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**Statement of**  
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**before the**  
**Subcommittee on Science, Technology and Space**  
**Committee on Commerce, Science and Transportation**  
**United States Senate**

Mr. Chairman and Members of the Committee, thank you for this opportunity to appear today to discuss NASA’s FY 2005 budget request. On January 14th, the President visited NASA Headquarters and announced his Vision for U.S. Space Exploration. In his address, the President presented a vision for our Nation that is bold and forward-thinking, yet practical and responsible – one that explores answers to longstanding questions of importance to science and society and develops revolutionary technologies and capabilities for the future, while maintaining conscientious stewardship of taxpayer dollars.

The vision forms the basis of the new U.S. space exploration policy, “A Renewed Spirit of Discovery,” a copy of which is appended to this testimony as **Enclosure 1**. This policy is the product of months of extensive and careful deliberation. The importance of these deliberations increased with the findings of the *Columbia* Accident Investigation Board, which emphasized the importance of setting clear, long-term goals for the Nation’s human space flight program. Inputs from Members of Congress informed the Administration’s deliberations. Many others contributed ideas for the future of the space program. These deliberations were also the basis for formulating the President’s FY 2005 budget request for NASA. A commission appointed by the President will advise NASA on specific issues for implementation of the policy’s goals within four months.

Today, I will summarize the President’s FY 2005 budget request for NASA, discuss the goals set forth in the new U.S. space exploration policy, outline the major implementation elements and their associated budget details, explain the implications of this directive for NASA’s organization, and describe what the Nation’s future in exploration and discovery will look like in the coming years.

**FY 2005 Budget Summary**

The President’s FY 2005 Budget request for NASA is \$16.244 billion, a 5.6 percent increase over FY 2004, as reflected in **Enclosure 2**. The NASA budget request is designed with four key principles in mind:

Compelling – The budget fully supports the Vision for U.S. Space Exploration, and provides for ongoing NASA mission priorities such as Aeronautics and Earth Science.

Affordable – The budget is fiscally responsible and consistent with the Administration’s goal of cutting the Federal deficit in half within the next 5 years. NASA’s FY 2005 budget will increase by \$1 billion over 5 years, when compared with the President’s FY 2004 plan; that is an increase of approximately 5 percent per year over each of the next 3 years and approximately 1 percent for each of the following 2 years.

Achievable – The budget strategy supporting the vision for sustainable exploration will not require large balloon payments by future Congresses and Administrations. Unlike previous major civil space initiatives, this approach is intentionally flexible, with investments in sustainable exploration approaches to maintain affordability. After FY 2009, the budget projects that the exploration vision can be implemented within a NASA budget that keeps pace with inflation.

Focused – The budget begins the alignment of NASA’s program structure with the exploration vision. We now have the needed compass with which to evaluate our programs and make the required tough decisions.

### **Vision Goals**

The fundamental goal of this new policy is to advance U.S. scientific, security, and economic interests through a robust space exploration program. In support of this goal, NASA will:

- Implement a sustained and affordable human and robotic program to explore the Solar System and beyond;
- Extend human presence across the Solar System, starting with a human return to the Moon by the year 2020, in preparation for the human exploration of Mars and other destinations;
- Develop the innovative technologies, knowledge, and infrastructures both to explore and to support decisions about destinations for future human exploration; and
- Promote international and commercial participation in exploration to further U.S. scientific, security, and economic interests.

### **Implementation Elements and Budget Highlights**

To achieve these goals, NASA will plan and implement an integrated, long-term robotic and human exploration program, structured with measurable milestones and executed on the basis of available resources, accumulated experience, and technology readiness. Our initial plan is summarized in Enclosure 3.

NASA has developed a budget projection through 2020 to define the resources that will be available to achieve the vision for space exploration, as shown in Enclosure 4 [sand chart]. The first five years are based on the details contained in the President’s FY 2005 Budget request, and fiscal years 2010-2020 are based on roughly inflationary growth. NASA has taken the unusual step of projecting the budget beyond five years to demonstrate the exploration vision’s sustained and affordable approach, which redirects resources within NASA and does not require balloon payments beyond the normal five-year budget horizon.

