NASA Facts

National Aeronautics and
Space Administration

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Space Science

Exploring Beyond Earth Orbit

Space science is vitally important to NASA and the United States as it's the only national program that explores beyond Earth orbit and looks outward to the universe beyond our Solar System.

NASA seeks answers to fundamental questions, like:

- What is the Universe? How did it come into being? How does it work? What is its ultimate fate?
- How does the Sun influence the Earth and the rest of the Solar System? What causes the variations in the Sun's output?
- What was the origin of the Sun, the Earth and the other planets, and how have they evolved? Are there worlds around other stars?
- How did life arise on Earth? Has life begun elsewhere in the universe?

As the United States looks to the future, NASA's space science program helps keep America at the forefront of science, technology, and education by:

- making new discoveries that will rewrite the textbooks well into the 21st century
- providing technological advances in automation, robotics, instrumentation, information technology, and communications
- making significant contributions to U.S. educational goals
- offering a unique perspective on life that transcends the problems and challenges of daily existence
- finding innovative ways to develop science with fewer resources

NASA also explores the often bizarre Universe beyond our Solar System using space- and Earth-based observatories and telescopes, including the:

- Hubble Space Telescope
- Compton Gamma Ray Observatory
- Cosmic Background Explorer
- Extreme Ultraviolet Explorer

Recent Major Discoveries and Activities

- fundamental discoveries by the Hubble Space Telescope and the Compton Gamma Ray Observatory about the size, age and evolution of the Universe and many of its mysteries, including black holes, quasars and its “missing” dark matter
- unprecedented space- and ground-based observations of the impact of Comet Shoemaker-Levy 9 with Jupiter, including direct views of the impact by the Galileo spacecraft, which will arrive in orbit around the giant gas planet in December 1995 to conduct at least two years of detailed study of the complex planet and its diverse moons
- confirmation of the Big Bang theory of the origin of the Universe by the Cosmic Background Explorer spacecraft
- the unexpected finding by the joint European Space Agency/NASA Ulysses solar spacecraft that the Sun apparently lacks a magnetic pole, discovered during the first-ever flight over the Sun's south pole. In 1995, Ulysses flew over the Sun's north pole.
- the first-ever spacecraft flybys of two asteroids, including the discovery of a small moon around asteroid Ida, which was made by Galileo while on its way to Jupiter

- the International Solar-Terrestrial Physics Program studies the tremendous energies involved in interactions of the solar wind and the Earth's magnetic field. The remaining three ISTP missions, NASA's Polar spacecraft and the European Space Agency's SOHO and Cluster missions, will be launched later this year, joining the two missions already in space.
- NASA's Wind and the joint Japanese/NASA Geotail spacecraft.

A History of Achievement

NASA's space probes, planetary landers and orbiters have produced spectacular images and quantum leaps in knowledge about the Sun and nearly every planet in our Solar System.

- A series of Mariner and Pioneer spacecraft in the 1960’s and 1970's began humankind's initial reconnaissance of the Solar System. One spacecraft, Pioneer 11, became the first object from Planet Earth to leave the Solar System.
- Two Viking spacecraft, each divided into a lander and an orbiter, explored Mars in the 1970's. Viking Lander 1 became the first spacecraft from Earth to land on the Red Planet. Findings were both comprehensive and tantalizing.
- The twin Voyager spacecraft mapped the four largest planets in the Solar System. Their mission began with Jupiter in 1979 and concluded with Neptune 10 years later. In their journeys, the Voyager spacecraft investigated 4 planets and more than 50 moons, rewriting astronomy textbooks.
- The Magellan spacecraft completed mapping 95% of the planet Venus, discovered active geology and performed the first aerobraking maneuver, pioneering a technique that will be used in 21st century planetary exploration.

Future Missions

- The proposed New Millennium program would develop new microtechnology and advanced automation techniques, precipitating a revolution in the design and operation of scientific spacecraft. A fleet of these small, high-tech probes would return a continuous flow of information to Earth about the solar system and possibly even the existence of planets around nearby stars.
- The Cassini mission to Saturn will orbit the ringed planet and drop a European Space Agency-built probe into the atmosphere of its mysterious moon, Titan.
- The Advanced X-ray Astrophysics Facility, the third Great Observatory, will search for dark matter, believed to make up most of the mass of the Universe.
- A series of small orbiters and landers will be sent to Mars under the Mars Surveyor program, beginning in November 1996. NASA also is discussing cooperative Mars exploration missions with the Russian Space Agency.
- The Near-Earth Asteroid Rendezvous mission will orbit an asteroid for the first time as part of the Discovery series of low-cost, high-tech spacecraft.
- The Stratospheric Observatory for Infrared Astronomy, an airborne telescope, will study star and planet formation and the dynamics and chemistry of the interstellar medium, with direct participation by students and teachers.
- The Space Infrared Telescope Facility, the fourth and final Great Observatory, is designed to peer to the very center of our Milky Way galaxy.

Budget

The fiscal year 1995 budget for Space Science is $2.01 billion, an increase of 3.4% over 1994. To accomplish its present and future goals in an era of level or declining budgets, NASA has:

- reduced both the life-cycle and peak-year costs of major missions now in development
- streamlined ongoing mission operations by using paperless procedures, shared computer equipment and software, and new automation technologies
- emphasized the development of new missions that are smaller and less costly than their predecessors yet still return ground-breaking science
- continued investments in advanced technologies and testbeds

The fiscal year 1996 request of $1.959 billion represents a balanced effort that continues to pursue the fundamental scientific questions in astrophysics, planetary exploration, space physics and related research, while addressing the challenges that will define space science in the 21st century. Of this amount, $1.057 billion is for physics and astronomy research, $672 million is for planetary exploration, and $230 million is for launch services.

Partnerships

- university community-performing fundamental science on a wide range of space science missions

- aerospace industry-increasing involvement by small and minority businesses
- international cooperation-ranging from joint science teams to shared hardware and launch costs, including Galileo, Ulysses, Cassini, the Rosetta comet rendez-vous mission with the European Space Agency and Astro-E, an X-ray astrophysics mission with Japan

“There's always more. I'll think about Hubble for the rest of my life. It's a symbol of humanity's quest, a reaching out to find out what this Universe is all about.”

Dr. Story Musgrave, Shuttle Astronaut
leader of the Hubble Space Telescope
servicing activities in December 1993