NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

The President's Proposal:

- Aligns all programs with a new agency vision and mission that emphasize research that is most appropriate for NASA to do, including reducing or terminating programs that are lower priority or not central to the agency's mission;
- Invests in key power, propulsion, and communications technologies, and human research to improve the efficiency and scientific return of exploration in space;
- Directs funding to research to better understand the environmental forces affecting the Earth's climate and improve the safety and security of the nation's air system;
- Maintains budget reserves for the Space Station consistent with the recommendations of independent cost reviews; and
- Invests in space launch improvements to extend the Space Shuttle's life, to develop technologies for next generation launch systems, and to design a crew transport backup to the Space Shuttle, which would provide an emergency crew return from the Space Station and improve astronaut flight safety.

The Agency's Major Challenges:

- Focusing research and technology on activities most appropriate for NASA; and
- Controlling costs of its launch vehicles, space platforms, ground facilities, and workforce to maximize resources for research, including completing construction of the U.S. core Space Station on time and on budget.

National Aeronautics and Space Administration

Sean O'Keefe, Administrator

www.nasa.gov 202–358–0000

Number of Employees: 19,050

2003 Spending: $14.6 billion

Major Assets: Approximately 40 operational spacecraft, one Space Station orbital laboratory, four Space Shuttle orbiters, and nine field centers.

The National Aeronautics and Space Administration (NASA) conducts research in four areas: 1) Space Science inquires into the origins, evolution, and nature of life and our universe; 2) Earth Science seeks to understand the forces affecting our planet's environment; 3) Biological and Physical Research uses the space environment to gain insight into how the laws of nature work; and 4) Aeronautics Technology develops new technologies to improve the nation's air transportation system.

NASA's research would not be possible without many enabling capabilities, including launches of the Space Shuttle and other launch vehicles, orbiting platforms like the Space Station, space communications systems, new spacecraft and launch technology, and research facilities.

Setting Priorities and Bringing Costs Under Control

NASA is a science and technology agency pursuing research in fields as diverse as astronomy and astrophysics, global climate change, human physiology, and aeronautical engineering. Because the agency conducts so many types of research, it must prioritize its resources to accomplish its most important research goals.

NASA's New Mission

To understand and protect our home planet

To explore the universe and search for life

To inspire the next generation of explorers

…as only NASA can.

This year, the agency revised its mission to place a higher priority on research that is most appropriate for NASA to pursue. The President's Budget focuses on those areas that are unique to NASA by investing in new technologies that will improve scientific return and efficiency, by investing in environmental research and aviation technology to improve life on Earth, and by reducing overlap with other government agencies or commercial industry.

To focus its resources on research priorities, NASA must keep the cost of its enabling capabilities under control. This is a major management challenge for the agency. Much of NASA's research requires expensive launch vehicles and space platforms, extensive ground facilities, and a significant workforce. NASA must carefully manage the costs of these capabilities to maximize funding for research. In the past, research was cut back rather than reducing unneeded infrastructure, or containing costs on large programs like the Space Station and the Shuttle. To maintain robust research efforts, the President's Budget aggressively implements reforms to control Space Station costs and invests in activities to improve flight safety and extend the life of the Space Shuttle. NASA will also continue to reduce redundancy across its field centers.

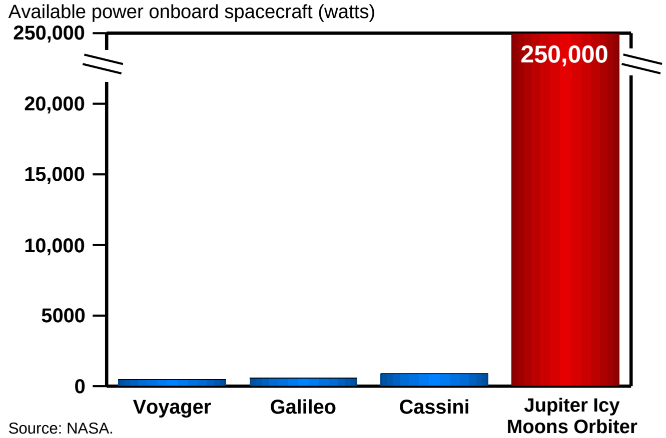
Improving the Efficiency and Scientific Return of Space Missions

The President's Budget invests in three technology areas that hold significant promise in overcoming the limitations of robotic- and human-led research in space. These technologies are critical to improving the efficiency and scientific return of space missions.

