impacts of these reductions and the requisite decisions. As always, we are here to carry out our Nation's civil space and aeronautics programs with the resources made available by the Congress. All of our programs proceed in a "go-as-we-can-afford-to-pay" manner; so if we receive less funding than requested, we will adjust our pace. Our stakeholders have my commitment to continue to keep them informed as to what I believe is the best approach to carrying out NASA's space and aeronautics research missions with the resources provided. In this determination, I will be guided by the NASA Authorization Acts, annual Appropriations Acts, Presidential policy, and the decadal survey priorities of the National Academy of Sciences. If we

determine that there is an Agency objective that we will be unable to meet, I will inform our Agency's stakeholders, including this Subcommittee.

### **Highlights of the NASA FY 2008 Budget Request**

The FY 2008 budget request for NASA is a carefully considered and balanced request formulated over many months with the White House. Unfortunately, the Congress had not completed action on the FY 2007 budget at the time the FY 2008 budget was being finalized, so the impact of the final FY 2007 appropriation outcome is not accounted for in NASA's FY 2008 budget request. The FY 2008 budget request weaves together the Nation's priorities in space exploration, scientific discovery, and aeronautics research that will help fuel this Nation's future, creating new opportunities for scientific benefit, economic growth, national security, and international cooperation.

The greatest challenge NASA faces is safely flying the Space Shuttle to assemble the International Space Station (ISS) prior to retiring the Shuttle in 2010, while also bringing new U.S. human spaceflight capabilities on-line soon thereafter. We must understand that, given proper goals, human spaceflight is a strategic capability for this Nation, and we must not allow it to slip away. In January, we remembered those whom we have lost in the exploration of space. In the aftermath of the *Columbia* tragedy, President Bush addressed the NASA workforce, saying: "In your grief, you are responding as your friends would have wished – with focus, professionalism, and unbroken faith in the mission of this agency." We must commit ourselves to the focus of professionalism and unbroken faith every day in order to carry out the tasks before us.

In analyzing not only the root causes, but also the systemic reasons behind the *Columbia* accident, the Columbia Accident Investigation Board (CAIB) made critical observations that guided the formulation of our present civil space policy. I fear that with the passage of time and the press of other concerns, we may be losing sight of some of these principles, so let me reiterate some of them here today. First, the CAIB noted that, "The U.S. civilian space effort has moved forward for more than 30 years without a guiding vision." Second, "because the Shuttle is now an aging system but still developmental in character, it is in the Nation's interest to replace the Shuttle as soon as possible as the primary means for transporting humans to and from Earth orbit." Third, "the previous attempts to develop a replacement vehicle for the aging Shuttle represent a failure of national leadership." And finally, the Board noted that "this approach can only be successful: if it is sustained over the decade; if by the time a decision to develop a new vehicle is made there is a clearer idea of how the new transportation system fits into the Nation's overall plans for space; and if the U.S. government is willing at the time a development decision is made to commit the substantial resources required to implement it."

Since then, the President, the Congress and NASA have charted a new course in U.S. civil space policy that addresses all of these points, and the President's FY 2008 budget reaffirms that commitment with the necessary funds for the Space Shuttle and the ISS. NASA will continue forward at the best possible pace with the development of the Orion and Ares I crew vehicles. However, due to the cumulative effect of Space Shuttle Return to Flight and operations cost increases and the FY 2007 appropriation, NASA may not be able to bring these new capabilities on-line by 2014. If we do not quickly come to grips with this issue, America may have a prolonged gap between the end of the Shuttle program and the beginning of Orion and Ares I operational capability, a gap similar to the one that occurred from 1975 to 1981 when our Nation transitioned from Apollo to the Space Shuttle.

NASA has a lot of hard work ahead of it and many major milestones this year and next. The transition from the Space Shuttle to the Orion and Ares launch vehicles over the next several years must be

carefully managed, and we must be focused, professional and committed to our mission. This is NASA's greatest challenge, and I ask the Subcommittee's help in meeting it.