The President's five-year FY 2005-09 Budget request establishes necessary groundwork for the execution of the exploration vision. Proposed near-term investments are focused on technology risk reduction and flight experiments as well as robotic missions throughout solar system.

Enclosure 4 shows a rough estimate for the cost of the exploration initiative through the initial human lunar landing. This represents a bounding estimate based on experience and actual costs from relevant elements of the Apollo program. The estimate does not reflect architecture studies, design analysis, new technologies, and innovative approaches yet to be undertaken. It also does not reflect that the vision, unlike Apollo, views the lunar landing not as an end in itself, but as one step in a sustained human and robotic program to explore the solar system and beyond.

The policy envisions the following major implementation elements:

Space Shuttle – NASA will safely return the Space Shuttle to flight as soon as practical, based on the recommendations of the Columbia Accident Investigation Board. The budget includes \$4.3 billion for the Space Shuttle, a 9 percent increase above FY 2004. Included in this total is an estimated \$238 million for Return to Flight (RTF) activities in FY 2005. The RTF activities are under evaluation to confirm the estimated cost and associated out year phasing. The focus of the Space Shuttle will be finishing assembly of the International Space Station (ISS). With its job done, the Space Shuttle will be phased out when assembly of the ISS is complete, planned for the end of the decade. NASA will determine over the next year how best to address the issues associated with the safe retirement of the Space Shuttle fleet.

International Space Station – NASA plans to complete assembly of the International Space Station by the end of the decade, including those U.S. components that will ensure our capability to conduct research in support of the new U.S. space exploration goals, as well as those elements planned and provided by foreign partners. The budget provides \$1.9 billion for ISS assembly and operations, a 24 percent increase above FY 2004. This increase forward funds \$100 million in reserves to partially restore planned near-term reserve levels following the \$200 million Congressional cut to Space Station in FY 2004 and provides \$140 million in new funding for transportation services to the Space Station. We will separate, to the maximum extent practical, crew and cargo transportation for both ISS and exploration missions. NASA will acquire ISS crew transport as required and will acquire cargo transportation as soon as practical and affordable. NASA envisions that commercial and/or foreign capabilities will provide these services.

The Administration is also prepared to address issues associated with obtaining foreign transportation services to the Space Station, including provisions of the Iran Nonproliferation Act, but, until the ISS Partnership adopts a specific implementation strategy, it is premature to identify specific issues.

U.S. research activities aboard the ISS will be focused to support the new exploration goals, with an emphasis on understanding how the space environment affects astronaut health and capabilities, and on developing appropriate countermeasures to mitigate health concerns. ISS will also be vital to developing and demonstrating improved life support systems and medical care. Consistent with this focus, the budget provides \$343 million, a 61 percent increase above the FY 2004 request, for bioastronautics research to understand and mitigate risks to humans on exploration missions. Over the next year, the Biological and Physical Research Enterprise will conduct a thorough review of all research activities to ensure that they are fully aligned with and supportive of the new exploration vision.

New Space Transportation Capabilities – The budget provides \$428 million to begin a new Crew Exploration Vehicle, named Project Constellation, which will provide crew transport for exploration missions beyond low-Earth orbit. The current budget planning is based on formulation concept studies to be conducted in FY 2004, preliminary design activities conducted in FY 2005-2006, a System Design Review in FY 2005, and a Preliminary Design Review in FY 2006. NASA plans to develop Project Constellation in a step-by-step approach, with an initial unpiloted test flight as early as 2008, followed by tests of progressively more capable designs that provide an operational human-rated capability no later than 2014. Project Constellation may also provide transportation to the Space Station, but its design will be driven by exploration requirements.

NASA does not plan to pursue new Earth-to-orbit transportation capabilities, except where necessary to support unique exploration needs, such as those that could be met by a heavy lift vehicle. The budget discontinues the Space Launch Initiative, although knowledge gained on the Orbital Space Plane will be transferred to Project Constellation.

Lunar Exploration – NASA will undertake lunar exploration and demonstration activities to enable the sustained human and robotic exploration of Mars and other destinations in the Solar System. Beginning no later than 2008, NASA plans to launch the first in a series of robotic missions to the Moon to prepare for and support human exploration activities. The budget provides \$70 million for these robotic lunar test beds, increasing to \$420 million by FY 2009. The policy envisions the first human expedition to the lunar surface as early as 2015, but no later than 2020. These robotic and human missions will further science and demonstrate new approaches, technologies, and systems -- including the use of space resources -- to support sustained human exploration to Mars and other destinations.

