National Aeronautics and Space Administration
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NASA History Fact Sheet

A BRIEF HISTORY OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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Launching NASA

"An Act to provide for research into the problems of flight within and outside the Earth's atmosphere, and for other purposes." With this simple preamble, the Congress and the President of the United States created the national Aeronautics and Space Administration (NASA) on October 1, 1958. NASA's birth was directly related to the pressures of national defense. After World War II, the United States and the Soviet Union were engaged in the Cold War, a broad contest over the ideologies and allegiances of the nonaligned nations. During this period, space exploration emerged as a major area of contest and became known as the space race.

During the late 1940s, the Department of Defense pursued research and rocketry and upper atmospheric sciences as a means of assuring American leadership in technology. A major step forward came when President Dwight D. Eisenhower approved a plan to orbit a scientific satellite as part of the International Geophysical Year (IGY) for the period, July 1, 1957 to December 31, 1958, a cooperative effort to gather scientific data about the Earth. The Soviet Union quickly followed suit, announcing plans to orbit its own satellite.

The Naval Research Laboratory's Project Vanguard was chosen on 9 September 1955 to support the IGY effort, largely because it did not interfere with high-priority ballistic missile development programs. It used the non-military Viking rocket as its basis while an Army proposal to use the Redstone ballistic missile as the launch vehicle waited in the wings. Project Vanguard enjoyed exceptional publicity throughout the second half of 1955, and all of 1956, but the technological demands upon the program were too great and the funding levels too small to ensure success.

A full-scale crisis resulted on October 4, 1957 when the Soviets launched *Sputnik 1*, the world's first artificial satellite as its IGY entry. This had a "Pearl Harbor" effect on American public opinion, creating an illusion of a technological gap and provided the impetus for increased spending for aerospace endeavors, technical and scientific educational programs, and the chartering of new federal agencies to manage air and space research and development.

More immediately, the United States launched its first Earth satellite on January 31, 1958, when *Explorer 1* documented the existence of radiation zones encircling the Earth. Shaped by the Earth's magnetic field, what came to be called the Van Allen Radiation Belt, these zones partially dictate the electrical charges

in the atmosphere and the solar radiation that reaches Earth. The U.S. also began a series of scientific missions to the Moon and planets in the latter 1950s and early 1960s.

A direct result of the Sputnik crisis, NASA began operations on October 1, 1958, absorbing into itself the earlier National Advisory Committee for Aeronautics intact: its 8,000 employees, an annual budget of $100 million, three major research laboratories-Langley Aeronautical Laboratory, Ames Aeronautical Laboratory, and Lewis Flight Propulsion Laboratory-and two smaller test facilities. It quickly incorporated other organizations into the new agency, notably the space science group of the Naval Research Laboratory in Maryland, the Jet Propulsion Laboratory managed by the California Institute of Technology for the Army, and the Army Ballistic Missile Agency in Huntsville, Alabama, where Wernher von Braun's team of engineers were engaged in the development of large rockets. Eventually NASA created other Centers and today it has ten located around the country.

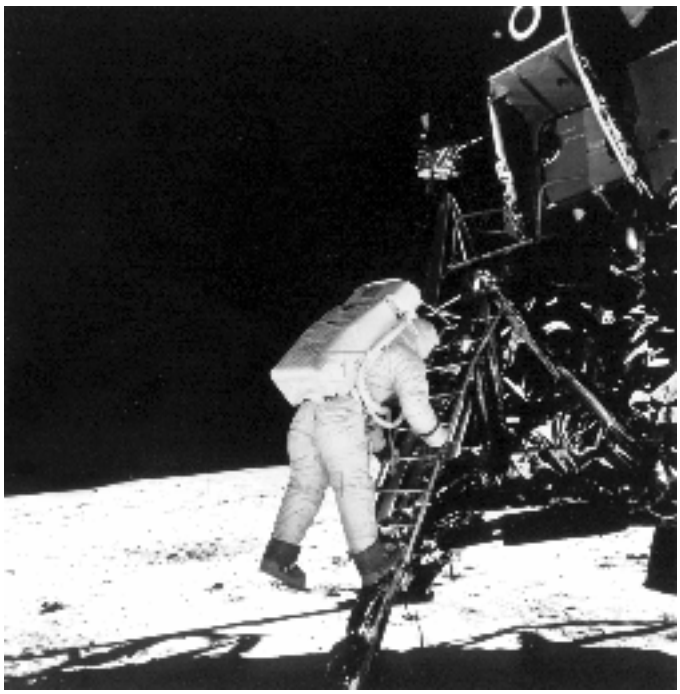
NASA began to conduct space missions within months of its creation, and during its first twenty years NASA conducted several major programs:

