

## Chandrayaan steady as Russia exits moon race

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NEW DELHI: The second and final adjustment to Chandray-aan-3's lunar lander has been successfully carried out and the space craft is now in a smaller orbit, the Indian Space Research Organisation (Isro) add in a statement on Sunday, and added that the touchdown will be at 6.04pm on August 23.

The announcement came hours before Russia confirmed it had lost its Luna-25 lander after it attempted its own orbital adjustment on Saturday, leaving India at the cusp of history — if Chandrayaan's lander Vikram makes it to the surface as planned, it will be the first time any country's mission has reached the south polar region.

On Sunday, the Indian agency confirmed the lander had now been placed in a 25km x 134km orbit—these numbers refer to the closest and the farthest points on the orbit from the surface—after a deceleration maneuver, which the agency calls "de-boosting".

Isro added that the module would undergo internal checks and await the sunrise at the designated landing site. "The powered descent is expected to commence on August 23, 2023, around 1745 Hrs. (5.45pm) IST." the agency said in a in a cent on V (Grospel F. witter)

post on X (formerly Twitter). The first de-boosting operation was conducted on Friday where the orbit of the lander was reduced to 113kmX157km. The second operation was initi-

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## CHANDRAYAAN

ated around 2am on Sunday.
The space agency conducts de-boosting operations to gradually reduce the velocity of the spacecraft so that it attains a specified controlled speed before landing on the surface of the moon.

According to the agency's statement, the powered descent—when the craft shifts its circular momentum to a landing trajectory and uses its boosters to slow down the approach—will take roughly 19 minutes.

"Chandrayaan-3 Mission: Chandrayaan-3 is set to land on the moon on August 23, 2023, around 18:04 Hrs. IST. Thanks for the wishes and positivity! Let's continue experiencing the journey together...." the space agency said in a statement.

A follow-up mission to the 2019 Chandrayan-2, the latest programme has three objectives — to demonstrate a safe and soft landing on the lunar surface, to demonstrate rover abilities on the surface of the moon, and to conduct scientific experiments.

A successful landing on the moon will make India the fourth country to land on the surface of the moon after the United States, the erstwhile Soviet Union, and China.

Russia's Luna-25 mission, which crashed on Sunday, was its first in 47 years — the country has not had a moon mission since the USSR collapsed.

We were never competing with Russia. Both missions are unique in approach and methodology. The global space programme is not one country against the other, but we are all learning from the experience of each other's experience. Our focus for Chandray-

aan-3 was to learn from the mistakes of Chandrayaan-1 and Chandrayaan-2, its predecessor missions. We have spent time correcting our flaws and go forward with this mission," a top Isro official said, asking not to be named.

While Chandryaan-3 was launched on July 14, Luna-25 took off only on August 11. India's approach was to make the mission more cost-effective by using solely the "slingshot" method of using the planetary gravity to gain momentum, Russia's approach was to use a more powerful rocket.

After the announcement of Russia's crash landing, India's science and technology and space minister Jitendra Singh too said that there was no rivalry between Indian and Russian space programmes.

"Russia has been a traditional friend so no animosity, no sense of rivalry between the two teams. There is a natural bond. The first Indian who went to Moon — Rakesh Sharma — was on a Russian rocket. So, we already have a close collaboration with Russia," he said, addressing the media.

Prior to the latest attempts, all the lunar missions have only landed in the equatorial region of the moon — a few degrees north or south of the lunar equator. Only the Surveyor-7, launched by National Aeronautics and Space Administration (Nasa) in 1968, managed to land near 40 degrees south aittude, which is the furthest any spacecraft has landed from the equators.

Soft landings occur when the craft touches down at a safe, slow, and controlled speed. Soft landings are particularly necessary on crewed missions or missions in which the craft is expected to take scientific measurements or perform tests after landing, as is the case with the Chandrayaan-3 mission.

Chandrayaan-3 consists of an indigenous lander module (LM), a propulsion module (LM), a propulsion module (PM) and a rover, to develop and demonstrate new technologies required for interplanetary missions. The lander has the capability to soft land at a specified lunar site and deploys the rover, which will carry out in-situ chemical analysis of the lunar surface during the course of its mobil-

After the lander module was separated from the propulsion module, the latter will now continue its journey along the lunar orbit for at least six

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