Exploration of Mars – The stunning images we have received since January 2004 from Mars, and the recent findings by the Opportunity Rover of evidence of large volumes of standing water on the Meridiani Planum, lay the foundation of the Vision for U.S. Space Exploration. NASA will enhance the ongoing search for water and evidence of life on Mars by pursuing technologies in this decade to be incorporated into advanced science missions to Mars in the next decade. Also starting in the next decade, NASA will launch a dedicated series of robotic missions to Mars that will demonstrate greatly enhanced capabilities and enable the future human exploration of the Red Planet. The budget provides \$691 million for Mars Exploration, a 16 percent increase over FY 2004, and will double Mars Exploration funding by FY 2009. NASA will conduct human expeditions to Mars and other destinations beyond Earth orbit on the basis of available resources, accumulated experience, and technology readiness.

Other Solar System Exploration – Over the next two decades, NASA will conduct an increasingly capable campaign of robotic exploration across the Solar System. The budget provides \$1.2 billion for Solar System Exploration missions to Jupiter's icy moons, to Saturn and its moon Titan, to asteroids and comets, and to other Solar System bodies. These missions will search for potentially habitable environments, evidence of life, and resources, and help us to understand the history of the Solar System.

Extrasolar Planets – NASA will launch advanced space telescopes that will search for Earth-like planets and habitable environments around other stars. The budget includes \$1.1 billion for the Astronomical Search for Origins, a 19 percent increase over FY 2004, to support the recently launched Spitzer Space Telescope, James Webb Space Telescope development, as well as several future observatories. This funding also supports investments to extend the lifetime of the Hubble Space Telescope to the maximum extent possible without a Shuttle servicing mission and to safely deorbit the observatory when its science operations cease.

Enabling Capabilities – NASA will pursue a number of key capabilities to enable sustainable human and robotic exploration across the Solar System. Among the most important of these capabilities is advanced power and propulsion, and the budget provides \$438 million for Project Prometheus to develop these technologies for future robotic and human exploration missions. The budget also includes \$636 million in other Human and Robotic Technology funding to pursue sustainable approaches to Solar System exploration, such as reusable and modular systems, pre-positioned propellants, space resource utilization, automated systems and robotic networks, and in-space assembly. These technologies and techniques will be demonstrated on the ground, in orbit, and on the Moon beginning in this decade and extending into the next to help inform future exploration decisions. The budget projects that funding for these Human and Robotic Technology investments will grow to \$1 billion by FY 2009.

The budget also includes innovative opportunities for U.S. industry, academia, and members of the public to help meet the technical challenges inherent in the new space exploration vision. The budget includes \$20 million for the new Centennial Challenges program, which will establish competitions to stimulate innovation in space and aeronautical technologies that can advance the exploration vision and other NASA missions. The budget also provides \$10 million for NASA to purchase launch services for its payloads from emerging launch vehicle providers. And as previously mentioned, the budget includes \$140 million for Space Station transportation services.

Ongoing Priorities – The budget supports the Vision for U.S. Space Exploration, while maintaining NASA commitments in other important roles and missions.

NASA continues its commitment to understanding our changing global climate. The budget makes NASA the largest contributor to the interagency Climate Change Science Program with \$100 million for the Climate Change Research Initiative. The budget includes \$560 million for Earth System Science research, a 7 percent increase above FY 2004, to support research on data from 80 sensors on 18 satellites currently in operation. Work also continues on Earth observation missions in development or formulation, including \$141 million (a 36 percent increase from FY 2004) for the National Polar Orbiting Environmental Satellite System Preparatory Project, and \$240 million (a 37 percent increase from FY 2004) for missions in formulation, such as the Orbiting Carbon Observatory, Aquarius, and Hydros, as well as the Landsat Data Continuity Mission.