- Human space flight initiatives-Mercury's single astronaut program (flights during 1961-1963) to ascertain if a human could survive in space; Project Gemini (flights during 1965-1966) with two astronauts to practice space operations, especially rendezvous and docking of spacecraft and extravehicular activity (EVA); and Project Apollo (flights during 1968-1972) to explore the Moon.
- Robotic missions to the Moon (Ranger, Surveyor, and Lunar Orbiter), Venus (*Pioneer Venus*), Mars (*Mariner 4*, *Viking 1* and *2*), and the outer planets (*Pioneer 10* and *11*, *Voyager 1* and *2*).
- Aeronautics research to enhance air transport safety, reliability, efficiency, and speed (X-15 hypersonic flight, lifting body flight research, avionics and electronics studies, propulsion technologies, structures research, aerodynamics investigations).
- Remote-sensing Earth satellites for information gathering (Landsat satellites for environmental monitoring).
- Applications satellites for communications (*Echo 1*, *TIROS*, and *Telstar*) and weather monitoring.
- An orbital workshop for astronauts, *Skylab*.
- A reusable spacecraft for traveling to and from Earth orbit, the Space Shuttle.

Early Spaceflights: Mercury and Gemini

NASA's first high-profile program involving human spaceflight was Project Mercury, an effort to learn if humans could survive the rigors of spaceflight. On May 5, 1961, Alan B. Shepard Jr. became the first American to fly into space, when he rode his Mercury capsule on a 15-minute suborbital mission. John H. Glenn Jr. became the first U.S. astronaut to orbit the Earth on February 20, 1962. With six flights, Project Mercury achieved its goal of putting piloted spacecraft into Earth orbit and retrieving the astronauts safely.

Project Gemini built on Mercury's achievements and extended NASA's human spaceflight program to spacecraft built for two astronauts. Gemini's 10 flights also provided NASA scientists and engineers with more data on weightlessness, perfected reentry and splashdown procedures, and demonstrated rendezvous and docking in space. One of the highlights of the program occurred during Gemini 4, on June 3, 1965, when Edward H. White, Jr., became the first U.S. astronaut to conduct a spacewalk.



1**Going to the Moon - Project Apollo**

The singular achievement of NASA during its early years involved the human exploration of the Moon, Project Apollo. Apollo became a NASA priority on May 25 1961, when President John F. Kennedy announced "I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the Moon and returning him safely to Earth." A direct response to Soviet successes in space, Kennedy used Apollo as a high-profile effort for the U.S. to demonstrate to the world its scientific and technological superiority over its cold war adversary.

In response to the Kennedy decision, NASA was consumed with carrying out Project Apollo and spent the next 11 years doing so. This effort required significant expenditures, costing $25.4 billion over the life of the program, to make it a reality. Only the building of the Panama Canal rivaled the size of the Apollo program as the largest nonmilitary technological endeavor ever undertaken by the United States; only the Manhattan Project was comparable in a wartime setting. Although there were major challenges and some failures - notably a January 27, 1967 fire in an Apollo capsule on the ground that took the lives of astronauts Roger B. Chaffee, Virgil "Gus" Grissom, and Edward H. White Jr. Jr. - the program moved forward inexorably.

Less than two years later, in October 1968, NASA bounced back with the successful Apollo 7 mission, which orbited the Earth and tested the redesigned Apollo command module. The Apollo 8 mission, which orbited the Moon on December 24-25, 1968, when its crew read from the book of Genesis, was another crucial accomplishment on the way to the Moon.

"That's one small step for [a] man, one giant leap for mankind." Neil A. Armstrong uttered these famous words on July 20, 1969, when the Apollo 11 mission fulfilled Kennedy's challenge by successfully landing Armstrong and Edwin E. "Buzz" Aldrin, Jr. on the Moon. Armstrong dramatically piloted the lunar module to the lunar surface with less than 30 seconds worth of fuel remaining. After taking soil samples, photographs, and doing other tasks on the Moon, Armstrong and Aldrin rendezvoused with their colleague Michael Collins in lunar orbit for a safe voyage back to Earth.