In the important area of Earth Science, we recently received the first-ever Decadal Survey for Earth Science from the National Academy of Sciences, which NASA, the National Oceanic and Atmospheric Administration (NOAA), and the United States Geological Survey (USGS) requested in 2003. As the first of its kind, the Survey has drawn considerable attention, and we will observe the programmatic priorities for Earth Science which it advocates. In addressing the Survey's Earth Science priorities, and consistent with ensuring that NASA maintains a balanced portfolio of science as directed by the NASA Authorization Act of 2005 (P.L. 109-155), we have added funding to the Global Precipitation Measurement (GPM) mission, the follow-on to the highly successful Tropical Rainfall Measuring Mission (TRMM), to improve our ability to keep this mission on schedule. Our plan is to launch the first Core satellite for the GPM mission not later than 2013, followed by the second Constellation spacecraft the following year. The FY 2008 budget request also augments funding for the Landsat Data Continuity Mission (LDCM) and Glory missions in order to help keep those projects on schedule. Within Planetary Sciences, funding has been identified for Lunar Science research project beginning in FY 2008 to leverage the many opportunities for payloads on NASA and other nations' lunar spacecraft, such as India's Chandrayaan-1, as well as to analyze the science data from these missions, including NASA's Lunar Reconnaissance Orbiter. In 2008, we will launch a host of Heliophysics missions, many with international and interagency partners, to analyze the effects of solar flares, coronal mass ejections, and galactic cosmic rays. In Astrophysics, the final Hubble servicing mission is currently planned for a Space Shuttle flight in September 2008. And, as I advised the Congress and the science community last summer, NASA has reinstated the Stratospheric Observatory for Infrared Astronomy (SOFIA) mission. Though we know of no technical showstoppers in regard to the airworthiness of the aircraft or operation of the telescope, this program has some remaining hurdles to overcome and so remains subject to a management review later this spring. NASA will launch or participate in seven science missions in FY 2007, followed by 10 missions in FY 2008, resulting in many new Earth and space science discoveries in the years ahead.

The FY 2008 budget request increases the budget profile for Aeronautics Research over the President's FY 2007 request, aligns our aeronautics activities with the President's recently issued Aeronautics Research and Development Policy, and advances U.S. technical leadership in aeronautics. NASA has made significant progress in reformulating its approach to aeronautics research by collaborating with the broad research community including industry, academia, and other government agencies including the Federal Aviation Administration (FAA) and the Department of Defense (DOD). Through these changes, NASA will help ensure that America continues to lead the way in aeronautics research.

NASA continues to monitor and manage our "uncovered capacity" (employees not directly assigned to specific projects and programs). A little over 18 months ago, nearly 3,000 of NASA's 19,000 employees were designated as "uncovered capacity." Today, largely with the work defined in the Constellation program, we have greatly reduced that problem to manageable levels. As of February 2007, we have fewer than 200 uncovered capacity employees in FY 2007 and FY 2008. More importantly, many of our best engineers are working diligently on the great challenges before us. Every NASA Center is now vested in our space exploration mission. While we are proud of the progress that has been made, significant human capital challenges remain. These include matching available skills with the important work to be done, managing attrition, retraining and hiring, and improving our workforce planning for future years in FY 2009 and beyond. To address these challenges and any potential impacts resulting from the FY 2007 funding reductions, we have established a new intra-agency Workforce Planning Technical Team.

In addition, beginning in FY 2007, the Agency revised overhead allocations to simplify how we manage under full cost accounting. These changes will ensure a uniform cost rate for all NASA civil servants across the Agency's Government field centers. All changes are revenue-neutral to programs and projects; none of NASA's missions gain or lose funding as a result of this accounting change. At first glance, this accounting change appears to reduce the Aeronautics Research budget because so much of that work is done at our smaller research Centers. However, in actuality, NASA's direct spending for Aeronautics Research has increased in the FY 2008 budget runout by \$205 million through FY 2011 compared to the FY 2007 budget runout.

Beyond our budget request, NASA is beginning to transition the workforce, infrastructure, and equipment from the Space Shuttle to new Exploration systems. Many of our most experienced people will be considering retirement between now and 2010. We will need the means to manage this attrition in a targeted manner to achieve better alignment of the workforce with our mission without creating unwanted losses and skills imbalances. One tool we may be using is the authority for the Agency to be able to re-employ selected retirees without an offset to their annuity — thus giving them an incentive to see a project or program to completion. To assist employees with transition to the private sector, and ease that upheaval, another tool would authorize NASA to continue their coverage under the Federal Employees Health Insurance for one year after departure.

We will also need better tools to manage the transition of our facilities. The Agency is proposing slight changes and expansion to existing authority to permit leasing of underutilized facilities and related equipment. The Agency would retain the proceeds of those leases to be deposited in a NASA capital asset account and invested in activities to improve and sustain our facilities and infrastructure. We plan to discuss the details of these legislative requests with Members of Congress in the weeks and months ahead.

The remainder of my testimony outlines the FY 2008 budget request for NASA in greater detail.

