

# Chandrayaan rover has begun mobility operations, says ISRO

**The Hindu Bureau**  
BENGALURU


Hours after the Pragyan lunar rover rolled out from the Vikram lander and took its first "walk on the moon" in the early hours of Thursday, the Indian Space Research Organisation (ISRO) said that the historic Chandrayaan-3 mission was running on schedule, with all systems working normally.

Instruments aboard the lander and rover will now study the moon's mineral composition and the seismic activities in its atmosphere, according to ISRO Chairman S. Somanath.

The indigenous rover's exploration of the lunar surface began a day after India became the fourth country to successfully land on the moon, spurring euphoric celebrations at ISRO and around the country.

"Chandrayaan-3 ROV-

There are two instruments in the rover and three instruments onboard the lander, and all of them have been switched on sequentially



S. SOMANATH  
ISRO Chairman

ER: Made in India Made for the MOON! The Ch-3 Rover ramped down from the Lander and India took a walk on the moon!" ISRO posted on X (formerly Twitter), on Thursday morning. President Droupadi Murmu had made the first announcement of the rover's successful deployment at 7 a.m.

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## ISRO: Rover has begun mobility operations

"Its rolling out a few hours after the landing of Vikram marked the success of yet another stage of Chandrayaan-3. I look forward with excitement, alongside my fellow citizens and scientists, to the information and analyses that Pragyan will acquire," Ms. Murmu posted.

Later in the evening, ISRO added an update on mission operations and the payloads aboard the lander. "Chandrayaan-3 Mission: All activities are on schedule. All systems are normal. Lander Module payloads ILSA, RAMBHA and ChaSTE are turned ON today. Rover mobility operations have commenced. SHAPE payload on the Propulsion Module was turned ON on Sunday," it posted.

Dr. Somanath confirmed that the rover movement is happening and working very well. He said that there are two instruments in the rover and three instruments on board the lander, and all of them have been switched on sequentially.

"They will study basically the mineral composition of the Moon, as well as the atmosphere of the Moon and the seismic activities there," he added.

Dr. Somanath also said that the Chandrayaan-3 spacecraft's lander Vikram had touched down on the moon's surface well within the area identified for the purpose.

# Modi, Xi call for speedy disengagement along LAC

PM meets Chinese President on the sidelines of the BRICS summit; Modi says respecting the LAC is a must for normalisation of relations; this is their first such conversation on the stand-off

**Suhasini Haidar**  
NEW DELHI

India and China have agreed to step up efforts for the disengagement of troops and de-escalation of tensions along the Line of Actual Control (LAC) after a conversation between Prime Minister Narendra Modi and Chinese President Xi Jinping on the sidelines of the BRICS summit in South Africa, Foreign Secretary Vinay Kwatra said on Thursday.

The meeting between Mr. Modi and Mr. Xi took place on Wednesday, sources said, as the two leaders attended the summit in Johannesburg along with leaders from Brazil, Russia and South Africa. However, the announcement of the talks was kept



**Ice-breaker:** The two leaders held the talks on the sidelines of the summit on Wednesday. AP

under wraps until the next day, just prior to the PM's departure for Greece.

## 'Respect the LAC'

"In a conversation with President Xi Jinping of China, PM highlighted India's concerns on the unresolved issues along the LAC in the western sector of the India-China border areas,"

Mr. Kwatra told the media. He said Mr. Modi had "underlined that the maintenance of peace and tranquillity in the border areas and observing and respecting the LAC are essential for normalisation of the India-China relationship".

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## BRICS decides to include six new members

**Kallol Bhattacharjee**  
NEW DELHI

In a landmark decision, members of the BRICS on Thursday declared expansion of the grouping by welcoming six new countries into the fold.

Announcing the decision at the end of the 15th BRICS summit at Johannesburg, Prime Minister Narendra Modi said the move would strengthen the grouping and increase confidence in the idea of multi-polar world order.

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## **Disengagement along LAC sought by Modi, Xi**

The readout given by the Foreign Secretary, however, made no mention of the Prime Minister making any reference to India's earlier position that a reversion to the "status quo ante" as of April 2020 was necessary to resolve the conflict.