Better Science at Distant Planets. NASA's new mission places a high priority on the search for life beyond Earth. Recent discoveries at Mars and the moons around Jupiter indicate that there may be or have been habitable environments on these worlds that supported the development of life in the past and may support primitive lifeforms today. Understanding the evolution of our solar system lends new insight to developments on our planet.

Increasing the scientific return from missions to these planets requires new power and propulsion technologies. For example, using existing propulsion technology, it can take half a decade or more for spacecraft to travel to Jupiter and other planets in the outer solar system. Once there, it is difficult and sometimes impossible for spacecraft to enter orbit around one or more of a planet's moons. In addition, power on a spacecraft is a scarce resource. Science instruments on these spacecraft often run on the same amount of electricity as a light bulb. High radiation and extreme temperatures in some of these worlds also limit the lifetime of spacecraft power sources to a few months or less.

New Mission Greatly Increases Power for Science



Source: NASA.

To develop and demonstrate new power and propulsion technologies to overcome these limitations, the President's Budget proposes $279 million; ($3 billion over five years) for Project Prometheus, which builds on the Nuclear Systems Initiative started last year. Project Prometheus includes the development of the first nuclear-electric space mission, called the Jupiter Icy Moons Orbiter. This mission will conduct extensive, in-depth studies of the moons of Jupiter that may harbor subsurface oceans and thus have important implications in the search for life beyond Earth. In addition, it will prove new technologies for future NASA missions.

Where Are the Real Space Aliens?

Despite all the space aliens that appear in science fiction movies and books, we have yet to find conclusive evidence for life, even microbes, anywhere in the universe besides Earth.

Through the early 1990s, research showed that the universe, except for the Earth, was possibly inhospitable to life. However, in the past 10 years, a number of important discoveries indicate that habitable worlds may be much more prevalent than previously thought.

Researchers have found life in very harsh environments on Earth, which expands the possible kinds of places where life might exist. In our solar system, scientists have discovered evidence of currently or previously existing large bodies of water, a key ingredient of life, on Mars and the moons of Jupiter. Astronomers also have begun to find planets outside our solar system, identifying approximately 90 stars with at least one planet orbiting them.

Perhaps the notion that "there's something out there" is closer to reality than we have imagined.

Getting More Scientific Data Back. Like power and propulsion, today's communications technology also limits scientific research in space. Since the beginning of space exploration, radio waves have transmitted information to and from Earth. But radio signals weaken as they travel and carry limited scientific data. Optical communications, which rely on lasers, can carry much larger amounts of information than radio signals—enough to send video-like transmissions from deep space missions.

To take advantage of this emerging technology and greatly improve the scientific and educational return of future research missions, the President's Budget provides $31 million to initiate development of the first operational deep space optical communications system. Spacecraft in the Mars Exploration Program will be the first missions to use this technology in 2009, increasing the amount of data they can transmit back to Earth.