Five more successful lunar landing missions followed. The Apollo 13 mission of April 1970 attracted the public's attention when astronauts and ground crews had to improvise to end the mission safely after an

oxygen tank burst midway through the journey to the Moon. Although this mission never landed on the Moon, it reinforced the notion that NASA had a remarkable ability to adapt to the unforeseen technical difficulties inherent in human spaceflight.

With the Apollo 17 mission of December 1972, NASA completed a successful engineering and scientific program. Fittingly, Harrison H. "Jack" Schmitt, a geologist who participated on this mission, was the first scientist to be selected as an astronaut. NASA learned a good deal about the origins of the Moon, as well as how to support humans in outer space. In total, 12 astronauts walked on the Moon during 6 Apollo lunar landing missions.

In 1975, NASA cooperated with the Soviet Union to achieve the first international human spaceflight, the Apollo-Soyuz Test Project (ASTP). This project successfully tested joint rendezvous and docking procedures for spacecraft from the U.S. and the U.S.S.R. After being launched separately from their respective countries, the Apollo and Soyuz crews met in space and conducted various experiments for two days.

2**Space Shuttle**

After a gap of six years, NASA returned to human spaceflight in 1981, with the advent of the Space Shuttle. The Shuttle's first mission, STS-1, took off on April 12, 1981, demonstrating that it could take off vertically and glide to an unpowered airplane-like landing. On STS-6, during April 4-9, 1983, F. Story Musgrave and Donald H. Peterson conducted the first Shuttle EVA, to test new spacesuits and work in the Shuttle's cargo bay. Sally K. Ride became the first American woman to fly in space when STS-7 lifted off on June 18, 1983, another early milestone of the Shuttle program.

On January 28, 1986 a leak in the joints of one of two Solid Rocket Boosters attached to the *Challenger* orbiter caused the main liquid fuel tank to explode 73 seconds after launch, killing all 7 crew members. The Shuttle program was grounded for over two years, while NASA and its contractors worked to redesign the Solid Rocket Boosters and implement management reforms to increase safety. On September 29, 1988, the Shuttle successfully returned to flight. Through mid-1998, NASA has safely launched65 Shuttle missions since the return to flight. These have included a wide variety of scientific and engineering missions. There are four Shuttle orbiters in NASA's fleet: *Atlantis*, *Columbia*, *Discovery*, and *Endeavour*.

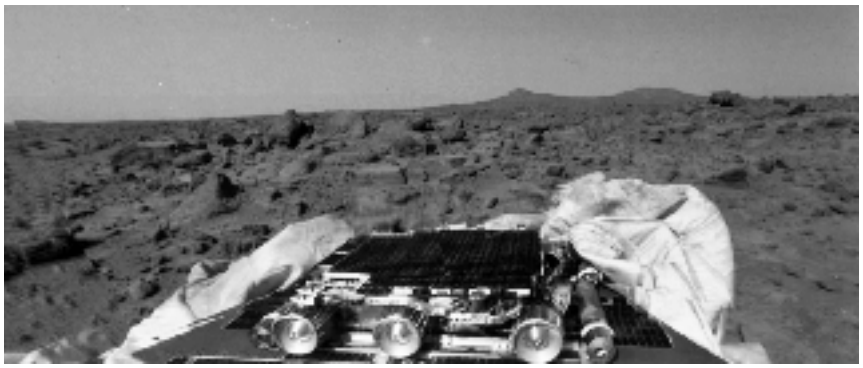
Toward a Permanent Human Presence in Space

The core mission of any future space exploration will be humanity's departure from Earth orbit and journeying to the Moon or Mars, this time for extended and perhaps permanent stays. A dream for centuries, active efforts to develop both the technology and the scientific knowledge necessary to carry this off are now well underway. The next generation of launch vehicles taking us from the Earth into orbit are being developed right now. The X-33, X-34, and other hypersonic research projects presently underway will help to realize routine, affordable access to space in the first decades of the twenty-first century.

An initial effort in this area was NASA's Skylab program in 1973. After Apollo, NASA used its huge Saturn rockets to launch a relatively small orbital space workshop. There were three human Skylab missions, with the crews staying aboard the orbital workshop for 28, 59, and then 84 days. The first crew manually fixed a broken meteoroid shield, demonstrating that humans could successfully work in space. The Skylab program also served as a successful experiment in long-duration human spaceflight.

