

NASA R&D in the FY 2003 Budget

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HIGHLIGHTS

- The FY 2003 request provides \$15 billion to NASA, \$104 million more than FY 2002. Total NASA support of R&D in FY 2003 increases to \$10.7 billion (see Table II-12).
- Administrator O’Keefe has stated that a “return to basics” and a refocus on the agency’s traditional role of conducting high-technology research and development is his vision for NASA.
- The FY 2003 request proposes investments in safe nuclear-electric propulsion and nuclear power technologies to enhance the science capability of future planetary missions.
- The Landsat Data Continuity Mission will look to industry to supply data continuity in a commercial data buy in place of flying an eighth NASA Landsat satellite.
- The FY 2003 budget proposes a multi-agency Climate Change Research Initiative to provide near-term climate change products.
- NASA will work closely with the White House Office of Science and Technology Policy to establish near-term Space Station science objectives. The results of this review will help set the science agenda for Space Station.
- Increased funding is provided for the Space Radiation and Space Biology Generations programs to launch radiation research in the Van Allen belts and Low Earth Orbit (LEO).

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- The NASA/FAA joint programs will be strengthened to ensure that NASA technology investments are incorporated into the National Airspace System.
- Every three years the National Academy of Sciences will conduct a review of NASA's aeronautics technology program. These reviews will assess NASA's technology research and program planning, whether the work can be performed outside of NASA, and the integration of technology with the NASA customer's needs.
- Funding for Space Shuttle upgrades has been set aside to accelerate the upgrade implementation. Delays in upgrades continue to be a concern and Space Shuttle upgrades are planned on only those improvements that can be implemented by 2007. Planned upgrades now include Cockpit Avionics Upgrade Increment 1, Space Shuttle Main Engine Health Monitoring System Phase 1, and External Tank.
- NASA will pursue Space Shuttle competitive sourcing in an effort to retain skilled personnel, increase efficiency, and make NASA a purchaser of services rather than operations agency.

AGENCY OVERVIEW

This year has ushered in many changes at NASA. The Honorable Sean O'Keefe was confirmed as NASA Administrator in late December 2001 and took the NASA helm at the beginning of the year. Before coming to NASA, O'Keefe was the deputy director of the White House Office of Management and Budget (OMB) in the second Bush Administration. Prior to working at OMB, O'Keefe was the Louis A. Bantle Professor of Business and Government Policy, an endowed chair at the Syracuse University Maxwell School of Citizenship and Public Affairs. O'Keefe has also served in the first Bush administration as the Secretary of the Navy in 1992 and Comptroller and Chief Financial Officer of the Department of Defense in 1989. Before his service in the Administration he was on the U.S. Senate Committee on Appropriations staff for eight years, and was Staff Director of the Defense Appropriations Subcommittee. The Honorable Daniel S. Goldin had held the

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Administrator post since 1992 and Administrator O'Keefe's appointment marks the end of Goldin's tenure as the longest serving NASA Administrator.

In the FY 2003 budget request, emphasis has been placed on improving NASA's management capability to a level that matches its technical capability. Administrator O'Keefe has promised a "return to basics" at NASA, a reference to reforming the agency's financial and management issues, and has specifically pointed to the President's Management Agenda as the guide to improving the agency's management. The areas targeted for enhancement include: Improving Human Capital, Competitive Sourcing, Improved Financial Management, Expanded Electronic Government, and Budget/Performance Integration.

The first NASA budget submitted to Congress under the leadership of Administrator O'Keefe shows substantial new investments in safe nuclear power and propulsion technologies. NASA is furthering the development of nuclear power to increase the scientific return of future planetary missions. The decision to return to nuclear power research for deep space missions highlights the need to move from the limited capability of current solar and battery power sources to new technology.

The International Space Station continues to endure challenges with budget overruns and management concerns. NASA is currently conducting an intensive reassessment and review of the ISS program that was initiated under the President's Budget Blueprint for FY 2002 and plans to institute corrective actions this year to ensure proper cost controls to regain the program's credibility. NASA's vision for the Space Station program is to continue to U.S. core complete (completion of the U.S. portion of the Station under the current, newly redesigned plan) within available resources and then identify options beyond core complete that realize the international partners' planned integration. The ISS Management and Cost Evaluation (IMCE) Task Force, led by Thomas Young, was organized to perform an independent review of the budget and provide recommendations to control cost while still providing the maximum scientific return. The Task Force concluded that an equal level of fiscal management must meet the program's technical excellence. Administrator O'Keefe has indicated that the Young team's recommendations have been endorsed as the roadmap to improve the ISS Program management.