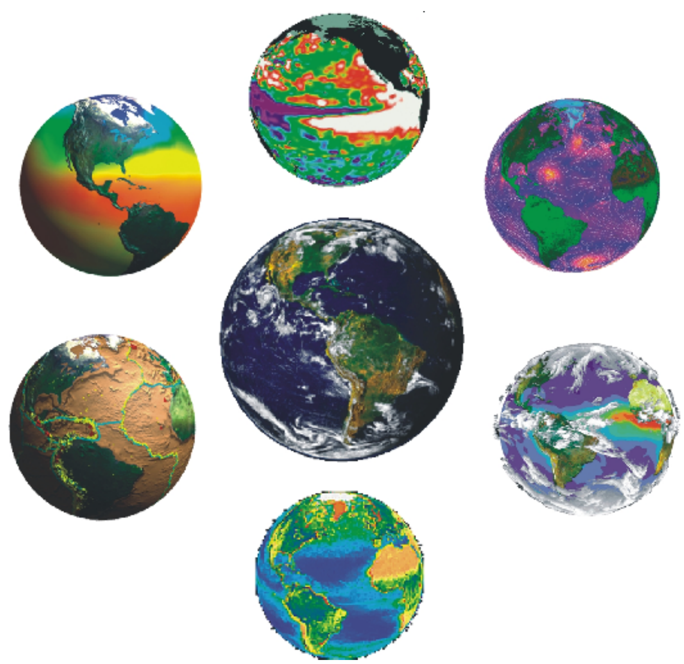
Improving the Efficiency and Safety of Human Research in Space. The space environment is hazardous to the human body. High radiation, the lack of gravity, and distance from resources make it difficult, and sometimes dangerous, for astronauts to pursue research in space. This is especially true for any future long-term missions beyond Earth's orbit that may require humans to conduct research that would not otherwise be possible. In these extreme and distant environments, astronauts would not be protected by Earth's magnetic field, could be exposed to harsh conditions for several months, and must carry large amounts of food, water, air, and other supplies.

To understand and address these health and logistical challenges, the President's Budget provides $39 million to begin a Human Research Initiative. This initiative builds on three years of continuous human presence on board the Space Station to accelerate our understanding of what is required to safely send humans on long-term missions beyond Earth's orbit. This initiative will also help operate the Space Station more efficiently by reducing the amount of supplies that must be launched to the Station and enabling astronauts to safely spend more time in orbit.

The President's Budget directs funding to better understand the environmental forces affecting the Earth's climate and to improve the safety and security of the nation's air transportation system. This research uses capabilities that are unique to NASA in order to improve life on Earth.

Knowledge and Technology to Improve Life on Earth

Climate Change Research. NASA uses the unique vantage point of space to enhance scientific understanding of the Earth's environment. Research satellites explore the distribution and transportation of pollutants in the atmosphere, changes in oceans and land cover, and the motions of the Earth's landmasses and interior. NASA's efforts are a major contribution to the Administration's Climate Change Science Program, which includes the Climate Change Research Initiative (CCRI) to reduce scientific uncertainties about the Earth's changing climate and better inform environmental policy decisions. NASA research satellites test new instruments and techniques that can be used on satellites providing long-term data and observations necessary for understanding climate change. This budget includes $79 million for CCRI investments at NASA, including key satellite instruments, research data, computer models, and decision support tools focused on climate prediction models.



NASA uses remote sensing satellites to view different environmental processes on the Earth, from severe weather to changes in ozone levels to volcanic eruptions.

Aviation Safety and Security. NASA develops aeronautics technologies to improve the nation's air transportation system in key areas like safety, airport congestion, and air and noise pollution from aircraft. New technologies can improve the visibility and awareness of pilots, allow more aircraft to land and take-off simultaneously from the same airport, and reduce chemical emissions from jet engines that can cause smog. In the wake of the terrorist attacks of September 11th, the President's Budget targets $21 million of the agency's aeronautics activities for the development of technologies that can improve the security of aircraft and the nation's air system. NASA will work closely with the newly formed Department of Homeland Security and the Federal Aviation Administration to identify and develop technologies that exploit NASA's unique expertise and can be applied to making the nation's air system more secure.

NASA graphical cockpit weather displays provide real time information that can help aircrews avoid areas of hazardous weather.

Revise Commercial Programs

Consistent with NASA's new mission focus on research that only NASA can or will pursue, the budget reduces funding for two commercial programs, partly because they overlap with private sector activities.