In 1984, Congress authorized NASA to build a major new space station as a base for further exploration of space. By 1986, the design depicted a complex, large, and multipurpose facility. In 1991, after much debate over the station's purpose and budget, NASA released plans for a restructured facility called Space Station Freedom. Another redesign took place after the Clinton administration took office in 1993 and the facility became known as Space Station Alpha.

Then Russia, which had many years of experience in long-duration human spaceflight, such as with its *Salyut* and *Mir* space stations, joined with the U.S. and other international partners in 1993 to build a joint facility that became known formally as the International Space Station (ISS). To prepare for building the ISS starting in late 1998, NASA participated in a series of Shuttle missions to *Mir* and seven American astronauts lived aboard *Mir* for extended stays.



3**The Science of Space**

In addition to major human spaceflight programs, there have been significant scientific probes that have explored the Moon, the planets, and other areas of our solar system. In particular, the 1970s heralded the advent of a new generation of scientific spacecraft. Two similar spacecraft, Pioneer 10 and Pioneer 11, launched on March 2, 1972 and April 5, 1973, respectively, traveled to Jupiter and Saturn to study the composition of interplanetary space. Voyagers 1 and 2, launched on September 5, 1977 and August 20, 1977, respectively, conducted a "Grand Tour" of our solar system.

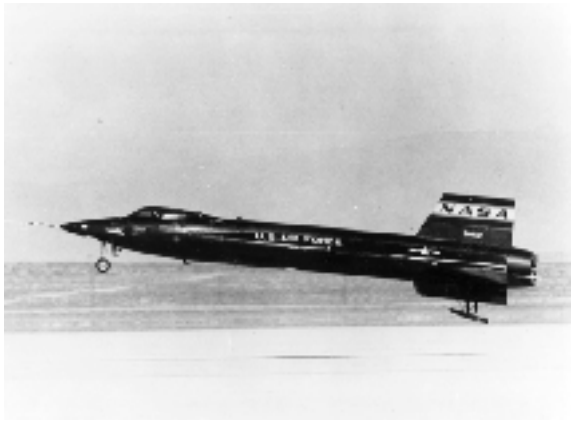
In 1990, the Hubble Space Telescope was launched into orbit around the Earth. Unfortunately, NASA scientists soon discovered that a microscopic spherical aberration in the polishing of the Hubble's mirror significantly limited the instrument's observing power. During a previously scheduled servicing mission in December, 1993, a team of astronauts performed a dramatic series of spacewalks to install a corrective optics package and other hardware. The hardware functioned like a contact lens and the elegant solution

worked perfectly to restore Hubble's capabilities. The servicing mission again demonstrated the unique ability of humans to work in space, enabled Hubble to make a number of important astronomical discoveries, and greatly restored public confidence in NASA.

Several months before this first HST servicing mission, however, NASA suffered another major disappointment when the Mars Observer spacecraft disappeared on August 21, 1993, just three days before it was to go into orbit around the red planet. In response, NASA began developing a series of "better, faster, cheaper" spacecraft to go to Mars.

Mars Global Surveyor was the first of these spacecraft; it was launched on November 7, 1996, and has been in a Martian orbit mapping Mars since 1998. Using some innovative technologies, the Mars Pathfinder spacecraft landed on Mars on July 4, 1997 and explored the surface of the planet with its miniature rover, Sojourner. The Mars Pathfinder mission was a scientific and popular success, with the world following along via the Internet.

Over the years, NASA has continued to look for life beyond our planet. In 1975, NASA launched the two Viking spacecraft to look for basic signs of life on Mars; the spacecraft arrived on Mars in 1976 but did not find any indications of past or present biological activity there. In 1996 a probe from the Galileo spacecraft that was examining Jupiter and its moon, Europa, revealed that Europa may contain ice or even liquid water, thought to be a key component in any life-sustaining environment. NASA also has used radio astronomy to scan the heavens for potential signals from extraterrestrial intelligent life. It continues to investigate whether any Martian meteorites contain microbiological organisms and in the late 1990s, organized an "Origins" program to search for life using powerful new telescopes and biological techniques.



4The "First A in NASA:" Aeronautics Research

Building on its roots in the National Advisory Committee for Aeronautics, NASA has continued to conduct many types of cutting-edge aeronautics research on aerodynamics, wind shear, and other important topics using wind tunnels, flight testing, and computer simulations. In the 1960s, NASA's highly successful X-15 program involved a rocket-powered airplane that flew above the atmosphere and then glided back to Earth unpowered. The X-15 pilots helped researchers gain much useful information about supersonic aeronautics and the program also provided data for development of the Space Shuttle. NASA also cooperated with the Air Force in the 1960s on the X-20 Dyna-Soar program, which was designed to fly into orbit. The Dyna-Soar was a precursor to later similar efforts such as the National Aerospace Plane, on which NASA and other Government agencies and private companies did advanced hypersonics research in such areas as structures, materials, propulsion, and aerodynamics.

