

Important Vocab For the Editorial

1. **daybreak** (noun) – early morning, dawn, sunrise, break of day.
2. **rendezvous** (noun) – meeting, engagement, assignation.
3. **pull back** (phrasal verb) – withdraw, pull out, get out, quit.
4. **lift-off** (noun) – a vertical take off (of a rocket/helicopter/spacecraft).
5. **owing to** (phrase) – because of, as a result of, on account of/due to.
6. **glitch** (noun) – problem, difficulty, issue/complication.
7. **damper** (noun) – brake/check, restraint/restriction, control.
8. **look forward to** (phrasal verb) – wait for, count on, expect.
9. **nail-biting** (adjective) – difficult, strained/stressful, anxious.
10. **predecessor** (noun) – previous one; forerunner, precursor, antecedent.
11. **setback** (noun) – problem, difficulty, issue.
12. **call off** (phrasal verb) – cancel, abandon, shelve (an event).
13. **propellant** (noun) – fuel, power source (in a rocket engine) to provide thrust (force) during launch.
14. **strap-on** (adjective) – able to be attached by a strap.
15. **thrust** (verb) – drive, force, push.
16. **pave the way for** (phrase) – clear the way for, create a situation to do something, precede, make provision for.
17. **subsequently** (adverb) – afterwards, later on, eventually.
18. **window** (noun) – opportunity, chance, opening.
19. **take up** (phrasal verb) – accept, agree to, accede to.
20. **dire** (verb) – terrible/awful, appalling, distressing.
21. **pronouncement** (noun) – (formal) announcement, declaration, statement.
22. **plunge** in (verb) – push, thrust, force/drive suddenly.
23. **overlap** (verb) – coincide or cover (partly) in time.
24. **lander** (noun) – a spacecraft designed to land on the surface of a planet/moon. A lander is immobile, and maintains its fixed position once it has landed.
25. **rover** (noun) – a space exploration vehicle designed to move and explore the surface of a planet or moon. A rover is mobile, and has wheels with which it can move.
26. **manoeuvre** (noun) – operation, action, activity.
27. **leeway** (noun) – freedom, scope/flexibility, latitude/elbow room.
28. **take into account** (phrase) – consider, respect, regard to.

Waiting for daybreak: on Chandrayaan-2

Chandrayaan-2 missed this rendezvous with the moon, but the next date is not too far

India's second moon mission, **Chandrayaan-2, was pulled back from launch just 56 minutes before its scheduled liftoff on July 15.** This was owing to a technical glitch in the GSLV Mark-III rocket launcher. No rescheduled date has been announced for launch. This has no doubt served as a damper on those who eagerly looked forward to India being

only the fourth country to launch a mission that would land on the moon, and the very first to land on and explore its south pole region. Yet, it was best that the glitch was discovered before the launch. Rocket launches always have a nail-biting finish. Even the GSLV-D1, the slighter predecessor to the GSLV Mark-III, suffered such a setback when it was about to be launched for its first developmental test flight in 2001. It was called off exactly one second before launch, as it was discovered that one of the four liquid propellant strap-on stages had not developed the required thrust. This test flight was conducted just 21 days later, paving the way for several successful launches of the GSLV rocket subsequently.

What seems to have touched the popular imagination is that the current launch window ends on July 16 and if this window is missed there could be an indefinite delay in rescheduling the launch. Coupled with news reports that checking and correcting the error could take up to 10 days, this has led to dire pronouncements of an indefinite postponement of the mission. The 'launch window' is determined by several factors. One of the most important considerations is that any spot on the moon receives sunlight for approximately 14 (earth) days before being plunged in night for another fourteen. The landing has to be timed so that it maximises the overlap with the sunlit days on that spot. This is because the lander and the rover need solar energy to power them and to keep the instruments warm. Therefore, given a landing spot that can be seen from the earth, the landing date has to coincide with the sixth phase of the moon (first quarter) as seen from the earth, on that spot. Secondly, once placed on the moon orbit, Chandrayaan-2 must have full visibility to the ground station, which will determine the time of operation of the landing. From the date of launch to the date of landing, the planned interval is about 54 days. Much of this time is needed for the Chandrayaan-2 mission to make various orbital manoeuvres and operations, but there is a leeway of a day or two to take some decisions. A window that takes all this into account, is available for about 10 minutes on each day now for about a week. Such a window can be found every month. Other tighter windows are available but are high-risk options. So even if Chandrayaan-2 misses its rendezvous with the moon this month, it will find a date, perhaps even next month, that will be suitable.