While Mr. Modi and Mr. Xi had spoken briefly on the sidelines of the Bali G-20 summit dinner last year about the need to "stabilise the LAC", this is the first such conversation in the last three years where the two leaders spoke at some length on resolving the issue.

Mr. Kwatra said that the two leaders had decided to "direct their relevant officials to intensify efforts at expeditious disengagement and de-escalation", indicating the current talks being held between military commanders at the LAC. These talks had been extended earlier this month after an unsuccessful 19th round of commander level talks were completed on August 14.

As *The Hindu* reported, the talks were restarted a few days later and Major Generals on both sides reportedly discussed the stalemate over the disengagement of troops. In addition, the creation of buffer zones as part of agreements between the two sides has restricted patrolling by the troops.

While no timeline was given for the "expeditious" resolution of the issue after the meeting between the two leaders, the situation has some parallels to the 2017 Doklam conflict between India and China that ended after a similar encounter between Mr. Modi and Mr. Xi on the sidelines of that year's G-20 Summit in Hamburg.

In this case, the BRICS summit provided the meeting ground for the two leaders.

## **BRICS to add six new member countries**

South African President Cyril Ramaphosa, current Chair of BRICS, presented the Johannesburg Declaration—the outcome document of the summit—and made an indirect reference to the Ukraine conflict saying the grouping's members had sought "peaceful resolution" of disputes.

"I am pleased that our teams have come to an agreement on the guiding principles, standards, criteria and procedures for expansion. And based on these, today we have agreed to welcome Argentina, Egypt, Iran, Saudi Arabia, Ethiopia, and United Arab Emirates into BRICS," Mr. Modi said, expressing confidence that together with the new members, BRICS would be able to have new dynamism and energy in its actions. Addition of Iran, Saudi Arabia and the UAE is of special significance as the three will represent both flanks of the energy-rich Gulf in the BRICS. Joining the BRICS is also the first time that Iran and Saudi Arabia took a common diplomatic decision months after they normalised relations in April this year.

The decision to expand BRICS was taken 13 years after the organisation was last expanded with the addition of South Africa in 2010. Originally consisting of Brazil, Russia, India, and China, BRICS was envisioned as a global-level outfit of major economies that are playing an increasingly important role in the post-Cold War world order.

Apart from the main BRICS events, PM Modi held bilateral meetings with leaders from Senegal, Mozambique, Ethiopia, and Iran and delivered a speech at BRICS-Africa Outreach and BRICS Plus dialogue session where he invited the participant countries to join bodies such as the International Solar Alliance; One Sun, One World, One Grid; Coalition for Disaster Resilient Infrastructure; One Earth, One Health; Big Cat Alliance; and Global Centre for Traditional Medicine.

"We reiterate our commitment to inclusive multilateralism and upholding international law, including the purposes and principles enshrined in the United Nations Charter. We are concerned about the ongoing conflicts in many parts of the world. We stress our commitment to the peaceful resolution of differences and disputes through dialogue and inclusive consultation," Mr. Ramaphosa said.



## BRICS now a non-Western grouping with the induction of six more member nations

### NEWS ANALYSIS

**Suhasini Haidar**  
NEW DELHI

By doubling its number of members from five to 11 in one quick sweep, the BRICS grouping has strengthened its position as a global grouping to be reckoned with. In addition, the choice of countries, bringing in four major players from the West Asian region – Egypt, Iran, Saudi Arabia and the UAE – apart from Ethiopia and Argentina from Africa and South America is significant, as it denotes a shift in the non-western economic grouping's underpinnings, to make it a more politically relevant bloc.

Chief among the messages the BRICS has sent out is that despite misgivings and even mockery of the cohesion in the grouping in the west, it is an attractive club for members of the Global South. BRICS founders chose from 22 countries that formally applied for BRICS membership, and more than 40 in all that have evinced interest in the group. The message that the summit and the BRICS expansion took place despite the U.S. and Europe's moves to "iso-



**Global repositioning:** Narendra Modi addressing a session at the 15th BRICS Summit in Johannesburg on Thursday. PTI

late" Russia over its invasion of Ukraine, and to push for an ICC international warrant that prevented Russian President Vladimir Putin from travelling to Johannesburg would not be lost on the Western bloc either.

