

NASA and its achievements

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Manifest Pedagogy

NASA's missions are equally important as ISRO's missions for UPSC. Ex: Juno Mission in Mains 2018. One has to prepare for SpaceX missions too. Hence, missions of ISRO, NASA and SpaceX can be studied with comparison.

In news

NASA's 60 years

Placing it in syllabus

Science and Technology- developments.

Awareness in the fields of Space

Static dimensions

NASA's landmark launches in 60 years

Current dimensions

NASA's recent space probes

Content

NASA'S birth and its early achievements

NASA was first established in 1958 and over the last 60 years has literally expanded humanity's horizons.

The Cold War between the United States and former Soviet Union gave birth to the space race and an unprecedented program of scientific exploration. The Soviets sent the first person into

space on April 12, 1961. In response, US achieved landing a man on the Moon and returning him safely to earth. It took eight years for accomplishing **3 missions – Mercury, Gemini and Apollo.**

Project Mercury

Project Mercury, the **first U.S. program to put humans in space**, made 25 flights, six of which carried astronauts between 1961 and 1963. **The objectives of the program were: to orbit a human spacecraft around Earth, to investigate a person's ability to function in space, and to recover both the astronaut and spacecraft safely.** Mercury showed that humans could function for periods up to 34 hours of weightless flight.

The Gemini Program

The Gemini program primarily tested equipment and mission procedures and trained astronauts and ground crews for future Apollo missions to the Moon. The program's main goals were: **to test an astronaut's ability to fly long duration flights (14 days); to understand how a spacecraft could rendezvous and dock with another vehicle in Earth orbit; to perfect re-entry landing methods; and to further understand the effects of longer spaceflights on astronauts.** Gemini IV spacewalk, June 3, 1965. NASA astronaut **Ed White became the first American to walk in space.**

The Apollo Program

Project Apollo **landed the first humans on the lunar surface and returned them safely to Earth.** The Apollo program also developed technology to meet other national interests in space, conducted scientific exploration of the Moon, and developed humanity's capability to work in the lunar environment.

Skylab

In 1973, Skylab expeditions paved the way for the International Space Station. The four, windmill-like solar arrays were attached to the Apollo Telescope Mount. Observations of the Sun were one of this space lab program's primary achievements.

Apollo Soyuz Test Project

In the 1970s, U.S.-Soviet political tensions that had accelerated the space race began to thaw. Competition gave way to cooperation between the two nations with the Apollo-Soyuz Test Project.

On July 17, 1975 the Apollo-Soyuz Test Project docked together U.S. and Soviet spacecraft and paved the way toward international partnerships in space.

Space Shuttle Era

Over 30 years, NASA's space shuttle fleet—Columbia, Challenger, Discovery, Atlantis and Endeavour—flew 135 missions and carried 355 different people to space. **Humanity's first reusable spacecraft, the space shuttle carried people into orbit repeatedly;** launched, recovered and repaired satellites; conducted cutting-edge research; and built the largest structure in space, the International Space Station. Tragically, NASA lost two crews of seven in the 1986 Challenger accident and the 2003 Columbia accident.

Hubble Space Telescope

The Hubble Space Telescope is a space telescope that was launched into low Earth orbit in 1990 and remains in operation. Although not the first space telescope, Hubble is one of the largest and most versatile and is well known as both a vital research tool and a public relations boon for astronomy.

1991 saw the launch of the Compton Gamma Ray Observatory which joined Hubble as part of NASA's "Great Observatories" series of telescopes.

Space Station Era

The International Space Station is a model for global cooperation and scientific advancements that is enabling growth of private industry in low-Earth orbit and development of new technologies to advance human space exploration. Built between 1998 and 2011, the space station has housed humans continuously since Nov. 2, 2000. Because molecules and cells behave differently in space, **research in microgravity** helps advance scientific knowledge.

The space station is a U.S. National Laboratory, which the Center for the Advancement of Science in Space (CASIS) manages for research investigations that improve life on Earth. NASA has contracted with commercial companies SpaceX, Orbital ATK, and Sierra Nevada Corporation to deliver science investigations, cargo, and supplies to the crews living in space, and soon Boeing and SpaceX will transport astronauts to and from the station.

NASA wasn't just about human spaceflight

In addition to NASA's enormous contributions to manned spaceflight, they also developed many significant scientific probes throughout the years. These probes have explored the Moon, other planets and areas of our home solar system.

