

Lunar Missions

December 11, 2020

Space is the new platform for competition among global powers. Different space agencies are in race to claim supremacy in space explorations. Recent lunar probe launched by Chinese Space agency is one such milestone. One has to study the different space missions from both prelims and mains point of view.

In news: The Chang'e 5 lander of Chinese lunar mission set down on the lunar surface on December 1st, 2020.

Placing it in syllabus: S&T – space

Dimensions

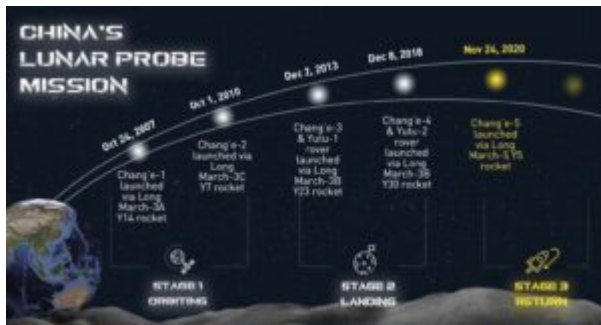
1. Indian missions: Chandrayaan 1 and 2
2. Chinese missions
3. NASA and other Space Agencies' recent missions

Content:

Chinese lunar missions:

Chang'e 1 was launched in October 2007 on a 16-month mission to map the moon. The spacecraft scrutinized the lunar surface, analyzed the composition and depth of the materials there, and also looked at the surrounding environment. The mission fulfilled all of its objectives and controllers deliberately crashed the spacecraft onto the moon on March 2, 2009.

Chang'e 2, the second Chinese lunar mission was launched on Oct. 1, 2010. It returned a high-resolution map of the entire moon's surface and took close-up images of the Bay of Rainbows, where mission planners at the time suggested they might put down the country's first lander. Chang'e-2 left the moon's neighborhood in April 2012 to fly by the asteroid 4179 Toutatis, which it reached in December 2012.



Chang'e 3 was the third Chinese lunar mission and the **first to land on the surface**. It made a safe landing on the moon on Dec. 14, 2013, at Mare Imbrium, on a site later called Guang Han Gong (Moon Palace). Chang'e 3 took images of the night sky from its perch on the surface, using an optical telescope, and it sent back imagery of the surrounding area as well as of its rover, Yutu. It also discovered a new kind of basaltic rock in 2015.

In October 2014, China launched its **first round-trip moon journey, dubbed Chang'e 5 Test 1** mission. The mission was supposed to test the performance of spacecraft items such as its heat shield, guidance, navigation and control. Once analyzed, this information was expected to be included in future lunar-landing missions. The Chang'e 5 Test 1 mission landed safely in Mongolia on Oct. 31, 2014.

Chang'e 4 descended into history on January 2, 2019, when it made a safe touchdown on the far side of the moon. The spacecraft landed in Von Kármán Crater, taking pictures of its gentle fall using a descent camera. The lander and its rover will work together to learn more about the moon's radiation environment, surface and subsurface. They also will do radio astronomy, as well as a small biosphere experiment.

Chang'e -5 was launched in November, 2020. On 1st December, the **Chang'e 5 ascent vehicle blasted off from the moon surface with the collected samples**. The Chang'e 5 sample return mission is expected to last just 23 days, ending with a landing in Inner Mongolia around Dec. 17.

Indian missions: Chandrayaan 1 and 2:

- Chandrayaan-1 was India's first mission to the moon, which was launched by Polar Satellite Launch Vehicle, PSLV-C11 on October 22, 2008, from Sriharikota.
- Chandrayaan-1 made more than 3,400 orbits around the moon.
- It was operational for 312 days till August 29, 2009.
- The lift-off mass of Chandrayaan-1 was 1380 kg, according to ISRO.

Chandrayaan-1 key achievements:

- The Chandrayaan-1 discovered traces of water on the moon-a path-breaking discovery in the world of space science.
- Chandrayaan-1 also discovered water ice in the North polar region of the Moon.
- It also detected Magnesium, Aluminium and Silicon on the lunar surface.
- Global imaging of the moon is another achievement of this mission.

Chandrayaan-2:

- Chandrayaan-2 is India's first lander mission.
- It consists of an Orbiter, Lander and Rover, all equipped with scientific instruments to study the moon.
- The Lander and Rover modules will separate from the orbiter and make a soft-landing on the moon's surface (either on September 5 or 6, 2019).
- **Orbiter** – The Orbiter is a 2379-kg spacecraft with 7 instruments on board. The Orbiter will observe lunar surface and relay communication between Earth and the Lander.
- **Lander** – ISRO has named the Lander module as **Vikram**. It carried three instruments that will mainly study the moon's atmosphere. One of the instruments will also look

out for seismic activity on the lunar surface.

- **Rover** – The Rover is a 6-wheeled, Artificial Intelligence-powered and solar-powered vehicle named **Pragyan**, meaning wisdom. Once on the moon, the rover will detach itself from the lander. Its primary objective is to study the composition of the moon's surface near the landing site and determine the abundance of different elements on the moon's surface.
- Chandrayaan-2 was planned to make a landing at a site where no earlier mission had gone, i.e near the South pole of the moon.
- It is a completely unexplored territory and holds the possibility of the presence of water.

However, a part of the mission failed as the Vikram lander crash-landed on the lunar surface.

Chandrayaan-3 is likely to be launched in early 2021. It will be a mission repeat of Chandrayaan -2 and will include a Lander and Rover similar to that of Chandrayaan-2, but will not have an orbiter.

Other future lunar missions:

NASA missions:

- NASA is committed to landing American astronauts, including the first woman and the next man, on the Moon by 2024 through the agency's **Artemis lunar exploration program**.
- It is working toward launching Artemis I, an uncrewed flight to test the **Space Launch System (SLS)** and Orion spacecraft together, followed by the Artemis II mission, the first SLS and Orion test flight with crew.
- Astronauts will dock Orion at the Gateway and transfer to a human landing system for expeditions to the surface of the Moon.
- They will return to the orbital outpost to board Orion

again before returning safely to Earth.

- Recently NASA has selected 18 astronauts from its corps to form the Artemis team who come from a diverse range of backgrounds, expertise, and experience.

China space agency missions:

- Chang'e 6, a backup mission for this year's sample-return launch, is scheduled to head to the moon in 2023 or 2024.
- Chang'e 7 is planned to launch around 2024 with the dual aims of landing on the south pole of the moon and closely studying the region from orbit.

Together, the missions will form part of a planned **International Lunar Research Station**, a major project concept that China has proposed to other nations.

Other missions:

- European space agency (ESA) is working with the Canadian and Japanese space agencies to prepare the **Heracles robotic mission to the Moon**.
- Using the space Gateway as a halfway point, a robotic rover will scout the terrain in preparation for the future arrival of astronauts, and deliver lunar samples to Earth.

Mould your thought:

1. Brief about the lunar explorations undertaken by different space agencies around the world.

Approach to the answer:

- Write about recent Chang'e 5 exploration
- Write about India's lunar programs
- Highlight the lunar missions of NASA, Chinese and other space agencies
- Conclusion