NASA maintains planned Aeronautics Technology investments to improve our Nation's air system. The budget includes: \$188 million, a 4 percent increase above FY 2004, for technology to reduce aircraft accidents and improve the security of our Nation's aviation system against terrorist threats; \$72 million, an 11 percent increase above FY 2004, for technology to reduce aircraft noise and improve the quality of life for residents living near airports; \$209 million for technology to reduce aircraft emissions and improve environmental quality; and \$154 million for technologies to increase air system capacity and reduce delays at the Nation's airports.

NASA will continue to make fundamental advances in our knowledge of the Sun and the Universe. The budget provides \$746 million for Sun-Earth Connection missions, including the Solar Dynamics Observatory and the Solar-Terrestrial Relations Observatory. The budget also provides \$378 million for Structure and Evolution of the Universe missions, including the Chandra X-ray Observatory and three major missions currently under development.

NASA maintains its role in science, engineering and math education. The budget includes \$10 million for the newly authorized Science and Technology Scholarship program, which will help attract the Nation's best college students to NASA science and engineering careers. The budget also

provides \$14 million for the NASA Explorer Schools program, which seeks to attract students to mathematics and science during the critical middle school years. The Explorer Schools program is entering its third phase and will be selecting 50 new schools for a total of 150 participating schools.

NASA's education programs are, and will continue to be imbedded and directly linked to our vision for space exploration. Students now have unprecedented opportunities to engage in NASA flight programs, the observation of distant galaxies, and the robotic exploration of distant planets. Mission experiences link students and classrooms to NASA's diverse personnel, research facilities, telescopes, and planetary probes. Our successful efforts to "inspire the next generation of explorers" sustain a continuous pipeline of scientists, technologists, engineers, mathematicians, and teachers to carry forward our Nation's exploration goals.

Management of Human Capital, Facilities and Institution – NASA has the distinction of being the only Federal agency to earn top grades for the Human Capital and Budget and Performance Integration initiatives under the President's Management Agenda. Congress recently passed the NASA Flexibility Act of 2004. NASA is grateful for the hard work of this Committee in shaping this legislation to provide the necessary flexibilities to better attract and manage a diverse workforce. These flexibilities will be critical to implementing the exploration vision. The budget includes \$25 million in FY 2005 to begin to address critical workforce skill and aging issues. NASA ratings have also improved in the Competitive Sourcing and E-Government initiatives, resulting in more total improvements than in any other agency. Although we received a disclaimed opinion on our recent audit statement, we are determined to pursue the right path in Financial Management bringing on a new financial system that will standardize accounting across the Agency and provide the tools necessary for improved program management. NASA remains committed to management excellence and believes it is essential to implementing the new exploration vision.

The budget includes funding for critical institutional capabilities, including \$77 million for the NASA Engineering and Safety Center and \$27 million for our software Independent Verification and Validation facility. The budget also provides \$307 million, a \$41 million increase versus FY 2004, for facilities maintenance.

### **Organizing for Exploration**

To successfully execute the exploration vision, NASA will re-focus its organization, create new offices, align ongoing programs, experiment with new ways of doing business, and tap the great innovative and creative talents of our Nation.

The President has issued an Executive Order establishing a commission of private and public sector experts to advise us on these issues. Pete Aldridge former Undersecretary of Defense and Secretary of the Air Force, is Chair of the Commission. The President has named eight other commissioners to join Mr. Aldridge. The commission will issue its report within 120 days of its first meeting, which was held on February 11, 2004.

Immediately following the President's speech, we established an Exploration Systems Enterprise, which will have the responsibility for developing the Crew Exploration Vehicle and other exploration systems and technologies. Retired U.S. Navy Rear Admiral Craig Steidle, former manager of the Defense Department's Joint Strike Fighter Program, is heading this new organization. Relevant programs of the Aerospace Technology, Space Science, and Space Flight enterprises are being transferred to the Exploration Systems Enterprise. The Aerospace Technology Enterprise has been renamed the Aeronautics Enterprise to reflect its new focus.

As human explorers prepare to join their robotic counterparts, coordination and integration among NASA's diverse efforts will increase. The Exploration Systems Enterprise will work closely with the Space Science Enterprise to use the Moon to demonstrate new approaches, technologies, and systems to support sustained human exploration. NASA's Space Science Enterprise will have the responsibility for implementing early robotic testbeds on the Moon and Mars, and will also demonstrate other key exploration technologies – such as advanced power and communications – in missions to Mars and Jupiter's moons. NASA's Space Science Enterprise will eventually integrate human capabilities into exploration planning for Mars and other destinations.

