

Giant Leaps Ahead

The Indian Space Research Organisation (ISRO) lost contact with its lunar lander and rover but experts say the Chandrayaan-2 is "95% successful" as the mission's space probe has been put in its orbit around the moon. It can send back valuable data that will help ISRO's future missions. Here's a look at the missions the space agency has lined up in the coming years

Staying up there Space Station, around 2025

Within a decade, India wants to have a space station up there. The station will help astronauts stay longer in space to conduct experiments. India wants to launch the space station by 2025 around the time the International Space Station is decommissioned around 2028. China is also planning a large space station in the lower Earth orbit.

Reaching for the Sun Aditya-1, 2019-2020

Aditya-1 is India's first dedicated scientific mission to study the Sun. A 400 kg class space telescope will be inserted into a halo orbit 1.5 million km from the Earth to study the three layers of the sun – photosphere, chromosphere and corona, the outer atmosphere of the star in our solar system. The mission is aimed at developing insights on the weather in space and to understand why the outer atmosphere of the Sun is 200 times hotter than the solar disc. This pathbreaking satellite is expected to be launched by next year.

Origins of the universe Astrosat-2, 2025

India plans to send a second observatory in space. It will be a follow-up mission of Astrosat-1 – India's first dedicated multi-wavelength space telescope – aimed at looking at the origin of the universe and discover new planets. ISRO is finalising a plan for the mission.

Befriending a solar sibling Mission Venus, 2023

ISRO is planning a mission to the Earth's "twin sister" – Venus. Both the Earth and Venus share similarities in size, mass, density, bulk composition and gravity. The space agency will fly a spacecraft around 400 km over Venus to conduct research and understand its formation, its atmosphere and its interaction with the solar wind. The mission is expected by 2023.

Drilling with Japan Moon Mission, 2023

ISRO and Japan Aerospace Exploration Agency will send a joint mission to the Moon's south pole. The mission includes landing a rover that will drill the Moon's surface to conduct scientific experiments. The primary focus will be to explore the existence of water. Japan is likely to provide the rocket and a lunar rover, while India will contribute with a lander.

Gazing at celestial bodies X-Ray Polarimeter Satellite, 2021

This satellite will measure the degree and direction of X-ray photons from at least 50 potential celestial sources. The satellite will have instruments built by Raman Research Institute. These will collect data to help understand composition, temperature and density of celestial instruments.

Manned space mission Gaganyaan, 2021

Three Indian astronauts are expected to fly to space in the country's first human space flight mission in 2021, nearly four decades after Rakesh Sharma made his journey on a Russian rocket in 1984. This time, the Russians are helping India make the space suits and train its astronauts to live in a space capsule for the week-long mission. A Geosynchronous Satellite Launch Vehicle Mk-3, an upgraded version of the rocket that sent the Chandrayaan-2 mission to the Moon, will fly the astronauts – fighter pilots selected from the Indian Air Force – to space.

Back to Mars Mangalyaan-2, 2024

ISRO plans to return to Mars through this mission. The success of Mangalyaan has prompted the space agency to send a second probe by 2024, which will do deeper studies of the Earth's neighbour and understand the evolution of the red planet better.

Facts about Chandrayaan-2

₹603 cr
Mission cost of Chandrayaan-2, India's second mission to the Moon

₹375 cr
Cost of the launcher, GSLV Mk-3, India's heaviest rocket

120
No of Indian companies who contributed to making the spacecraft

1500 No of Indian companies who contributed to putting together GSLV Mk-3

15 No of academic institutions involved in Chandrayaan-2 project

3.8 tonnes
Weight of integrated module with orbiter, lander and rover, including 14 instruments

BE AWARE

HISTORY OF THE STRAW

The plastic straw is a product that is slowly being banned across the world. A report on the history of straws and why we can do without them...

Not long ago, people lived – and drank – without the 'drinking tubes' we use today. How? They simply used their mouths! Then how did plastic straws take over the world? While plastic straws are a recent invention, humans have been using hollow, cylindrical tubes to suck in liquids for centuries, Nat-Geo's Sarah Gibbens wrote in 2018.

HISTORY OF DRINKING TUBES
Ancient Sumerians, who made beverages 5,000 years ago, used large jars for fermentation. They submerged long, thin tubes made from precious metals into the jars to extract the liquid that got collected at the bottom. In 1888, a man named Marvin Stone filed a patent for a drinking straw. According to the Smithsonian Institute, Stone was drinking a cool mint julep on a hot summer day in 1880 and the rye grass straw used for drinking in those days began to disintegrate.

THE FIRST PAPER STRAWS
Stone was a paper manufacturer. He wrapped strips

of paper around a pencil, glued them together, removed the pencil and made a straw. He patented his design. By 1890, his factory,

Stone Industrial, was mass producing them.

In the 1930s, inventor Joseph Friedman happened to watch his young daughter struggle to drink with

the straight paper straw. He inserted a screw, pressed it and when he removed the screw, the swirls made by it allowed the straw to bend. Friedman patented his invention. Hospitals at once bought these bendable straws, since they made it easy

THE EXPLOSION OF PLASTIC STRAWS

for patients to drink while lying in bed. The paper straw soon became popular and found its way into sodas and milkshakes across America.

THE ENVIRONMENTAL CRISIS

Now, the world is struggling to recover from this plastic deluge. One study published earlier this year estimated that as many as 8.3 billion plastic straws litter beaches

ECO-FRIENDLY ALTERNATIVES

Bamboo straws: These are lightweight, reusable, and don't have any chemicals. **Paper straws:** These are durable enough to not break down and are fully compostable. **Steel straws:** Are durable, easy to clean, and can be carried around in a bag without worrying about stains. **Glass straws:** Are easy to use as you don't have to tip your glass.

From the 1960s to the 1980s plastic straws were produced in massive numbers. Everyone used them. Plastics Europe, one of the world's largest plastic producers, reports that 1.5 million tons of plastic were produced in 1950

across the world. People use them to drink and simply throw them on the waterfront. People have begun to ask themselves and others: **Can't we live without drinking straws?** And answer: Yes, we can easily do without straws. It does not ask for a big change in habit.

RULES & BANS

Some companies have begun to manufacture metal and glass straws that environmentally-conscious consumers can buy for personal use. The companies that made plastic straws in huge numbers because the "public wanted them" are now thinking of making alternatives to plastic straws. Giving up plastic straws makes it easier for people to give up other types of plastic and to ultimately think about the impact plastic has on the environment, especially the oceans.

