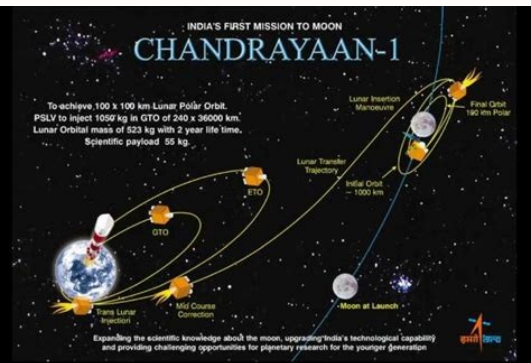


I'm not robot!



Chandrayaan-2 was India's second mission to the moon, and was a follow-up mission from the Chandrayaan-1 (opens in new tab) mission that assisted in confirming the presence of water/hydroxyl on the moon in 2009. Chandrayaan-2 launched from the Satish Dhawan Space Center in Sriharikota, India, aboard a Geosynchronous Satellite Launch Vehicle (GSLV) rocket on July 22, 2019 and reached lunar orbit on Aug. 19. During the Sept. 6 (Sept. 7 IST) moon landing attempt, ISRO officials lost contact with the Vikram moon lander (opens in new tab) as the probe was just 1.3 miles (2.1 kilometers) above the lunar surface. Officials have been unable to reach the lander since losing contact on Sept. 6. Despite the apparent crash-landing of the lander, ISRO has confirmed that all the instruments on board the orbiter are working well. The current orbiter carries eight different instruments (opens in new tab) – and Indian scientists are already poring over some of the mission's very first science data (opens in new tab). On Oct. 4, ISRO released photos the orbiter's High Resolution Camera took on Sept. 5 of a crater called Boguslawsky E, located near the lunar south pole.Related: India's Space Program: Complete Coverage (opens in new tab)Development and scienceInitially, ISRO planned to partner with Russia to perform Chandrayaan-2 (opens in new tab). The two agencies signed an agreement in 2007 to launch the orbiter and lander in 2013. Russia later pulled out of the agreement, however, according to a news report from The Hindu (opens in new tab). The Russian lander's construction was delayed after the December 2011 failure of Roscosmos' Phobos-Grunt mission to the Martian moon of Phobos, the report stated. Russia subsequently pulled out of Chandrayaan-2 altogether, citing financial issues. Some reports stated that NASA and the European Space Agency were interested in participating, but ISRO proceeded with the mission on its own.The goal of the Chandrayaan-2 orbiter was to circle the moon and provide information about its surface, ISRO stated previously. "The payloads will collect scientific information on lunar topography, mineralogy, elemental abundance, lunar exosphere and signatures of hydroxyl and water-ice," ISRO said on its website (opens in new tab). The mission was also supposed to send a small, 20-kilogram (44 lbs.), six-wheeled rover to the surface that could move semi-autonomously, examining the lunar regolith's composition.This is the list of instruments that were on the orbiter, according to the Planetary Society (opens in new tab):Image 1 of 8The Indian Space Research Organisation's Chandrayaan-2 spacecraft (bottom) and its Vikram lander (top) are prepared to be encapsulated by a payload fairing before being loaded on their Geosynchronous Satellite Launch Vehicle Mark III-M1 rocket for a July 2019 launch. (Image credit: India Space Research Organisation)Image 1 of 8India's Vikram moon lander (left) is moved into launch position on the Chandrayaan-2 lunar orbiter ahead of a planned July 2019 launch. The mission will send an orbiter, lander and rover to the moon. (Image credit: India Space Research Organisation)Image 1 of 8The target landing site for India's Chandrayaan-2 mission to explore the lunar south pole. (Image credit: Indian Space Research Organisation)Image 1 of 8This Indian Space Research Organisation diagram shows the flight profile of the Chandrayaan-2 spacecraft as they fly to the moon between July and September 2019. (Image credit: Indian Space Research Organisation)Image 1 of 8The India Space Research Organisation's Chandrayaan-2 moon orbiter, lander and rover launch into space atop a Geosynchronous Satellite Launch Vehicle Mark III-M1 rocket from the Satish Dhawan Space Centre on Sriharikota Island on July 22, 2019. (Image credit: India Space Research Organisation)Image 1 of 8India plans to launch its second moon mission, Chandrayaan-2, in July 2019. (Image credit: ISRO via Twitter)Image 1 of 8An artist's illustration of India's Chandrayaan-2 lander, Vikram, and its Pragyan rover on the surface of the moon near the lunar south pole. (Image credit: Indian Space Research Organisation)Image 1 of 8(Image credit: India Space Research Organisation)Image 1 of 8Terrain Mapping Camera 2 (TMC-2), which will map the lunar surface in three dimensions using two on-board cameras. A predecessor instrument called TMC flew on Chandrayaan-1.Collimated Large Array Soft X-ray Spectrometer (CLASS), which will map the abundance of minerals on the surface. A predecessor instrument called CIXS (sometimes written as CIXS) flew on Chandrayaan-1.Solar X-ray Monitor (XSM), which looks at emissions of solar X-rays.Chandra's Atmospheric Composition Explorer (ChACE-2), which is a neutral mass spectrometer. A predecessor instrument called CHACE flew on Chandrayaan-1's Moon Impact Probe.Synthetic Aperture Radar (SAR), which will map the surface in radio waves. Some of its design is based on Chandrayaan-1's MiniSAR.Imaging Infra-Red Spectrometer (IIRS), which will measure the abundance of water/hydroxyl on the surface.Orbiter High Resolution Camera (OHRG) to examine the surface, particularly the landing site of the lander and rover.The lander's instruments included:Instrument for Lunar Seismic Activity (ILSA), to look for moonquakes.Chandra's Surface Thermophysical Experiment (ChaSTE), to examine the surface's thermal properties.Radio Anatomy of Moon Bound Hypersensitive Ionosphere and Atmosphere (RAMBHA-Langmuir Probe), to look at plasma density on the surface.The rover also carried two science instruments designed to look at the composition of the moon's surface: the Laser-Induced