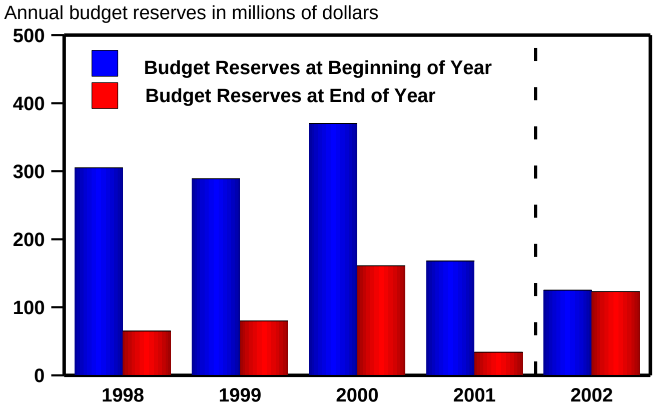
Commercial Technology. The budget terminates the Commercial Technology program, which markets NASA-developed technologies to potential private sector users. Although it is important to make NASA's technologies available to others, the government does not need to spend $30 million to $40 million per year just to make companies aware of these technologies. NASA believes a better approach is to make technology transfer a normal part of doing business whenever it is developing new technologies and to potentially leverage technology transfer capabilities at other agencies.

The budget provides $5 million for a new approach, known as the Enterprise Engine, to partner with private firms on the development of commercial technologies that can directly contribute to the agency's core research activities, while benefiting private industry.

Commercial Space Product Development. The budget redirects the Commercial Space Product Development program, which develops commercial products in space. Although it is important to make the Space Station viable to commercial users, NASA has spent $20 million to $30 million per year since 1985 on commercial space product development efforts with limited success. The government is not in the best position to decide which commercial products should be developed. NASA plans to reduce funding for this promotional program through 2005 and redirect efforts to other important biological and physical research on the Space Station.

Space Station Reforms

Management of Space Station Budget Reserves Improving



Source: NASA.

In concert with its international partners, NASA is building the International Space Station to create a laboratory for scientific research in the unique environment of space. The program has suffered from a long history of cost overruns. Two years ago, NASA projected a $5 billion (50 percent) overrun in the cost of completing the Space Station. To keep the Station within planned budgets, the Administration scaled it down to a core Space Station, and set management reform goals that must be met before considering any further additions to the core Station.

While not yet complete, NASA has demonstrated progress in its efforts to reform the program. The agency has strengthened cost and management controls and secured independent reviews of Space Station cost estimates. 2002 was the first year that the program did not need to tap its reserves. Independent cost reviews ranked the program cost estimates as credible and commended the program for improved cost analysis. However, these independent cost estimates also showed that the Space Station program will likely need additional budget reserves to manage risks associated with the transition from Station development to its operation. These additional reserves were requested in a 2003 budget amendment.

Most importantly, NASA has focused on research productivity as the goal for Station operations. To best improve Space Station research, NASA plans to create a Space Station Research Institute. This institute will improve access for researchers to the Space Station by streamlining the management of Space Station research and serving as a single point-of-contact for scientists, technologists, and commercial researchers who want to conduct research on the Space Station.

Challenges still remain. There is a year to go until construction of the U.S. core Space Station is complete. NASA must also transition from building to efficiently operating the Space Station. These challenges must be overcome before declaring with confidence that Space Station costs are under control. The Space Station's performance evaluation rating reflects that the Space Station is a program in transition.

Performance Evaluation of Select Programs

Three NASA programs have been reviewed for performance effectiveness, as summarized in the accompanying table. For further details on the performance assessments of the programs listed here, refer to the NASA chapter in the *Performance and Management Assessments* volume.

Program	Rating	Explanation	Recommendation
Space Station	Results Not Demonstrated	Space Station cost controls have improved since recent overruns, but it is too early to tell whether management reforms will continue to be successful.	NASA will continue building the U.S. core Space Station, and the Administration will monitor program performance to see if recent management reforms are successful.
Space Shuttle	Moderately Effective	Shuttle operations are well managed, but investments to improve the Shuttle suffer from inadequate planning and poor cost management.	NASA will develop tools to track the impact of investments on the Shuttle's operational life, flight safety, and facilities conditions. NASA also will strengthen capital investment cost controls.
Mars Exploration Program	Effective	Good planning and execution have led to important scientific discoveries. The program has recovered from the loss of two spacecraft in late 1990s.	NASA will carefully track development of the 2003 Mars rover missions which are a major program challenge. NASA also will use planning for potential missions next decade to drive technology investments this decade.