### **Science Mission Directorate**

This past year was truly remarkable for science discovery about the Earth, Sun, solar system, and universe. NASA was responsible for 11 percent of *Science News* magazine's top stories (covering all fields of science) for 2006, which is an all-time record in the 34 years of tracking this metric. NASA's findings ranged from new observations of familiar phenomena like hurricanes, thunderstorms, and rainfall, to the identification of 16 new extra-solar planets orbiting distant stars near the center of our galaxy. As NASA continues to add observations from long-lived assets such as the Spirit and Opportunity Mars Exploration Rovers, it continues to successfully develop and launch the next generation of missions and to support a vigorous scientific community.

In 2006, NASA launched four new science missions, one technology demonstration mission, and partnered with other Federal and international agencies to launch three other science and technology missions, as well as the GOES-O satellite, to bring the current total number of operational science missions to 52. In January 2006, we launched the New Horizons spacecraft to the planet Pluto. Scheduled to arrive at Pluto in 2015, the spacecraft is making its closest approach to Jupiter as we speak. With the April 2006 launch of the CloudSat and Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) spacecraft, NASA added to the "A-train" of satellites flying in close proximity around Earth to gain a better understanding of key factors related to climate change. In October 2006, NASA's twin Solar Terrestrial Relations Observatories mission (STEREO) spacecraft were launched to help researchers construct the first-ever 3-dimensional views of the sun. Although the two spacecraft will not return images until later this year, initial results from STEREO have provided us with an

unprecedented look at solar activity. A few weeks ago, we also recently launched five Time History of Events and Macroscale Interactions during Substorms (THEMIS) microsatellites to study the Earth's magnetosphere, and we are on track to launch the Dawn mission to main belt of asteroids between Mars and Jupiter and the Phoenix Mars mission later this year.

NASA's FY 2008 budget requests \$5.5 billion for the Agency's Science portfolio. This represents an increase of \$49.3 million (or 1 percent) over the FY 2007 request and will enable NASA to launch or partner on 10 new missions, operate and provide ground support for more than 50 spacecraft, and fund scientific research based on the data returned from these missions. For FY 2008, NASA separated the Earth-Sun System theme into two themes: Earth Science and Heliophysics, and programmatic responsibility for studies of Near Earth Objects is transferred to the Exploration Systems Mission Directorate

The Earth Science budget requests \$1.5 billion, an increase of \$27.7 million over the FY 2007 request, to better understand the Earth's atmosphere, lithosphere, hydrosphere, cryosphere, and biosphere as a single connected system. This request includes additional funding for the Global Precipitation Measurement (GPM) mission to improve schedule assurance in response to the high priority placed on GPM in the Decadal Survey. As the follow-on to the highly successful Tropical Rainfall Measuring Mission, NASA's plans to launch GPM's first Core satellite no later than 2013, followed by the second Constellation spacecraft the following year. The Earth Science budget also includes increased funding for the Landsat Data Continuity Mission and Glory in order to help keep them on their schedules, and provides funds for the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP) to reflect instrument availability and launch delays. Funds are requested for continued development and implementation of the Ocean Surface Topography Mission to launch in 2008, the Aquarius mission to measure the ocean's surface salinity to launch in 2009, and the Orbiting Carbon Observatory mission planned for launch in 2008. NASA will continue to contribute to the President's Climate Change Research Initiative by collecting data sets and developing predictive capabilities that will enable advanced assessments of the causes and consequences of global climate change. Over the coming months, NASA will evaluate opportunities for implementing the recommendations of the National Research Council's Earth Science Decadal Survey and responding to challenges to the continuity of climate measurements resulting from the Nunn-McCurdy recertification of the NPOESS program.

The Heliophysics budget request of \$1.1 billion will support 14 operational missions to understand the Sun and its effects on Earth, the solar system, and the space environmental conditions that will be experienced by astronauts, and to demonstrate technologies that can improve future operational systems. During FY 2008, the Explorer Program will launch the Interstellar Boundary Explorer (IBEX) mission, focused on the detection of the very edge of our solar system, and the Coupled Ion-Neural Dynamics Investigation (CINDI) Mission of Opportunity conducted by the University of Texas. The Solar Dynamics Observatory (SDO) to study the Sun's magnetic field will complete launch readiness milestones in FY 2008 and is presently scheduled for launch in August of 2008. The Geospace Radiation Belt Storm Probes (RBSP) mission, presently in formulation, will undergo a Preliminary Design Review and a Non-Advocate Review in FY2008 in preparation for entering development in early FY2009. RBSP will improve the understanding of how solar storms interact with Earth's Van Allen radiation belts. While the ST-7 and ST-8 missions are on track for launches in 2009, the New Millennium ST-9 mission, along with follow-on missions, is delayed.

