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## Chandrayaan releases lander for touchdown

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**NEW DELHI:** India moved a step closer to making a successful landing on the Moon on Thursday when Chandrayaan-3's lander separated from the propulsion module and entered the penultimate phase of its lunar journey, the Indian Space Research Organisation (ISRO) announced.

The Vikram lander includes a small lunar rover, Pragyan, which will emerge from it if the touchdown goes according to plan on August 23, making India among a handful of nations to have explored the dusty, speckled surface of the Moon.

"Chandrayaan-3 Mission: 'Thanks for the ride, mate!' said the Lander Module (LM). LM is successfully separated from the propulsion module (PM). LM is set to descend to a slightly lower orbit upon a de-boosting planned for tomorrow (Friday) around 1800 hrs, IST. Now, India has three around Moon." Isro said in a post from its official X (formerly Twitter) handle on Thursday.

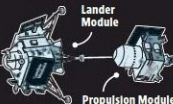
Expressing confidence in the mission, Union minister of science and technology and space, Jitendra Singh, said Isro will attempt the landing between 5:30pm and 6pm on August 23.

"Even though the US and the then USSR, started their space journey long before us — and America also landed a human being on the surface of moon in 1969 — it was nevertheless our Chandrayaan that brought home pictures of water on the surface of moon and started the entire

### Lander a step away from moonshot moment

#### What happened on Thursday?

The lander module of the India's third lunar space craft, the Chandrayaan-3, successfully entered the penultimate phase of its journey to the moon and separated from the propulsion module. The Vikram lander will now begin its descent towards the surface of the Moon, while the propulsion device will continue its journey along the lunar orbit for at least six months.



#### Propulsion module begins its own journey

The propulsion module will study the Earth's atmosphere to find signatures that can then be compared with that of other planets — when observed from afar — to judge their suitability to life.

### AUGUST 23: SCHEDULED LANDING

A small lunar rover, Pragyan, will emerge from Vikram if the touchdown goes according to plan

world including the Americans. We always heard imaginary fiction and asked ourselves whether there were any people living on the moon, but for the first time Chandrayaan's findings prompted the world community to find scientific answers to these mysteries," Singh said. To be sure, the finding the minister referred to was not of visible water but of detections by a Nasa mineralogy spectrometer carried on the Chandrayaan-1 as it orbited the moon. The spectrometer confirmed the presence of water molecules locked in minerals seen on the lunar

surface. The space agency explained with the lander module now on its way to descent, the propulsion module will continue its journey along the lunar orbit for at least six months. The propulsion module has Spectro-polarimetry of Habitable Planet Earth (SHAPE) payload to study the spectral and polarimetric measurements of Earth from the lunar orbit. In simpler terms, the propulsion module will study the Earth's atmosphere to find signatures that can then be compared with that of other planets

#### Till touchdown....

The next step will involve slowing down, that will occur on August 18 to carefully control its approach towards the lunar surface.

Scientists will then proceed go ahead with a series of complex braking processes to reduce the velocity of the Vikram lander to achieve a soft landing

The space agency will also be working to change the spacecraft's horizontal orientation into a vertical one, before the lander attempts to achieve a soft landing.

— when observed from afar — to judge their suitability for life.

For the lander, the next step will involve slowing down — a deceleration manoeuvre the agency also referred to as de-boosting — that will occur on August 18 to carefully control its approach towards the lunar surface.

A senior official of the department of space said that this step in the mission was the final leg, leading up to the craft's landing.

"Till this point, we have achieved all stages in the previous moon missions also. The

[continued on → 17](#)

the lander attempts to achieve a soft landing.

After landing, the rover will roll off and explore the lunar region for experiments for next 14 days, or one lunar day.

Chandrayaan-3 is a follow-up mission to Chandrayaan-2, which failed to achieve its last stage of landing softly.

Since July 15, the space agency carried out a series of manoeuvres to "slingshot" the spacecraft away from the Earth's orbit and closer to the moon to achieve its objective.

"While the whole world watches, team Isro has done India proud by gloriously coming through the last critical test. Chandrayaan-3 has successfully conducted the separation of the lander module from the propulsion module. We are now heading for the next destination. Countdown has begun for landing on the moon," said Singh on Thursday.

#### CHANDRAYAAN

tricky bit will start now when the craft enters the landing phase. It's here that we fell short in the Chandrayaan-2 mission and our scientists have worked for nearly three years since the last mission to ensure that all errors are rectified and what we could not achieve back then, is achieved now," the official said.

The de-boosting will put the lander in an orbit where the perilune (the point at which a spacecraft in lunar orbit is closest to the moon) is around 30km, and apolune (the point at which it is farthest from the surface) is around 100km.

Scientists will then go ahead with a series of complex braking processes to reduce the velocity of the Vikram lander to achieve a "soft landing". The space agency will also be working on changing the spacecraft's horizontal orientation into a vertical one, before