Many other elements of the NASA organization will be focused to support this new direction. NASA's Biological and Physical Research Enterprise will put much greater emphasis on bioastronautics research to enable the human exploration of other worlds. NASA's Office of the Space Architect will be responsible for integrating the exploration activities of NASA's different Enterprises and for maintaining exploration roadmaps and coordinating high-level requirements.

As we move outward into the Solar System, NASA will look for innovative ideas from the private sector and academia to support activities in Earth orbit and future exploration activities beyond. Many of the technical challenges that NASA will face in the coming years will require innovative solutions. In addition to tapping creative thinking within the NASA organization, we will leverage the ideas and expertise resident in the Nation's universities and industry.

In his speech, the President directed NASA to invite other nations to share in the challenges and opportunities of this new era of exploration and discovery, and he directed us to fulfill our standing international commitments on ISS. We are discussing the impact of our vision implementation plans on the ISS with our partners, and as I have already indicated, we will complete the assembly of the ISS. The President called our future course of exploration “a journey, not a race,” and other nations have reacted positively to the Vision; several have already contacted us about joining in this journey. Building on NASA's long history and extensive and close ties with the space and research agencies of other nations, we will actively seek international partners in executing future exploration activities “that support U.S. goals” or “wherever appropriate”.

NASA will also invigorate its workforce, focus its facilities, and revitalize its field centers. As exploration activities get underway, NASA anticipates planning, reviews, and changes to align and improve its infrastructure. In order to achieve the exploration vision, we will be making decisions on how to best implement new programs. While some of these necessary actions will be difficult, they are essential to achieving the goals of the overall effort before us. I urge you to consider the full context of what we will be proposing rather than any isolated, specific action. Such a perspective will allow us to move forward in implementing the vision.

### **FY 2003 Accomplishments**

Much of the NASA's future ability to achieve the new space exploration vision is predicated on NASA's many previous accomplishments. The most visible NASA successes over the past year are the Spirit and Opportunity rovers currently on Mars. Already, the landscapes imaged by these twin rovers and their initial science returns are hinting at fundamental advances in our understanding of early environmental conditions on Mars; the announcement regarding the discovery of evidence that there was once liquid water on Mars' surface is a dramatic example of such an advance.

However, Spirit and Opportunity are not the only recent NASA mission successes. NASA and its partners successfully launched seven new Space Science missions (including the two Mars rovers), three new Earth Science missions, one new NASA communications relay satellite, and completed

two Space Station deployment missions. Operating missions have achieved a number of notable successes, including the Stardust mission's successful flight through the tail of Comet Wild-2, initial images from the recently launched Spitzer Space Telescope, a ten- to 100-fold improvement in Earth's gravity map from the GRACE satellite, the most accurate maps of Earth temperatures to date from the Aqua satellite, and new insights into space weather and solar activity from Sun-Earth Connection missions.

NASA exceeded or met 83 percent of its annual performance goals for FY 2003. Among these accomplishments were demonstrations of new systems to improve air traffic control and to combat aircraft icing, improvements in battery, telescope sensor, and life support technologies; fundamental advances in understanding states of matter (from Space Station research); and the implementation of new remote sensing tools for tracking diseases and wild fires.

### **The Nation's Future in Exploration and Discovery**

As the President stated in his speech, we are embarking on a journey, not a race. We begin this journey of exploration and discovery knowing that many years of hard work and sustained effort will be required, yet we can look forward to achieving concrete results in the near term. The vision makes the needed decisions to secure long-term U.S. space leadership. It provides an exciting set of major milestones with human and robotic missions. It pursues compelling science and cutting-edge technologies. It invites new ideas and innovations for accomplishing these bold, new endeavors. And it will provide the opportunity for new generations of Americans to explore, innovate, discover, and enrich our Nation in ways unimaginable today. This challenging Vision provides unique opportunities for engaging students across the country, "as only NASA can," to enter careers in science, engineering, technology, and math.

I sincerely appreciate the forum that the Subcommittee has provided today, and I look forward to responding to your questions.