The Planetary Science budget request of \$1.4 billion will advance scientific knowledge of the solar system, search for evidence of extraterrestrial life, and prepare for human exploration. NASA will get an early start on Lunar science when the Discovery Program's Moon Mineralogy Mapper (M3) launches aboard India's Chandrayaan-1 mission in March 2008, along with the Mini-RF, a technology demonstration payload, supported by NASA's Exploration and Space Operations Mission Directorates and the Department of

Defense, which may glean water in the Moon's polar regions. In addition, the budget requests \$351 million from FY 2008 to FY 2012 for new Lunar Science research, including Missions of Opportunity, data archiving, and research. The budget supports the Mars Exploration Program by providing for a mission every 26 months, including the Phoenix spacecraft, scheduled for launch in 2007, and the Mars Science Laboratory, with a launch scheduled for 2009. The Discovery Program's Dawn Mission is scheduled to launch later this year, and the Mercury Surface, Space Environment, Geochemistry and Ranging (MESSENGER) spacecraft is already on its way to Mercury. Three Discovery mission proposals and three Missions of Opportunity were selected in 2006 for Phase A studies, and the Discovery Program will invite proposals for additional new missions in 2008. With the New Horizons spacecraft continuing on its way to Pluto, the New Frontiers Program's Juno Mission will undergo a Preliminary Design Review and a Non-Advocate Review in FY 2008 in preparation for entering development. The New Frontiers Program will release its third Announcement of Opportunity (AO) in late 2008.

The Astrophysics budget requests \$1.6 billion to operate NASA's astronomical observatories, including the Hubble Space Telescope (HST), Chandra X-Ray Observatory, and Spitzer Space Telescope, and to build more powerful instruments to peer deeper into the cosmos. HST is scheduled for a final servicing mission in September 2008 using the Space Shuttle Atlantis. Along with service life extension efforts, two new instruments will be installed during the servicing mission that are expected to dramatically improve performance and enable further discoveries, including enabling some science observations that have been affected by the recent failure of the Advanced Camera for Surveys. After the servicing mission, HST will once again have six fully operational instruments (including a suite of cameras and spectrographs that will have about 10 times the capability of older instruments) as well as new hardware capable of supporting at least another five years of world-class space science. The ESA Herschel and Planck missions, both of which include contributions from NASA, will launch in FY 2008 aboard an ESA-supplied Ariane-5. Kepler instrument and spacecraft integration and test will be completed in preparation for launch in November 2008, to determine the frequency of potentially habitable planets. The Gamma-ray Large Area Space Telescope (GLAST) will launch in FY 2008 to begin a five-year mission mapping the gamma-ray sky and investigating gamma-ray bursts. The James Webb Space Telescope will undergo Preliminary Design Review and a Non-Advocate Review in FY 2008, in preparation for entering development. The SOFIA observatory has been reinstated. Though we know of no technical showstoppers in regard to the airworthiness of the aircraft or operation of the telescope, this program has some remaining hurdles to overcome and so remains subject to a management review later this spring chaired by the NASA Associate Administrator. The SOFIA program baseline will be finalized at that time.

### **Exploration Systems Mission Directorate**

The FY 2008 budget request for the Exploration Systems Mission Directorate (ESMD) is \$3.9 billion to support continued development of new U.S. human spaceflight capabilities and supporting technologies, and to enable sustained and affordable human space exploration after the Space Shuttle is retired in 2010. With this budget, ESMD will continue to try to operate our next-generation crew exploration vehicle by 2014, while also providing research and developing technologies for the longer-term development of a sustained human presence on the Moon. ESMD will also continue to work with other nations and the commercial sector to leverage its investments and identify opportunities for specific collaboration on lunar data and lunar surface activities. New human spaceflight development of this magnitude, such as the Orion Crew Exploration Vehicle, occurs once in a generation. The next five years are a critical period in our Nation's space flight efforts.

The Constellation program includes the Orion Crew Exploration Vehicle; Ares I, a highly reliable crew launch vehicle; Commercial Orbital Transportation Services (COTS) demonstrations of cargo and crew

transport to the International Space Station; Ares V, a heavy-lift launch vehicle; spacesuits and tools required by the flight crews and; associated ground and mission operations infrastructure to support either lunar and/or initial low-Earth orbit (LEO) missions.