The 1970s was a massively important period for the development of these kinds of spacecraft.

Pioneer 10 and 11, which launched on the 2nd of March 1972 and April 5th, 1973 respectively, both travelled to Jupiter and Saturn. Their mission was to explore the composition of interplanetary space and the two planets.

In 1975, NASA launched the **two Viking spacecraft** to look for basic signs of life on the planet Mars. They arrived at Mars in 1976 and were, at that time, unable to detect any signs of life.

Other important probes include the highly successful **Voyager 1 and 2 craft**. These were launched on the 5th September 1977 and August 20th, 1977.

The Mars Global Explorer that launched on November 7th, 1996. This is still in orbit and has been mapping Mars since its arrival at the red planet in 1998.

1996 saw the launch of the **Galileo spacecraft** that was **developed to examine Jupiter and its moon Europa**. The probe revealed tentative information that the moon might contain ice or even liquid water – a key element for the potential presence of life.

The Mars Pathfinder mission successfully landed on the surface of Mars in July of 1997 and explored a limited area of the planet's surface using its rover, Sojourner. This mission received widespread public attention and was watched by many via the internet at the time. It was quickly followed by the Spirit and Opportunity rovers in January 2004.

Recent space missions of NASA

1. **InSight Mars Lander:** InSight (Interior Exploration using Seismic Investigations, Geodesy and Heat Transport) is a NASA Discovery Program mission that will place a single geophysical lander on Mars to study its deep interior. It is a terrestrial planet explorer that will address one of the most fundamental issues of planetary and solar system science – understanding the processes that shaped the rocky planets of the inner solar system (including Earth) more than four billion years ago.
2. **Low-Boom Flight Demonstration:** NASA's aeronautical innovators are leading a government-industry team to

collect data that could make supersonic flight over land possible, dramatically reducing travel time in the United States or anywhere in the world. The Low-boom Flight Demonstration mission has two goals:

- To design and build a piloted, large-scale supersonic X-plane with technology that reduces the loudness of a sonic boom to that of a gentle thump.
- To fly the X-plane over select U.S. communities to gather data on human responses to the low-boom flights and deliver that data set to U.S. and international regulators.

3. **James Webb Telescope:** The James Webb Space Telescope (sometimes called JWST or Webb) will be a large infrared telescope with a 6.5-meter primary mirror. The telescope will be launched on an Ariane-5 rocket from French Guiana in 2021.

The Webb telescope will be the premier observatory of the next decade, serving thousands of astronomers worldwide. It will study every phase in the history of our Universe, ranging from the first luminous glows after the Big Bang, to the formation of solar systems capable of supporting life on planets like Earth, to the evolution of our own Solar System.

Webb is an international collaboration between NASA, ESA (the European Space Agency), and the Canadian Space Agency (CSA). NASA's Goddard Space Flight Center in Greenbelt, Maryland, is managing the development effort.

4. **New Horizons:** The First Mission to the Pluto System and the Kuiper Belt. The New Horizons mission is helping us understand worlds at the edge of our solar system by making the first reconnaissance of the dwarf planet Pluto and by venturing deeper into the distant, mysterious Kuiper Belt – a relic of solar system formation. OSIRIS-REx – The Origins, Spectral Interpretation, Resource Identification, Security-

Regolith Explorer (OSIRIS-REx) spacecraft will travel to a near-Earth asteroid, called Bennu (formerly 1999 RQ36), and bring at least a 2.1-ounce sample back to Earth for study. The mission will help scientists investigate how planets formed and how life began, as well as improve our understanding of asteroids that could impact Earth. OSIRIS-REx was scheduled to launch Sept. 8, 2016. As planned, the spacecraft reached its asteroid target in 2018 and return a sample to Earth in 2023.

5. **Parker Solar Probe: Humanity's First Visit to a Star:** NASA's historic Parker Solar Probe mission will revolutionize our understanding of the Sun, where changing conditions can propagate out into the solar system, affecting Earth and other worlds. Parker Solar Probe will travel through the Sun's atmosphere, closer to the surface than any spacecraft before it, facing brutal heat and radiation conditions – and ultimately providing humanity with the closest-ever observations of a star.

Test yourself: Mould your thoughts

Has NASA established itself as the most successful organization in Space Research? Substantiate.