While India may not have been in favour of such a rapid expansion, officials have said it took the lead in drafting the criteria for membership, and the fact that most of the new members are strategic partners of India is the result of India's efforts.

The induction of Iran in BRICS sends a further message against U.S. sanctions, just as Iran's induction in the SCO this year did, and it is significant that Prime Minister Narendra Modi spoke to Iranian President

Ebrahim Raisi before the summit.

However, many international observers have pointed out that all the new members have very close economic ties to China, and the acceptance of Iran and Saudi-UAE to the same grouping has only been made possible by the peace deal brokered by Beijing earlier this year. This factor means that in the future, India may have to lobby harder to make its vote in the BRICS grouping count.

Briefing the media, Foreign Secretary Vinay Kwatra said the BRICS expansion would also bolster India's push for UN reform, more representation of the Global South and the expansion of the UN Security Council.

Chandrayaan mission a key milestone in ISRO's journey: Kasturirangan

Press Trust of India  
BENGALURU

The successful Chandrayaan-3 mission has opened up the potential to use the moon as a take-off point for future planetary missions, and bolstered India's credentials to participate in such futuristic explorations, veteran space scientist K. Kasturirangan said on Thursday.

Mr. Kasturirangan said the soft-landing and ability to manoeuvre after touchdown to explore the neighbourhood and all that goes along with it, including the understanding of the entire process, have given the ISRO a "total capability".

The latest mission is "one of the very key milestones of ISRO's journey in the past 50 years because, for the first time, you have comprehensively demonstrated the ability of the space programme of ISRO to land an object outside the earth, into another body of the solar system," he said. India on Wednesday became the first country to land a craft near the moon's South Pole.

"Exploring the south pole is very important because of the fact that sunlight does not come much, and since the moon has stopped evolving after two billion years, the South Pole is a pristine region which gives you telltale signs of almost two billion years of uninterrupted existence, without other kinds of radiations and so on and so forth," he said.

## The eyes and ears of Pragyan that guide it through lunar surface

Two navigation cameras aboard help the rover make its moves on the moon; another camera was the one that clicked the first image of the moon from the Vikram during the descent phase

Hemanth C.S.  
BENGALURU

With the Chandrayaan-3's lander module Vikram successfully touching down on the moon and the rover Pragyan rolling out from it, a camera developed by the Laboratory for Electro-Optics Systems (LEOS) here has already made an impact while another will be guiding Pragyan as it traverses the lunar surface.

The Lander Horizontal Velocity Camera (LHVC) aboard Vikram has already clicked the first image of the moon during its descent on the lunar surface on Wednesday. The LHVC, which was initially developed for the Chandrayaan-2 mission, has been adopted for Chandrayaan-3.

"The LHVC has an important role of measuring horizontal velocity during the lander descent phase. It does a complex algorithm calculating the velocity in which the lander is travelling. This instrument provides important information during the descent," said Subhakarshini Krishnamoorthy, who led a team of scientists at LEOS to develop the camera and who has now retired from ISRO. The second camera is the navigation camera



Shooting for the moon: A screenshot showing the surface of the moon captured by the Lander Imager Camera aboard ISRO's Chandrayaan-3 before its successful touchdown. (PTI)

(NAVCAM) and two of them will be the eyes of the rover, guiding it as it traverses the moon's surface. Both NAVCAMs are fitted in the front of the rover for path planning and obstacle avoidance, serving as its eyes.

"The Pragyan rover has two navigation cameras fitted in the front of the rover to navigate the rover in the lunar terrain. NAVCAM-Left & NAVCAM-Right help in path planning and ob-

stacle avoidance, to ensure that there is no rock, there is no obstacle, there is no pit, etc., in the path. It is like a human being or robot having eyes, so wherever the rover is going to move there is a path planning which is done based on the stereo images from NAVCAMs," said Ms. Krishnamoorthy, a former Deputy director of the Indian Space Research Organisation. She attributed the success to the sincere and

dedicated hard work of her team members.

She added that both the cameras were developed for the Chandrayaan-2 lander and rover. However, the Chandrayaan-2 mission ended in failure when during the descent, the Vikram lander gave up at an altitude of 2.1 km before touchdown and crashed on the lunar surface. It subsequently lost communication with the ground stations.