For FY 2008, pending a full analysis of the FY 2007 budget impacts, ESMD is on track to maintain its commitments for Ares I and Orion, and to continue meeting major milestones. This year Constellation will continue to mature and develop overall. Formulation of the Constellation elements will continue, leading to the Preliminary Design Review in 2008, at which time the program will be baselined. NASA will conduct an update for the overall Constellation Systems Requirements Review (SRR) in 2007 after the completion of all the Program Element SRRs. ESMD recently released the Ares I Upper Stage Request for Proposals (RFP). The RFP for the Ares I Avionics Ring is scheduled for release in May 2007, with selection and contract award scheduled for November 2007.

Facility, equipment, and personnel transitions from Space Shuttle to Constellation will be the major emphasis of the FY 2009 budget process. NASA transition activities are focused on managing the evolution from current operations of the Space Shuttle to future operations of Constellation and emerging commercial services, in a safe, successful and smooth process. This joint effort between the Space Operations Mission Directorate (SOMD) and ESMD includes the utilization and disposition of resources, including real and personal property, personnel, and processes, to leverage existing Shuttle and International Space Station assets for NASA's future Exploration activities. Formalized Transition Boards are working to achieve this outcome. A Human Spaceflight Transition Plan was developed in 2006, updates are in work, and metrics for the plan are being refined and will be implemented in 2007.

In August 2006, NASA signed Space Act Agreements with Space Exploration Technologies Corporation, of El Segundo, California, and Rocketplane-Kistler, of Oklahoma City, Oklahoma, to develop and demonstrate Commercial Orbital Transportation Services (COTS) that could open new markets and pave the way for commercial providers to launch and deliver crew and cargo to the ISS. The Space Act Agreements establish milestones and identify objective criteria to assess their progress throughout Phase 1 of the demonstrations. In the FY 2008 budget, funding for the purchase of crew and cargo transportation services, either from international partners or preferably from commercial providers, is transferred from ESMD to SOMD. COTS demonstration funding remains in ESMD to better exploit potential synergies with the Constellation Program.

With activities in the Advanced Capabilities program, NASA seeks to understand the space environment as it relates to human performance by addressing respective recommendations from the Exploration Systems Architecture Study that was conducted 2005. This included refocusing biomedical research and human life-support activities through new milestones and requirements to target the timely delivery of research products. Accordingly, ESMD created two new programs under Advanced Capabilities: the Human Research Program (HRP) to study and mitigate risks to astronaut health and performance and the Exploration Technology Development Program (ETDP) to enable future Exploration missions and reduce cost and risk. Plans for 2008 include:

- Testing of prototype ablative heat shield materials, low-impact docking systems, and landing attenuation systems;
- Testing of advanced environmental control systems on the ISS;
- Developing a lightweight composite command module test article for the Orion;
- Conducting studies to assess risks of long-term radiation exposure and continuing the use of the ISS as a testbed for studying human health and safety in space;
- Spacecraft integration and testing in preparation for the Lunar Reconnaissance Orbiter (LRO) launch in October 2008;
- Next-generation spacesuit capable of supporting exploration; and

- Developing jointly with the USAF the RS-68 engine that will be used on the Ares V.

Finally, the LRO and the Lunar CRater Observatory Sensing Satellite (LCROSS) to the Moon is planned to be launched in early FY 2008. These dual-manifested spacecraft have completed Critical Design Review and are currently in development. The science yielded from these missions will enable future outpost site selection and new information about the deep craters at the lunar poles. The LRO/LCROSS missions represent NASA's first steps in returning to the Moon.

### **Aeronautics Research Mission Directorate**

In 2006, NASA's Aeronautics Research Mission Directorate (ARMD) conducted a significant restructuring of its aeronautics program, allowing NASA to pursue high-quality, innovative, and integrated research that will yield revolutionary tools, concepts, and technologies to enable a safer, more flexible, environmentally friendly, and efficient national air transportation system. As such, ARMD's research will continue to play a vital role in supporting NASA's human and robotic space activities. The reshaped Aeronautics Program content and direction is consistent with the National Aeronautics Research and Development Policy, signed by the President on December 20, 2006.

A primary goal across all of the programs in ARMD is to establish strong partnerships involving NASA, other government agencies, academia, and industry in order to enable significant advancement in our Nation's aeronautical expertise. Because these partnerships are so important, NASA has put many mechanisms in place to engage academia and industry, including industry working groups and technical interchange meetings at the program and project level, Space Act agreements for cooperative partnerships, and the NASA Research Announcement (NRA) process that provides for full and open competition for the best and most promising research ideas. During 2006, ARMD's NRA solicitation resulted in the selection of 135 proposals for negotiation for award from 72 different organizations representing 29 different states plus the District of Columbia. NASA's FY 2008 budget request for Aeronautics includes \$51 million for NRA awards.