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Even with the challenges faced, the ISS has had a successful year of technical achievement. With the second stage of construction complete, the station's fourth Expedition Crew is conducting 47 distinct scientific experiments, on-orbit assembly and operations, and launch integration. Since 2000 there have been 20 successful missions launched to the ISS. The elements in space now represent a fully functional international spacecraft orbiting the Earth every 90 minutes.

In keeping with the IMCE Task Force recommendations for cost control, the Space Shuttle launch rate for mission support to the ISS will be reduced to only 4 flights per year. NASA will continue to explore additional Shuttle flight opportunities for research missions and the agency has scheduled a Hubble Space Telescope (HST) servicing mission in FY 2004.

Significant cost growth was identified in the FY 2002 baseline Shuttle operations program. In an effort to control costs, NASA has cancelled or postponed several of the Shuttle upgrades and has moved the Orbiter Major Modification work from Palmdale, CA to the Kennedy Space Center in Florida. Funding is provided to continue work on the Cockpit Avionics Upgrade, the Advanced Health Management System, and the External Tank Friction Stir Weld. With the FY 2003 budget, NASA will continue to pursue Shuttle competitive sourcing to further consolidate Shuttle operations as well as possibly privatize the Space Shuttle program. Based upon the opportunities and recommendations identified by the Shuttle Privatization Task Force, organized in 2001, NASA is working toward a transition to the new arrangement in FY 2004.

In 2001, the Office of Space Science produced many exceptional results: the HST discovered a supernova blast from the early life of Universe and the first detection and chemical analysis of the atmosphere of extra-solar planets; the Chandra X-Ray Observatory took the first images of a X-ray flare from the supermassive black hole at the center of the Milky Way; NASA and NSF astronomers discovered eight new extra-solar planets, bringing the total number of discovered planets to 80; and observations of the Submillimeter Wave Astronomy Satellite provided the first evidence of water on extra-solar planets. In our own solar system, the Near Earth Asteroid Rendezvous spacecraft achieved the first landing on an asteroid; the Mars Odyssey 2001 spacecraft reached Mars and began its mission to characterize the composition of the Martian surface; and

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the Deep Space-1 spacecraft conducted a flyby of the comet Borrelly providing the best look ever inside the comet's icy core.

In Earth Science, the global view afforded by the unique vantage point of space is providing new perspectives on how our planet's environment is influenced by natural and human forces. These views are finding increasingly broader applications in business, agriculture, and local governments in the United States. Last year NASA continued to deploy the first series of satellites of the Earth Observing System (EOS) with completion targeted for FY 2004. Data collected by the EOS has already provided global observations of critical weather cycles, land cover change, three-dimensional surface mapping, and climate modeling.

The Landsat Data Continuity Mission will seek a commercial data buy instead of launching and operating an eighth Landsat satellite. NASA, as part of the interagency U.S. Global Change Research Program (USGCRP), is currently reviewing its program plans and the Administration has directed the agency not to initiate any new missions until the review is completed. As a result, NASA is not formulating plans for any missions beyond the systems currently under development. (See Chapter 15 for complete information on USGCRP.)

The Aerospace Technology Enterprise suffered a set back in 2001 with the loss of the first X-43 hypersonic flight test vehicle. The X-vehicle was lost in its boost phase due to an apparent malfunction of its booster rocket. NASA is planning to continue the program with the remaining flight vehicles. The X-43 program's goal is to perform hypersonic research flights to Mach 7 and Mach 10. Additionally, the X-37 program has been reformulated to create separate suborbital and orbital phases. The X-37 is an advanced technology flight demonstrator to explore the future of space transportation and lower the cost of access to space.

FISCAL YEAR 2003 PRESIDENTIAL BUDGET REQUEST

NASA's FY 2003 budget request of \$15 billion, a 0.7 percent increase over the FY 2002 appropriation, provides relatively flat funding for the agency (see Table II-12). The Human Space Flight Account (HSF) was decreased by 10.2 percent from the previous year's funding level while the Science, Aeronautics, and Technology (SAT) budget has increased by 9.9 percent. This change in funding is primarily a transfer of costs for Space Communications and Data Systems operations of the Deep Space

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Network, Ground Networks, and Western Aeronautical Test Range transferred from HSF to SAT.

