

Soaring to the moon

Chandrayaan-2 will help India test the technologies for deep-space missions

A decade after the first successful mission to the moon with Chandrayaan-1, the Indian Space Research Organisation successfully launched its sequel, Chandrayaan-2, to further explore the earth's natural satellite. Earlier this year, China landed a robotic spacecraft on the far side of the moon, in a first-ever attempt. Now India is attempting a similar feat — to land its rover Pragyan in the moon's South Polar region, attempted so far by none. The equatorial region has been the only one where rovers have landed and explored. The launch by itself is a huge achievement considering

that it is the first operational flight of the indigenously developed Geosynchronous Satellite Launch Vehicle Mark-III (GSLV Mark-III) to send up satellites weighing up to four tonnes. The orbiter, the lander (Vikram) and the rover (Pragyan) together weigh 3.87 tonnes. Having reached the earth parking orbit, the orbit of the Chandrayaan-2 spacecraft will be raised in five steps or manoeuvres in the coming 23 days before it reaches the final orbit of 150 x 1,41,000 km. It is in this orbit that Chandrayaan-2 will attain the velocity to escape from the earth's gravitational pull and start the long journey towards the moon. A week later, on August 20, the spacecraft will come under the influence of the moon's gravitational pull, and in a series of steps the altitude of the orbit will be reduced in 13 days to reach the final circular orbit at a height of 100 km.

The next crucial step will be the decoupling of the lander (Vikram) and the rover (Pragyan) from the orbiter, followed by the softlanding of the lander-rover in the early hours of September 7. Despite the postponement of the launch from July 16 owing to a technical snag, the tweaked flight plan has ensured that the Pragyan robotic vehicle will have 14 earth days, or one moon day, to explore. Unlike the crash-landing of the Moon Impact Probe on the Chandrayaan-1 mission in November 2008, this will be the first time that ISRO is attempting to soft-land a lander on the earth's natural satellite. A series of braking mechanisms will be needed to drastically reduce the velocity of the Vikram lander from nearly 6,000 km an hour, to ensure that the touchdown is soft. The presence of water on the moon was first indicated by the Moon Impact Probe and NASA's Moon Mineralogy Mapper on Chandrayaan-1 a decade ago. The imaging infrared spectrometer instrument on board the orbiter will enable ISRO to look for signatures indicating the presence of water. Though the

Terrain Mapping Camera on board Chandrayaan-1 had mapped the moon three-dimensionally at 5-km resolution, Chandrayaan-2 too has such a camera to produce a 3-D map. But it will be for the first time that the vertical temperature gradient and thermal conductivity of the lunar surface, and lunar seismicity, will be studied. While ISRO gained much with the success of Chandrayaan-1 and Mangalyaan, the success of Chandrayaan-2 will go a long way in testing the technologies for deep-space missions.

<u>Words</u>	<u>Kind</u>	<u>Meaning</u>
Soar		Fly, wing, ascend, climb, rise, take off
Sequel		Low up, continuation, consequences, result,,
upshot		
Explore		investigate, look into, consider, examine
Satellite		space station, space capsule, space craft
Robotic		automatic, android
Feat		achievement, accomplishment, attainment,
triumph		
Rover		wanderer, traveller, globetrotter, drifter
Equatorial		tropical, hot, humid, sultry
Indigenous		native, original, ab-original, autochthonous
Geosynchronous		geostationary
Manoeuvres		tricks, artifice, roses, ploys
Velocity		speed, race, pace, momentum, impetus
Escape		get away, break away, shake off
Gravitational		forceful attraction, pull
Full (n)		attraction
Altitude		the height of an object in relation to sea level ground level
Decouple		separate, disengage, dissociate
Postponement		deferral, deferment, delay, putting off
Snag		complication, difficulty, catch, hitch
Tweak		pull, jerk, tug, twist
Infrared		electromagnetic, radiation
Gradient		steepness, angle, slant
Resolution		intention, resolve, decision, intent
Map(v)		chart, plot, delineate, depict, port ray
Lunar		relating to moon

What's NEXT?

National Exit Test should overcome legal and political opposition and avoid the NEET way. In its second iteration, the National Medical Commission (NMC) Bill seems to have gained from its time in the bottle, like ageing wine. The new version has some sharp divergences from the original. Presented in Parliament in 2017, it proposed to replace the Medical Council Act, 1956, but it lapsed with the dissolution of the Lok Sabha. The NMC will have authority over medical education — approvals for colleges, admissions, tests and fee-fixation. The provisions of interest are in the core area of medical education. The Bill proposes to unify testing for exit from the MBBS course, and entry into postgraduate medical courses. A single National Exit Test (NEXT) will be conducted across the country replacing the final year MBBS exam, and the scores used to allot PG seats as well. It will allow medical graduates to start medical practice, seek admission to PG courses, and screen foreign medical graduates who want to practise in India. Per se, it offers a definite benefit for students who invest much time and energy in five years of training in classrooms, labs and the bedside, by reducing the number of tests they would have to take in case they aim to study further. There are detractors, many of them from Tamil Nadu — which is still politically opposing the National Eligibility-cum-Entrance Test (NEET) — who believe that NEXT will undermine the federal system, and ask whether a test at the MBBS level would suffice as an entry criterion for PG courses. The Bill has also removed the exemption hitherto given to Central institutions, the AIIMS and JIPMER, from NEET for admission to MBBS and allied courses. In doing so, the government has moved in the right direction, as there was resentment and a charge of elitism at the exclusion of some institutions from an exam that aimed at standardising testing for entry into MBBS. The government also decided to scrap a proposal in the original Bill to conduct an additional licentiate exam that all medical graduates would have to take in order to practise, in the face of virulent opposition. It also removed, rightly, a proposal in the older Bill for a bridge course for AYUSH practitioners to make a lateral entry into allopathy. It is crucial now for the Centre to work amicably with States, and the Indian Medical Association, which is opposed to the Bill, taking them along to ease the process of implementation. At any cost, it must avoid the creation of inflexible roadblocks as happened with NEET in some States. The clearance of these hurdles, then, as recalled from experience, become fraught with legal and political battles, leaving behind much bitterness. NEXT will have to be a lot neater.

<u>Words</u>	<u>Kind</u>	<u>Meaning</u>
Iteration		replation, recapitulation, re-iteration
Version		account, report, statement, description
Divergence		separation, dividing, bifurcation
Lapse		failure, failing, slip, error, mistake
Dissolution		cessation, conclusion, end, ending
Unify		unite, combine, bring together, amalgamate
Screen		partition off, divide off, separate off
Perse		as such
Detractor		critic, disparager, denigrator, deprecaton
Undermine		subvert, sabotage, threaten, weaken, diminish
Suffice		be enough, be sufficient, be adequate
Criterion		criteria, feature, lineaments
Exemption		immunity, exception, exclusion, indemnity
Hither to		previously, formerly, earlier
Allied		federated, confederated, associated, inalliance
Resentment		bitterness, indignation, irritation, pique
Scrap		fragment, piece, snippet, shred, off cut oddment
Licentiate		a licenced preacher (church)
Virulent		poisonous, toxic, venomous, noxious, deadly
Crucial		pivotal, critical, climacteric, decisive
Amicable		friendly, affable, genial, congenial
Ease		relieve, soothe, alleviate, palliate, moderate
Hurdles		obstruction, impediments, constraint, restraint
Fraught with with		filled with, teemed with, full of, infested with pregnant
Bitterness		sharpness, acrimoniousness, acidity, acridity
Neat		orderly, well ordered, shipshape