Breakdown Spectroscope (LIBS) and the Alpha Particle X-Ray Spectrometer (APXS).Landing near the poleChandrayaan-2's lander and rover were targeted for a location about 600 km (375 miles) from the south pole, which would have been the first time any mission touched down so far from the equator, according to a January 2018 article in Science magazine. ISRO planned to use the experience for more challenging missions in the future, such as touching down on an asteroid or Mars, or sending a spacecraft to Venus, IRSO chair Kailasavadivoo Sivan said in the article.The lander was expected to last about one lunar day, or 14 Earth-days, and it was unclear if it would revive after falling into the darkness of a lunar night and ISRO will have to wait until another mission to find out. On Sept. 6, 2019 at 4:48 p.m. EDT (2048 GMT) K. Sivan, the director of ISRO, confirmed that communication had been lost with the Chandrayaan-2 Vikram lander. "Vikram lander descent was as planned and normal performance was observed up to an altitude of 2.1 kilometers [1.3 miles]," Sivan said in an announcement at mission control. "Subsequently the communications from the lander to the ground station was lost. The data is being analyzed."Video: The Moment India Lost Contact with the Vikram Moon Lander (opens in new tab)Related: India's Chandrayaan-2 Mission to the Moon in Photos (opens in new tab)Sivan did not specify when ISRO would be able to provide updates about the fate of the Vikram lander. According to data (opens in new tab) shown during the descent maneuver, the lowest altitude reported back to Earth was 0.2 miles (0.33 km) above the lunar surface.A plot comparing live data received to the mission's trajectory suggested that Vikram was about 0.6 miles (1 km) horizontally off-track from the targeted landing site when communications stopped.Prime Minister Narendra Modi had arrived onsite at the ISRO Telemetry, Tracking and Command Network (ISTRAC) in Bengaluru, India, about half an hour before scheduled touchdown of Vikram and was there to witness the communication loss."India is proud of our scientists!" Modi wrote in a Twitter update (opens in new tab) shortly after learning of the anomaly. "They've given their best and have always made India proud. These are moments to be courageous, and courageous we will be!" "We remain hopeful and will continue working hard on our space programme," he added.Additional resources:This article was updated on Oct. 8, 2019 by Space.com Reference Editor Kimberly Hickok. Chandrayaan-2 mission is a highly complex mission, which represents a significant technological leap compared to the previous missions of ISRO. It comprised an Orbiter, Lander and Rover to explore the unexplored South Pole of the Moon. The mission is designed to expand the lunar scientific knowledge through detailed study of topography, seismography, mineral identification and distribution, surface chemical composition, thermo-physical characteristics of top soil and composition of the tenuous lunar atmosphere, leading to a new understanding of the origin and evolution of the Moon. After the injection of Chandrayaan-2, a series of maneuvers were carried out to raise its orbit and on August 14, 2019, following Trans Lunar Insertion (TLI) maneuver, the spacecraft escaped from orbiting the earth and followed a path that took it to the vicinity of the Moon. On August 20, 2019, Chandrayaan-2 was successfully inserted into lunar orbit. While orbiting the moon in a 100 km lunar polar orbit, on September 02, 2019, Vikram Lander was separated from the Orbiter in preparation for landing. Subsequently, two de-orbit maneuvers were performed on Vikram Lander so as to change its orbit and begin circling the moon in a 100 km x 35 km orbit. Vikram Lander descent was as planned and normal performance was observed upto an altitude of 2.1 km. Subsequently communication from lander to the ground stations was lost. The Orbiter placed in its intended orbit around the Moon will enrich our understanding of the moon's evolution and mapping of the minerals and water molecules in Polar regions, using its eight state-of-the-art scientific instruments. The Orbiter camera is the highest resolution camera (0.3 m) in any lunar mission so far and will provide high resolution images which will be immensely useful to the global scientific community. The precise launch and mission management has ensured a long life of almost seven years instead of the planned one year. Science experiments Chandrayaan-2 has several science payloads to expand the lunar scientific knowledge through detailed study of topography, seismography, mineral identification and distribution, surface chemical composition, thermo-physical characteristics of top soil and composition of the tenuous lunar atmosphere, leading to a new understanding of the origin and evolution of the Moon. The Orbiter payloads will conduct remote-sensing observations from a 100 km orbit while the Lander and Rover payloads will perform in-situ measurements near the landing site. For understanding of the Lunar composition, it is planned to identify the elements and mapping its distribution on the lunar surface both at global and In-situ level. In addition detailed 3 dimensional mapping of the lunar regolith will be done. Measurements on the near surface plasma environment and electron density in the Lunar ionosphere will be studied. Thermo-physical property of the lunar surface and seismic activities will also be measured. Water molecule distribution will be studied using infra red spectroscopy, synthetic aperture radiometry & polarimetry as well as mass spectroscopy techniques.



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