In FY 2008, the President's budget for NASA requests \$554 million for Aeronautics Research. This budget reflects full cost simplification, which significantly reduces the Center overhead and infrastructure allocated to Aeronautics programs.

NASA's Airspace Systems Program (ASP) has partnered with the Joint Planning and Development Office (JPDO) to help develop concepts, capabilities and technologies that will lead to significant enhancements in the capacity, efficiency and flexibility of the National Airspace System (NAS). Such improvements are critical to meet the Nation's airspace and airports requirements for decades to come. In FY 2008, NASA's budget request would provide \$98.1 million for ASP to conduct further research in operational concepts and human-in-the-loop simulation modeling that supports advancements in automated separation assurance capabilities. In addition, ASP will pursue enhanced development of airport surface movement trajectory models to provide a basis for optimized use of super density airports, integrated airport clusters, and terminals where demand for runways is high. Last year, ASP took an important step toward this goal by completing development of a system-wide operational concept that provides a detailed description of future NAS capacity enhancements while assessing the benefits of such system improvements. Key to the analysis of the operational concepts was program-developed tools such as the Airspace Concepts Evaluation System and the Future Air Traffic Management Concepts Evaluation Tool, both of which have successfully transitioned from NASA to the Federal Aviation Administration and the JPDO.

NASA's Fundamental Aeronautics Program (FAP) conducts research in the engineering and scientific disciplines that enable the design of vehicles that fly through any atmosphere at any speed. The FY 2008

budget request, amounting to \$293.4 million, will enable significant advances in the Hypersonics, Supersonics, Subsonic Fixed Wing, and Subsonic Rotary Wing projects that make up the FAP. These projects focus on creating innovative solutions for the technical challenges of the future: increasing performance (range, speed, payload, fuel efficiency) while meeting stringent noise and emissions constraints; alleviating environmental and congestion problems of the Next Generation Air Transportation System (NGATS) through the use of new aircraft and rotorcraft concepts; and, facilitating access to space and re-entry into planetary atmospheres. A wide variety of cross-cutting research topics are being pursued across the speed regimes with emphasis on physics-based multi-disciplinary analysis and design, aerothermodynamics, materials and structures, propulsion, aero-servo-elasticity, thermal protection systems, advanced control methods, and computational and experimental techniques. A number of key activities are planned for FY 2007 and 2008 including the launch of a suborbital rocket to conduct flight experiments in hypersonic boundary layer transition and re-entry shapes, the flight test of scale models of the X-48B Blended Wing-Body concept to assess this advanced unconventional airframe configuration for its potential to decrease aircraft noise while also improving performance, the evaluation of radical new concepts for variable-speed rotor technologies that can result in highly improved performance, and the evaluation of actively-controlled inlets for supersonic transports.

The FY 2008 budget request for NASA's Aviation Safety Program (AvSP) is \$74.1 million. The four projects within the Program (Integrated Intelligent Flight Deck, Integrated Resilient Aircraft Control, Aircraft Aging and Durability, and Integrated Vehicle Health Management) will develop cutting-edge tools, methods, and technologies with close coordination among them to improve the intrinsic safety attributes of current and future aircraft that will operate in the NGATS. In FY 2008, the Program will complete a study of human-automation technology that will improve safety during approach and landing operations by allowing for active operator assistance that maintains appropriate levels of workload and will be conducted to evaluate neural networks for direct adaptive control that will maximize adaptation to simulated in-flight failures while minimizing adverse interactions. At the same time, onboard sensor technology will be developed and validated to achieve significant improvement in measuring atmospheric water content that will improve the ability to detect the onset of potential icing hazards. Challenges related to aircraft aging and durability will also be addressed by developing models capable of simulating the initiation and propagation of minute cracks in metallic materials.

Finally, NASA's Aeronautics Test Program (ATP) will continue to safeguard the strategic availability of a critical suite of aeronautics test facilities that are deemed necessary to meet Agency and national aeronautics needs. The FY 2008 budget request for ATP is \$88.4 million, which will enable strategic utilization, operations, maintenance and investment decisions for major wind tunnel/ground test facilities at Ames Research Center, Glenn Research Center and Langley Research Center and for the Western Aeronautical Test Range support aircraft and test bed aircraft at Dryden Flight Research Center. In FY 2006, NASA implemented procedures to ensure affordable and competitive pricing of its aeronautics facilities for use by other parties, including industry and university researchers. In FY 2008, ATP plans to continue ensuring competitive prices for ATP facilities, reducing a backlog of maintenance issues and investing in advanced technologies such as installing consistent angle of attack instrumentation at the research Centers.