Space Launch Improvements

NASA transports humans and cargo to and from space using the Space Shuttle. NASA also launches many science spacecraft on commercial rockets. The agency coordinates its investments in the Space Shuttle and new space transportation capabilities through its Integrated Space Transportation Plan. The budget supports several improvements to this plan to improve flight safety and extend the life of the Space Shuttle.

Next Generation Launch Technology Investments. NASA had planned to develop a new Reusable Launch Vehicle to replace the Space Shuttle by early in the next decade. However, current cost estimates for the vehicle, which range as high as $20 to $40 billion, are significantly beyond the program goal of $10 billion, and, thus, NASA is not ready to commit to the vehicle's development. The President's Budget continues to invest in next generation launch technologies for the potential development of a Reusable Launch Vehicle or other launch systems.

Orbital Space Plane Acceleration. The budget funds design, risk reduction activities, and development of the Orbital Space Plane, which would be launched on commercial rockets, to transport astronauts and some cargo to and from the Space Station. It would supply the first-ever crew transport backup for the Space Shuttle, flexible access to space, and also provide emergency crew-return from the Space Station. Due to its unique system characteristics, the Orbital Space Plane is expected to be safer and less expensive to fly than the Shuttle. Validating the performance requirements, development cost, and anticipated operational costs will be a major activity over the next year.

Space Shuttle Service Life Extension. With deferment of a Reusable Launch Vehicle to replace the Space Shuttle, NASA will need to operate the Space Shuttle longer. The budget provides additional funding to extend the Shuttle's service life. However, past management of Shuttle investments has suffered from unclear planning and cost overruns. In the coming year, NASA will reform its approach to Shuttle investment planning and management.

Space Shuttle Competition. With the Space Shuttle flying longer, NASA is examining options for introducing greater competition for work that is currently performed directly by the federal government and federal contractors. A competition plan will be incorporated in next year's budget.

Update on the President's Management Agenda

	Human Capital	Competitive Sourcing	Financial Performance	E-Government	Budget and Performance Integration
Status	🟡 ↑	🔴	🔴 ↓	🔴	🟡 ↑
Progress	🟢	🟢	🟢	🟢	🟢

Arrows indicate change in status since baseline evaluation on September 30, 2001.

NASA's status rating improved for both human capital and budget and performance integration efforts. For human capital, NASA has begun to implement its strategic human capital plan, including a tracking system to identify workforce deficiencies across the agency. In competitive sourcing, NASA has achieved the government-wide, 15 percent competitive sourcing goal for 2003, but is still working on a plan to achieve the long-term 50 percent goal. The status of financial performance fell due to a disclaimer of opinion on NASA's 2001 audit. The agency worked to resolve all issues from that audit, including accounting for contractor held property. Progress in E-Government has been slower due to information technology security reporting issues and problems with completing documentation to justify some information technology investments. In budget and performance integration, NASA is now budgeting for the full cost of its programs and has integrated its budget and performance reports starting with this budget.

National Aeronautics and Space Administration
(In millions of dollars)

	2002 Actual	Estimate	
		2003	2004
Spending			
Discretionary Budget Authority:			
Science, Aeronautics and Exploration (non-add)	*(6,542)*	*(6,975)*	*(7,661)*
Space Science	2,902	3,414	4,007
Earth Science	1,592	1,628	1,552
Biological and Physical Research	824	842	973
Aeronautics	997	947	959
Education Programs	227	144	170
Space Flight Capabilities (non-add)	*(8,326)*	*(8,000)*	*(7,782)*
Space Flight	6,773	6,131	6,110
Crosscutting Technology	1,553	1,869	1,672
Inspector General	24	25	26
Total, Discretionary budget authority	14,892	15,000	15,469