INTERNATIONAL SPACE STATION (ISS)

In FY 2003, the International Space Station will receive \$1.49 billion, a reduction of 13.3 percent. The primary reason for the funding reduction is that 98 percent of the hardware for the U.S. Core has been developed. In light of the purported ISS budgetary shortfall of over \$4 billion, the Administration proposed dramatic changes to the ISS program in 2001. NASA's redesigned station was dubbed "U.S. Core Complete" and included elimination of the Crew Return Vehicle (CRV), the Habitation and Propulsion Modules, and a 37 percent reduction in ISS science.

Although no funding was provided for the CRV in the FY 2003 budget request, work on the CRV will be continued with \$20 million of FY 2002 funding that has been carried over into FY 2003. NASA will be considering expanding the use of the CRV for possible crew transportation to orbit, as well as its original role as the ISS lifeboat. The X-38, an atmospheric test vehicle, will receive funding to perform more flight research in FY 2003 as NASA begins to assess the greater capability and utility of a Crew/Cargo Transfer Vehicle.

Congress initiated an investigation into the ISS program with the goal of answering basic questions with regard to the program's budgetary and management concerns. The Young Task Force Report has concluded that the concept of "U.S. Core Complete" is ill-defined and has recommended a course of action to improve the program. NASA will seek to reform and revitalize the station along the following five areas: research priorities, engineering development/deployment, cost estimation and analysis, the international partners, and mission and science operations.

The ISS international partners have expressed concern about the new approach to finish core complete and the uncertainty that lies beyond the core complete level of station research potential. In order to work with the international partners and to better understand their concerns, NASA has organized a team to maintain the ISS international partnerships.

NASA will also be working with the White House Office of Science and Technology Policy to redefine the scientific and technological goals of

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the space station in an effort to more effectively identify the resources and capabilities needed for the best investments to advance the nation's science and technology objectives. Additionally, NASA is considering the selection of a Non-Governmental Organization (NGO), similar to the NGO created to manage the research on the HST, to conduct future research on the ISS.

SCIENCE, AERONAUTICS, AND TECHNOLOGY (SAT)

The SAT appropriation has the majority of R&D programs, accounting for over three-fourths of total NASA funding for research and development. It funds R&D activities that extend our knowledge of the Earth, our solar system and space environment, and the universe. SAT also provides funds to invest in new aeronautics and advanced space transportation technologies that support the development and application of technologies critical to national economic, scientific, and technical competitiveness. Funding for R&D is included in accounts for space science, biological and physical research, earth science, aerospace technology, and academic programs. The FY 2003 budget request for SAT R&D funding is \$8.9 billion, up 9.9 percent from FY 2002 (see Table II-12).

Space Science: The FY 2003 Space Science budget of \$3.4 billion represents an increase of 19.0 percent over FY 2002. Funding has been increased as certain missions enter their peak development activity. The Space Science Enterprise is the office of NASA that conducts planetary exploration, studies the universe beyond our own solar system, and other phenomena that populate our Universe. The Office of Space Science (OSS) develops and operates a fleet of space probes and both space-based and ground-based telescopes to pursue the answers to fundamental questions about the origins of life and planets, how the Universe began and evolved, and the existence of life beyond Earth.

Some of the most exciting Space Science events of the past year were the discoveries made in the area of extra-solar planets detection. Last year NASA and NSF-funded astronomers discovered eight new extra-solar planets. Astronomers have also used the HST to analyze the atmosphere of extra-solar planets.

The FY 2003 request eliminates the Outer Planets program and both the Pluto-Kuiper mission and Europa Orbiter mission. A new program called

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New Frontiers will be established with a cost cap set on missions. These missions will be openly competed and capped at around \$650 million, twice the amount of the Discovery-class missions.

A new element to the Office of Space Science will be the research, development, and integration of nuclear propulsion and power technologies. In FY 2003, \$126 million has been requested for the new nuclear technology programs. This new initiative will provide advanced nuclear power and propulsion for deep space outer planets exploration and the Mars Exploration Program. Nuclear power technology will be incorporated into the Mars Smart Lander, scheduled for launch in 2009. The near-term Mars Exploration Program is largely unchanged, with two Mars surface rovers scheduled for launch in 2003, a Mars orbiter in 2005, and a Mars Scout Mission in 2007. (For more information on astronomy research within OSS, see Chapter 14.)

Biological and Physical Research (BPR): The Biological and Physical Research Enterprise was created in 2001 to conduct research in the unique space environment and develop commercial opportunities. This research will be used to increase the fundamental knowledge of biological, physical, and chemical processes; enable the development of space for human enterprise; and create new products and services. Also, the research conducted on the ISS was transferred from the Human Space Flight account to BPR in FY 2002. The FY 2003 funding request for BPR is \$851 million, an increase of 2.8 percent.