## 'Fly me to the moon' seems to be global ambition in 2023

The Hindu Bureau  
BENGALURU

The year 2023 seems to be the year of the moon as a number of lunar missions are scheduled to take place this year.

In the past two months, two missions were launched - India's Chandrayaan-3 on July 14 and Russia's Luna-25 on August 11. While Chandrayaan-3 met with success when its lander module safely touched down on the lunar surface and was followed by the rover's roll-out on Thursday, Luna 25 suffered a glitch and crashed on the moon's surface on August 19.

Apart from these two missions, there are four more lined up for this year.

They include the Commercial Lunar Payload Services (CLPS) and Lunar Trailblazer from the U.S.

The CLPS initiative of the National Aeronautics and Space Administration, according to the U.S. space agency, allows rapid acquisition of lunar delivery services from American companies for payloads that advance capabilities for science, exploration or commercial development of the moon. The Lunar Trailblazer on the other hand is an orbiter.

The moon missions include China's lunar communication and navigation satellite constellation and Japan's Smart Lander for Investigating Moon (SLIM), which is an orbiter/lander mission.

This year also saw



The ISRO's LVM3 carrying Chandrayaan-3 before its launch on July 14.

another failure as Japan's Hakuto-R lander failed to make a moon landing in April. Had the Hakuto-R mission completed its task, it would have been the world's first commercial soft landing on the lunar surface.

According to the ISRO, as of July, there are six active lunar orbiters and currently, the only operating rover is China's Yutu-2 rover released by Chang'e 4, which operates on the far side.

### Israel, China missions

Next year, Beresheet 2 from Israel, U.S.'s Volatiles Investigating Polar Exploration Rover (VIPER), China's Lunar Exploration Programme (CLEP) Chang'e 6 and Hakuto-II are expected to be launched.

## Congress accuses Modi of hogging the limelight after mission

The Hindu Bureau  
NEW DELHI

Lauding the Indian Space Research Organisation (ISRO) chief S. Somnath for his leadership, the Congress on Thursday accused Prime Minister Narendra Modi of hogging the limelight after the success of Chandrayaan-3.

In a letter, Congress leader Sonia Gandhi said she was writing to Dr. Somnath to let him know how thrilled she was by the ISRO's magnificent achievement on Wednesday.

"It is a matter of great pride and excitement to all Indians, particularly the younger generation," Ms. Gandhi said. She said the space agency's outstanding capabilities have been built up over decades.

Congress general secretary K.C. Venugopal targeted the Prime Minister on X for "hogging the limelight".

"However, the PM must answer some for his hypocrisy. You were quick to come on screen and take credit after the landing, but why has your government failed so terribly in supporting the scientists and the ISRO," he asked.

The Congress leader asked why Heavy Engineering Corporation engineers, who worked on Chandrayaan-3 launch pad, had not received their pay for the last 17 months. "Why did you cut the budget for such crucial missions by 32%," he asked.



# Know your rover PRAGYAN

Meet the Chandrayaan-3 rover on the moon. Weighing 26 kg and with a speed of 1 cm per second, it is a diminutive yet important component of the mission's distinction: as the first to conduct *in situ* studies of the lunar soil in the moon's south polar region

## PRAGYAN THE LAB

### Laser-Induced Breakdown Spectroscopy (LIBS)

- A powerful laser is shined on a target sample...
- ...until it blows off a few atoms and causes the sample to emit some radiation
- Detectors study this radiation to understand what the sample is made of
- Weighs 1.5 kg, consumes 5 W

### Alpha Particle X-Ray Spectrometer (APXS)

- Blasts a target sample with X-rays emitted by radioactive material (curium-244)
- Atoms in the sample absorb the X-rays and then release them at a different frequency
- Based on this frequency, scientists can say which elements the sample contains
- Weighs 6.7 kg, consumes 4 W

### What will the rover do on the moon?

- First, it will move around on the moon's surface in low gravity and a thin atmosphere in a semi-autonomous way and avoiding hazards
- Second, its instruments will study what the materials on the moon's surface near the landing site are made of