NASA has also done significant research on flight maneuverability on high speed aircraft that is often

applicable to lower speed airplanes. NASA scientist Richard Whitcomb invented the "supercritical wing" that was specially shaped to delay and lessen the impact of shock waves on transonic military aircraft and had a significant impact on civil aircraft design. Beginning in 1972, the watershed F-8 digital-fly-by-wire (DFBW) program laid the groundwork for electronic DFBW flight in various later aircraft such as the F/A-18, the Boeing 777, and the Space Shuttle. More sophisticated DFBW systems were used on the X-29 and X-31 aircraft, which would have been uncontrollable otherwise.

From 1963 to 1975, NASA conducted a research program on "lifting bodies," aircraft without wings. This valuable research paved the way for the Shuttle to glide to a safe unpowered landing, as well as for the later X-33 project, and for a prototype for a future crew return vehicle from the International Space Station.

5**Applications Satellites**

NASA did pioneering work in space applications such as communications satellites in the 1960s. The Echo, Telstar, Relay, and Syncom satellites were built by NASA or by the private sector based on significant NASA advances.

In the 1970s, NASA's Landsat program literally changed the way we look at our planet Earth. The first three Landsat satellites, launched in 1972, 1975, and 1978, transmitted back to Earth complex data streams that could be converted into colored pictures. Landsat data has been used in a variety of practical commercial applications such as crop management and fault line detection, and to track many kinds of weather such as droughts, forest fires, and ice floes. NASA has been involved in a variety of other Earth science efforts such as the Earth Observation System of spacecraft and data processing that have yielded important scientific results in such areas as tropical deforestation, global warming, and climate change.

Conclusion

Since its inception in 1958, NASA has accomplished many great scientific and technological feats. NASA technology has been adapted for many non-aerospace uses by the private sector. At its 40th anniversary, NASA remains a leading force in scientific research and in stimulating public interest in aerospace exploration, as well as science and technology in general. Perhaps more importantly, our exploration of space has taught us to view the Earth, ourselves, and the universe in a new way. While the tremendous technical and scientific accomplishments of NASA demonstrate vividly that humans can achieve previously inconceivable feats, we also are humbled by the realization that Earth is just a tiny

"blue marble" in the cosmos.

For further reading:

Roger E. Bilstein, *Orders of Magnitude: A History of the NACA and NASA, 1915-1990*. (NASA SP-4406) Washington, D.C.: Government Printing Office, 1989.

John M. Logsdon, et. al., *Exploring the Unknown: Selected Documents in the History of the U.S. Civil Space Program* (NASA SP-4407). Washington, D.C.: Government Printing Office. *Volume 1: Organizing for Exploration* (1995). *Volume 2: External Relationships* (1996). *Volume 3: Using Space* (1998).

Captions

1. Edwin E. "Buzz" Aldrin, Jr. descends from the Apollo 11 Lunar Module to become the second human to walk on the Moon. Neil A. Armstrong, who took this photograph, was the commander of the mission and the first to walk on the lunar surface.
2. This rare view of two Space Shuttle orbiters simultaneously on launch pads at the Kennedy Space center was taken on September 5, 1990. The Orbiter *Columbia* is shown in the foreground on pad 39A, where it was being prepared for a launch (STS-35) the next morning. This launch ended up being delayed until December 1990. In the background, the orbiter *Discovery* sits on pad 39B in preparation for an October liftoff on STS-41.
3. The Sojourner rover and undeployed ramps aboard the Mars Pathfinder spacecraft are shown shortly after landing on the Martian surface on July 4, 1997. Partially deflated airbags are also clearly visible.
4. The rocket-powered X-15 aircraft set a number of altitude and speed records. Its flights during the 1960s also provided engineers and scientists with much useful data for the Space Shuttle program.
5. This dramatic view of Earth was taken by the crew of Apollo 17. The Apollo program put into perspective for many people just how small and fragile our planet is. Over its forty-year existence, NASA has been involved in many meteorological and Earth science missions that help us better understand our Earth.

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