A new start for BPR in FY 2003 at \$21 million would be the Space Radiation and Generations Initiative. This new initiative will research the radiation environment beyond low-Earth and develop ways to protect humans from long duration exposure to radiation.

Earth Science: The President's budget for Earth Science in FY 2003 is \$1.6 billion, essentially unchanged from the FY 2002 budget. NASA's Earth Science Enterprise seeks to provide scientific answers to the question: How is the Earth changing, and what are the consequences for life on Earth? The unique vantage point of space allows scientists to observe the linkages of natural and man-made interactions on the Earth system. NASA's fleet of orbiting Earth Science missions and Earth observing satellites in development seek the answers to these questions.

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As mentioned, NASA continues the deployment of the first series of satellites for the Earth Observing System (EOS). EOS represents the largest activity within Earth Science with FY 2003 funding set at \$411 million. At the direction of the Administration, NASA will not formulate any new missions until completion of the USGCRP global climate change program review.

Aerospace Technology: In FY 2003, the Aerospace Technology Enterprise budget request is \$2.9 billion, which represents an increase of \$312 million from FY 2002. The funding increases are primarily in the Advanced Space Transportation/Space Launch Initiative.

The goal of the Aerospace Technology Enterprise is to provide revolutionary advancements in science and technology that sustain U.S. leadership in civil aeronautics and space. Per congressional direction, Aerospace Technology has been restructured to better distinguish aeronautics research from space transportation, technology, and commercial programs. These four subgroups are titled: Revolutionize Aviation, Advanced Space Transportation, Pioneer Technology Innovation, and Commercialize Technology.

In FY 2003, funding for the Revolutionize Aviation program is requested at \$541 million, a decrease of almost 10 percent from the FY 2002, and continues several years of declining budget requests in aeronautics R&D. Additionally, the request cuts funding for the Rotorcraft R&D program in FY 2003.

The request proposes an aggressive collaboration in aeronautics R&D between NASA and the FAA to meet the demand in growth in air travel. Additionally, the Commission on the Future of the U.S. Aerospace Industry, established by Congress and the Administration in 2001, has recommended the creation of a multi-agency coordinating council with the responsibility to meet the nation's future air traffic capacity demands. NASA's new Aeronautics Blueprint was issued along with the FY 2003 budget request. The Blueprint will serve as the agency's roadmap for aeronautics research and development and identifies four focus areas: The Airspace System, Revolutionary Vehicles, Aviation Security and Safety, and State of the Art Educated Workforce.

The FY 2003 request for Advanced Space Transportation is \$879 million, an increase of 52 percent from the previous year. Funding is

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included for the Space Launch Initiative (SLI) 2nd Generation RLV and Space Transfer and Launch Technology. The SLI program seeks to reduce the cost and improve the safety and reliability of space transportation systems. Last year the SLI program awarded over \$800 million in contracts with academia and industry for technology development and space launch architecture concepts.

The program area called Pioneer Technology Innovation (PTI) would receive \$275 million in the FY 2003 budget request. The PTI focuses on specific technology innovations to revolutionize the developmental process, tools, and capabilities of aerospace. Three PTI programs, Computing, Information and Communications Technology, Enabling Concepts and Technologies, and Engineering for Complex Systems, work together to achieve this goal.

The last major program area of the Aerospace Technology Enterprise, Commercial Technology Programs, would decrease by 10.3 percent to \$147 million in FY 2003. About 75 percent of this program funding goes to NASA's Small Business Innovation Research (SBIR) programs. The Commercial Technology Programs was established to ensure that NASA-developed technology is transferred to U.S. industry to improve U.S. economic competitiveness.

Academic Programs: NASA promotes excellence in the U.S. education system through Academic Programs. These programs seek to involve America's students in NASA's endeavors to create unique learning opportunities and to enlighten and inspire minds. The FY 2003 request is \$144 million, a decrease of 36.8 percent from FY 2002. FY 2002 funding ballooned significantly due to \$73.6 million in congressional earmarks, which would not be renewed in FY 2003.

Institutional Support: The FY 2003 request is \$2.91 billion. Institutional Support costs represent personnel, operations support, environmental management and maintenance for all ten NASA Centers. Funding for Institutional Support also includes emergency security funding, \$108.5 million, appropriated in FY 2002 and continued in FY 2003 following the tragic events of September 11th. Institutional support costs are spread across agency budget accounts, usually as a separate line (see Table II-12).