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MISSION CHANDRAYAAN 2: FAILURES TEACH WHAT SUCCESS CANNOT

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Euphoria over the launch of Chandrayaan 2, so hyped by the media on ISRO briefings and the implicitly assumed success of the mission, has died down by now. So has the frustration over the failure to soft land the *Vikram* Lander on the uncharted South Pole area of the Moon. It is, therefore, time for an objective analysis and a serious investigation into what went wrong with the mission and to learn as to what needs to be set right and avoided in the future.

It needs to be said that failures are endemic to scientific endeavour and should not demoralise anyone. The scientific fraternity accepts that all such missions are, essentially, experiments and failures are integral to them. These have confronted the US, Russia and other developed space powers at different times. In fact, science has always learnt more usefully from failures than its celebrated successes. For the purpose of inquiry in the particular case of Chandrayaan 2, a team of scientists, academics and experts, including from ISRO, has been set up to study the problem and suggest corrective measures. This, indeed, shows scientific temper and scientific approach towards investigation.

While the technical team would be looking to resolve the technical problems – and they are best suited to do so – from the outside, a failure in the communication strategy followed prior to the mission can be pointed out. Results of scientific missions are beset with external and internal imponderables. Hence, any implicit or prior assurance of success or hyped-up expectations of achieving desired results can be presumptuous and misplaced. That is what possibly happened in this case because success of the mission was almost taken for granted. But, hope was belied when *Vikram* fell silent, and the shock turned into an anti-climax.

Chairman Sivan, known to be a perfectionist and a hard taskmaster, perhaps, took it as a personal failure and it hurt him

deeply. Images of PM Modi consoling him by declaring the mission a virtual success, and supporting him with words of encouragement were viral. No doubt, our ISRO team remains the best and brightest, and fully capable and competent to achieve the task soon. But, failures must be prepared for – as much procedurally, as psychologically. Expectations of success need to be tempered with realism.

Chandrayaan 2 is indeed a crucial and prestigious mission in India's race to the Moon. It also has strategic nuances. The story of the mission starts from 23 July, 2019, when it was launched on ISRO's powerful rocket GSLV-MkIII. The rocket proved its mettle and took Chandrayaan into orbit around the Earth. It was a celebrated success. The Orbiter took almost a month to stabilise and was then moved to an orbit around the Moon. The manoeuvre to alter the orbit was also highly successful, was hailed by the scientists and infused great confidence. And then Chandrayaan stabilised its orbit around the Moon and gradually started getting closer to its destination. At this stage the lander, *Vikram*, was separated without a glitch. It was, indeed a moment of triumph. No wonder, repeated successes infused high confidence in the mission achievement. *Vikram* reached its rendezvous with the Moon on the night between 6 and 7 September, 2019 and was readied for mission performance.

Every control was functional till it was just 10 km from the Moon. But its speed had to be reduced for the smooth landing. It was a complex manoeuvre that covered a period of "fifteen minutes of terror" as per Sivan's own assessment. According to the plan rough brakes were applied to reduce speed for its controlled vertical descent which was to be followed by fine braking for smooth landing on the Moon. It was just then that the ground control lost communication with the Lander. The silence was heart-rending and an utter disappointment. Indications suggest a prognosis that *Vikram* has suffered a heavy landing on the Moon and as a result contact snapped. Other reasons as to why brakes were not effective and whether it was programme failure or activity inaction is yet to be ascertained.

In a sincere collaboration, efforts have been made by NASA to sight and capture images of *Vikram* through the flyby of Lunar Reconnaissance Orbiter (LRO) but no such payload was sighted by its cameras. NASA is still trying to validate, analyse and review the captured imagery, but possibly the Lander has fallen in the dark area of the Lunar South Pole and is not visible.

Chandrayaan 2 was supposed to be a historic and strategic mission with many advantages. First, it would have given India an experience in soft landing which is the next step in ISRO's learning process for future space activities. Also, through the Rover, *Pragyan*, it would have provided ample and clinching scientific data for clues on the presence of water

on the Moon. Of course, this accomplishment would have elevated India in the hierarchy of international order of space powers placing it next in line to the US, Russia and China. This would also have given a boost to its overall international standing and a new impetus and dimension to Indian dreams and ambitions in space.

However, while the recent malfunction may have delayed these outcomes, the Indian effort and scientific prowess has been well acknowledged. The professionalism of ISRO is evident in the efforts already being made to meet new targets. Failures are part and parcel of research in frontier technologies. They teach lessons that successes may make you overlook. While ISRO learns its technical lessons from this episode, the country of a billion plus people must learn how to handle expectations – without deification or vilification.

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