## **Space Operations Mission Directorate**

This was an extraordinary year for the Space Shuttle and International Space Station (ISS) Programs. NASA celebrated Independence Day 2006 by launching Space Shuttle *Discovery* on the STS-121 mission. The second of two test flights (the first was STS-114 in July/August 2005), STS-121 helped validate the improvements made to the Space Shuttle system since the loss of *Columbia* on February 1, 2003. The mission also marked the return of a complement of three crewmembers to the ISS. The Space

Shuttle *Atlantis* (STS-115), which launched on September 9, marked a return to sustained Space Shuttle operations and placed NASA on track to completing assembly of the ISS by 2010. STS-115 delivered the critical P3/P4 truss to the ISS, which will provide a quarter of the power services needed to operate the completed research facility. The last flight in December 2006, STS-116, was devoted primarily to deactivating the electrical power systems on the U.S. segment of the ISS and making a series of electrical and coolant connections between the P3/P4 truss segment and the rest of the Station. To do this, flight controllers at the mission control centers in Houston and Moscow uplinked over 17,900 commands to the ISS during the mission – all without a single unplanned or command error. STS-116 crewmember Robert Curbeam also set a record for the most spacewalks ever conducted by an astronaut on a single Space Shuttle mission, with four excursions totaling over 25 hours.

Operational activities onboard the ISS have continued into 2007, with a series of spacewalks that reconfigured the thermal system on the Station and prepared us for future assembly tasks. The Station is now able to provide additional power to the Space Shuttle, allowing two extra docked days, and we have connected permanent systems in place of temporary ones. The sequence of three complex spacewalks within nine days also demonstrated capabilities we will need later this year to fully install Node 2 following its delivery on STS-120.

These mission achievements reflect the NASA team's dedication to safely and successfully flying out the Space Shuttle program and meeting our Nation's commitments to our international partners. The program's successes also led to the decision in October 2006 to move forward with plans for a final servicing mission to the Hubble Space Telescope (HST). Following an extensive review by the relevant NASA offices of all safety and technical issues associated with conducting such a mission, it became clear that an HST servicing mission could be carried out effectively and safely. While there is an inherent risk in all spaceflight activities, the desire to preserve a truly international asset like the HST makes doing this mission the right course of action.

The Space Shuttle FY 2008 budget request of \$4,007 million would provide for five Shuttle flights, including four ISS assembly flights as well as the HST servicing mission. The ISS assembly flights include the launch of major research facility modules from the European Space Agency and Japan. The Canadian Special Purpose Dexterous Manipulator robotic system will also be flown in 2008. These flights are a major step towards fulfilling U.S. commitments to NASA's international partners as specified in the ISS agreements and the Vision for Space Exploration.

The FY 2008 budget request includes \$2,239 million for ISS activities. NASA has consulted with our international partners on the configuration of the ISS, and is working closely with them to determine the detailed plans for logistics required during and after assembly. The FY 2008 budget request provides the necessary resources to purchase Soyuz crew transport and rescue for U.S. astronauts as well as Progress vehicle logistics support for the ISS from the Russian Space Agency.

As the Shuttle approaches its retirement, the ISS Program intends to use alternative cargo and crew transportation services from commercial industry. Once a capability is demonstrated in Phase 1 of the Commercial Orbital Transportation Services (COTS) Space Act Agreements, NASA plans to purchase cargo delivery services competitively in Phase 2 and will decide whether to pursue crew demonstrations. In the FY 2008 budget, funding for the purchase of crew and cargo transportation services, either from international partners or preferably from commercial providers, is transferred from the Exploration Systems Mission Directorate to the Space Operations Mission Directorate. One item of significance in the FY 2008 budget runout, especially in the out-years, is that it allows for increases to our previously estimated costs for purchasing commercial cargo and crew services to support the ISS, assuming these commercial services are successfully demonstrated and are cost-effective. Should costs for those services be greater than what is presently budgeted, NASA has accepted a management challenge to scale back on our space operations

costs and will curtail some of our robotic lunar exploration or long-term exploration technology development in the out-years. COTS demonstration funding remains in ESMD to better exploit potential synergies with the Constellation Program.