### Where is the rover on the moon?

- On August 23, the Chandrayaan-3 lander descended at a site between the craters Manzinus C and Simpelius N. The lander has a moving speed of 1 cm per second, so it is also close to the lander
- It can't move more than 500 m from the lander anyway, to ensure that they are able to send signals between each other. The rover can communicate only with the lander

### Why does it have a short lifespan?

- When the sun sets on the moon, an area will become dark and very cold. This can damage the battery and other electronic components
- When the sun rises again, after 14 days, the rover can "return" to life if the components have survived. This is unlikely

### Local data storage: 2 Gb

Cameras to navigate the terrain

Worm Electronics Box has a volume of around 38 litres

Lifespan: One lunar day (14 earth days)

Is solar panels produce 50 W of power

Unlikely to survive lunar night: low temperature could damage electronic components

Rover speed is 1 cm per second

Weight 26 kg

Has rocker-bogie suspension

The rover has six wheels. The wheel treads will imprint ISRO logo and Ashoka lions emblem on the ground

It can climb a maximum slope of 20° and over obstacles maximum 5 cm high

Lander can transmit data to the rover at 2-4 GHz freq. at 2 kbps

Rover can transmit data to the lander at 2-4 GHz freq. at 64 kbps

# Carlsen shows his class, tames Pragg to claim the crown

The Norwegian, after winning the first rapid game when the Indian erred under time-pressure, accomplishes the mission by settling for a draw in the second; the teenager happy to qualify for Candidates tournament

CHESS WORLD CUP

Rakesh Rao

**M**agnus Carlsen came good when it mattered and stopped R. Praggnanandhaa 2.5-1.5 for his maiden World Cup title in Baku, in Azerbaijan, on Thursday.

After the two classical games ended in draws, Carlsen won the first rapid game when Praggnanandhaa's sense of danger let him down and he erred under time-pressure on the 42nd turn. In the next five moves, Praggnanandhaa faced a loss of bishop and resigned in 47 moves.

Facing a must-win situation in the second game with black pieces, Praggnanandhaa could not get the position from where he could put pressure on Carlsen. Soon it became clear that Praggnanandhaa, at best, could get a draw which he eventually did in just 22 moves.

Praggnanandhaa said, "I could have done better in the tie-breaker. These are shorter time-control and Magnus is very good at it. After the first game, I could have given a better fight. But being in a must-



Master of the 64 squares: Carlsen's experience came to the fore as he prevailed over Praggnanandhaa in the tie-breaker. xprite



win situation with black pieces against Magnus was difficult. But I am happy to qualify for the Candidates, that's very important."

Carlsen said, "That I am not feeling good physically is well documented. I was happy to get the match to tie-breaker to get an extra day's rest. But I was feeling pretty much spent. What prevailed today was experience. There were two key moments in the game today. He caught me out in the opening. Frankly, I did not know this line he played at all. I was trying to

respond by common sense moves. Today, I also felt that Praggnanandhaa played impulsively, something that he usually does not. And once he got into a time-scramble, I exploited the weak squares and it was easy. Pragg played really well in general in the tournament. He had an exceptional performance. Today, he had two moments of inexperience that cost him."

Carlsen chose to rate his first classical game against D. Gukesh as the best game of his tournament. "Gukesh is extremely strong

and he was sort of unlucky to have faced me that one day when I really showed my best."

The result saw Carlsen win \$110,000 and Praggnanandhaa earn \$80,000 (approx. ₹66,10,724). Later, Fabiano Caruana finished third after beating Nijat Abasov 3-1 by claiming the first two rapid games.

Carlsen may have proved his class, but this World Cup will be remembered for Praggnanandhaa leading India's charge in the premier competition.

For the first time, four Indians made it to the quarterfinals, with the fourth Indian Vidit Gujrathi accounting for the last Russian Ian Nepomniachtchi, seeded four.

Praggnanandhaa took out World No. 2 Hikaru Nakamura and World No. 3 Caruana as he played way over his ranking.

**The results:**

**Open (final):** Magnus Carlsen (Nor) bt R. Praggnanandhaa 2.5-1.5.

**For third place:** Fabiano Caruana (USA) bt Nijat Abasov (Aze) 3-1.