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{ 1 YEAR OF CHANDRAYAAN-3 } AMBITIOUS VISION LAID OUT

On first Space Day, Isro sets the vision for India's cosmic odyssey

President Droupadi Murmu during the event on Friday. PTI

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NEW DELHI: A lunar rock retrieval mission in 2027, a "Bharatiya" low-earth orbit by 2035 and the first Indian on the moon by 2040 — India's scientists laid out a pragmatic but ambitious vision of the space programme, outlining a timeline that builds on the historic success of the Chandrayaan-3 that reached its destination close to the south pole of the moon exactly one year to the day on Friday.

Unveiled by Indian Space Research Organisation (Isro) chairman S Somanath and minister of science and technology Jitendra Singh on a day the country marked its National Space Day, the roadmap is a far-sighted but resolute mission timetable to cement India's position as a burgeoning space power.

"It was a glorious moment for all the Indians when ISRO's Chandrayaan landed on the moon," said President Droupadi Murmu, who was present at the event. →P11

1st Space Day marks Chandrayaan-3 success

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The Indian Space Research Organisation (Isro) on Friday celebrated the first-ever National Space Day, marking the anniversary of the Chandrayaan-3 mission that made India the first country to land a probe on the lunar south pole, in a grand event where the nation laid out its ambitious road map for space exploration for the next two decades, which included plans for more lunar mission, an indigenous space station, a new rocket, as well as placing a man on the moon by 2040.

At a ceremony in New Delhi's Bharat Mandapam – attended by President Droupadi Murmu, Isro chairman S Somanath and minister of science and technology Jitendra Singh – the country's space agency also announced ambitious plan aimed at removing space debris from the Earth's orbit, a concern echoed by many, including President Droupadi Mumu.

Speaking at the event, the President expressed about the increasing effort and appreciated Isro's efforts to remove them. "Space debris can cause problems for space missions," she said. "I am also happy to note that India is moving forward to make all its space missions debris-free by 2030."

Murmu also underscored Isro's achievements despite its humble beginnings. "It was a glorious moment for all the Indians when Chandrayaan-3 landed on the moon. I saw the live telecast of that moment, I was so proud that day like other Indians... Along with the strides in the space sector, Isro also plays a vital role in the social and economic development of the country. I am confident that our country will make continuous progress in space science and we will continue to set new standards of excellence," she said.

The projects that Isro laid out for the next 16 years include expanding the Chandrayaan mission – the project that has clearly been the standout among all of Isro's achievements on the global stage. Plans for two more lunar missions (also to the south pole) have been laid out.

The first is Chandrayaan-4, which aims to bring rock samples from the lunar surface back to Earth after a soft landing. The mission, slated for launch in 2027, will expand on the technology developed in Chandrayaan-3 by adding elements like lunar docking, precision landing, sample collection and a safe journey back to Earth.

Chandrayaan-5, which will be in collaboration with Japan's space agency JAXA, will feature an Indian lander and a 350kg Japanese rover designed to explore these challenging lunar areas.

"Last year we successfully launched the Chandrayaan-3 mission. We never imagined the impact that is going to create out of this accomplishment... We were asked to prepare a long-term roadmap, a vision for space 2047 in the Amrit Kaal. The Prime Minister was delighted with our presentation on future space missions," Somanath said.

Perhaps the most significant project ahead, however, is to establish an indigenous space station dubbed the Bharatiya Antariksha Station (BAS) which will orbit 400km above the Earth's surface. The 52-tonne behemoth space station will serve as a research platform for Indian astronauts and scientists to conduct experiments in microgravity, astronomy and Earth observation, and will allow astronauts to stay in orbit for 15-20 days. The modular station will be assembled in space after getting launched in several stages starting 2028. The target to finish the entire project is for 2035, according to Isro.

Currently, there are only two operational space stations – the International Space Station (ISS), developed in cooperation by United States, Russia, Japan, Europe and Canada; and China's Tiangong Space Station (TSS).