The Space Shuttle Program's highest priority is to safely complete the mission manifest by the end of FY 2010, using as few flights as possible. Working through formalized Transition Control Board processes, the Space Shuttle Program will also play a key role in coordinating the smooth transition of Space Shuttle assets and capabilities to the next generation of Exploration systems without compromising the safety of ongoing flight operations. The greatest challenge NASA faces is safely flying the Space Shuttle to assemble the ISS prior to retiring the Shuttle in 2010, while also bringing new U.S. human spaceflight capabilities on-line soon thereafter. There are a number of major transition milestones set for FY 2008, including the transition of one of the four high bays in the Vehicle Assembly Building and Launch Pad 39B to the Constellation Systems Program. Space Shuttle *Atlantis* may also be retired in FY 2008 after the HST SM-4 mission and its systems and parts would be used to support the remaining Space Shuttle Orbiters, *Discovery* and *Endeavour*, during the program's last two years of operations. The FY 2008 budget request reflects the current assessment of costs to retire the Space Shuttle. Over the next year, NASA will develop additional detail and refine our cost estimates for the transition.

The FY 2008 budget also provides for the procurement of two additional Tracking and Data Relay Satellite System (TDRSS) satellites to replenish the constellation. NASA projects that the availability of aging TDRSS satellites to support overall user demand will be reduced by 2009 and depleted by 2015. In order to continue to support all users, NASA must begin the procurement process immediately, with planned launches in FY 2012 and FY 2013. By replenishing the satellites, NASA will be able to meet overall user demand through 2016. The Space Operations Mission Directorate has partnered with non-NASA users to provide a proportionate investment in the replacement capabilities.

### **Cross-Agency Support Programs**

The FY 2008 Budget Request for activities within the Cross-Agency Support Programs (CASP) – Education, Advanced Business Systems, Innovative Partnerships Programs, and Shared Capabilities Assets Program – is \$498.2 million. Within this amount, \$34.3 million is for the Shared Capability Assets Program (SCAP), which is designed to ensure that critical capabilities and assets (e.g. arc jets, wind tunnels, super computing facilities, rocket propulsion testing, etc.) required Agency-wide are available to missions when needed. The FY 2008 budget request for Advanced Business Systems, comprising the Integrated Enterprise Management Program (IEMP), is \$103.1 million. FY 2007 and FY 2008 funding will support IEMP in implementing capabilities that improve NASA's tracking and accountability of its property, plant, and equipment; integrate human capital information, providing employees and management with new, secure tools for accessing personnel data, and planning and budgeting NASA's workforce; and, provide more relevant and accurate financial information in support to NASA's programs and projects. This funding also supports ongoing operations and maintenance of NASA's financial system and other Agency-wide business systems.

For NASA's Education activities, the FY 2008 budget request totals \$153.7 million and sustains our ongoing commitment to excellence in science, technology, engineering, and mathematics (STEM) to ensure that our Agency is equipped with the right workforce to implement the Vision for Space Exploration. NASA will continue the tradition of investing in education and supporting educators who play a key role in preparing, inspiring, exciting, encouraging, and nurturing the youth who will manage and lead the laboratories and research centers of tomorrow. NASA Education is committed to three primary objectives to help improve the state of STEM education in our country: strengthen the Nation's

and NASA's future workforce; attract and retain students in the STEM discipline and; engage the American people in NASA's missions through partnerships and alliances.

The Innovative Partnerships Programs (IPP) provides leveraged technology investments, dual-use technology-related partnerships, and technology solutions for NASA. The FY 2008 budget request for IPP activities is \$198.1 million. The IPP implements NASA's Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) Programs that provide the high-technology small business sector with an opportunity to develop technology for NASA. Recently, NASA has made some changes to the management structure of these two programs to better enable technology infusion and to increase the efficiency of the operations. IPP also manages the Centennial Challenges Program. NASA has already benefited from the introduction of new sources of innovation and technology development even though the Program is relatively new and no prizes have yet been awarded. In addition, ongoing and future prize challenges will continue to inspire brilliant young minds.

## **Conclusion**

NASA has many challenges ahead of us, but we are on track and making progress in managing these challenges. The FY 2008 budget request demonstrates commitment to our Nation's leadership in space and aeronautics research, and while we may face a significant funding reduction for FY 2007, we will carry on, though not at the pace we had previously hoped.

I ask your help to ensure this Nation maintains a human space flight capability. Without stable funding as requested in this budget, we face the very real possibility of allowing that capability to slip away for the foreseeable future – even as other nations continue to develop similar capabilities.

I also need your help to effectively transition key elements of our Space Shuttle workforce, infrastructure, and equipment to our Nation's exploration objectives. The provisions I referenced earlier, as well as stable funding, will help ensure we preserve a critical and unique industrial base capability that has allowed the United States to lead the world in space exploration.

Again, thank you for the opportunity to appear before you today. I would be please to respond to any questions that you may have.