The station, Jitendra Singh said: "By 2035, there would be a Indian space station if everything goes well, as was announced by Prime Minister Narendra Modi... India has proved how space technology can be used in health, agriculture, climate, disaster management, smart cities, highway construction, or security of railway lines."

The third project, development of the Next Generation Launch Vehicle, or NGLV, dubbed "Soorya" – a three-stage partially reusable rocket, being developed by Isro – will form the backbone of India's future missions. Soorya, Isro has said, will be capable of carrying 10 tonnes of payload in geostationary orbit, and a payload of 30 tonnes in low-Earth orbit. It is expected to give a significant boost to India's future missions, which will require heavier payloads than the current generations of rockets.

The fourth major project on Isro's timeline is the expansion of the Gaganyaan mission (slated to kick off next year) to place the first Indian astronaut on the moon. The target for this project is 2040, according to Isro.

The newest addition to the agenda was the announcement of India's plan to clear space. "We have set up one of the latest technologies in Bengaluru to detect and clear debris, and very soon, we will be also retrieving back the decommissioned satellites. The satellites that have accomplished their missions, will be returned to the Earth, and the world will learn this art from India," said Jitendra Singh.

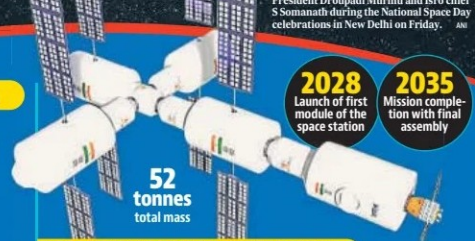
{ JITENDRA SINGH } SCIENCE AND TECH MIN

We have set up one of the latest technologies in Bengaluru to detect and clear (space) debris... we will be also retrieving back the decommissioned satellites.

India's Space Dreams

As part of the first National Space Day celebrations, Isro on Friday shed light on India's ambitious vision for space exploration. A look at what is in store in the coming years

President Droupadi Murmu and Isro chief S Somanath during the National Space Day celebrations in New Delhi on Friday. ANI



NEW ROCKET: SOORYA

Isro is developing a heavy-lift Next Generation Launch Vehicle (NGLV) for future space missions. Called Soorya, the NGLV will be capable of carrying heavy payloads, essential for manned missions such as Gaganyaan. It is envisioned as a robust and cost-effective launcher, capable of carrying heavy payloads

PAYLOAD

10 tonnes for Geostationary Transfer Orbit (Up to 35,786km)

30 tonnes for Low Earth Orbit (Up to 2,000km)

52 tonnes total mass

2028 Launch of first module of the space station

2035 Mission completion with final assembly

INDIA'S OWN SPACE STATION

India is setting up its own space station, Bharatiya Antariksh Station, which will be completed by 2035. The modular and robotically built space station will act as a research platform for scientists to conduct experiments in microgravity, astronomy, and Earth observation.

MISSION PARAMETERS

Dimensions: 27m length by 20m width
Crew size: 3-4 astronauts
Orbit: 400km

MAN ON THE MOON

With its maiden manned space mission in 2025 – Gaganyaan – India will launch a crew of three to a low earth orbit of 400km. The three-day mission will be carried out by the heavy-lift LVM-3 rocket

◀ Group Captain Shubhanshu Shukla

4 astronauts have been selected as part of Gaganyaan. This includes Group Captain Shubhanshu Shukla, who has been selected to be part of the Axiom-4 mission to fly to the International Space Station (ISS) later this year

2040 Future manned Isro missions will culminate in the organisation's ambitious plan to put an Indian on the lunar surface

CHANDRAYAAN-4

Isro will return to the moon with Chandrayaan-4. The latest mission in the lunar programme will see the introduction of new technologies such as:

- Docking on lunar orbit
- Precise landing on lunar surface
- Sample collection from surface of moon
- Safe return and re-entry to Earth

The lunar mission will be launched in two phases, using both LVM-3 and PSLV rockets

2027 Launch target of mission