

MARCH 1, 2004

A SPACE HOLDINGS NEWSPAPER

# SPACENEWS

INTERNATIONAL

## India Advances Lunar Mission Launch to 2007

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Encouraged by the rapid pace of progress to date on its planned \$100 million lunar orbiter mission, the Indian Space Research Organisation (ISRO) has moved the launch date for the robotic probe up by one year.

Originally scheduled to launch in 2008, the Chandrayaan-1 mission now could lift off in 2007 or even earlier, according to ISRO Chairman Gopalan Madhavan Nair. **Searching for potential deposits of Helium-3 – envisioned as a fuel for future fusion reactors – is one of the key objectives of the mission**, Nair added during a speech Feb. 17 here at the 13th National Space Science Symposium.

The new target launch date is not unrealistic, said M. Annadurai, who recently was appointed project director of Chandrayaan-1. “We can save time because the spacecraft and the launch vehicle are available virtually off the shelf and work on fabricating the payload has already begun,” he said in an interview.

Annadurai, who previously ran ISRO's Insat program, said the Chandrayaan-1 satellite will be based on the platform used for India's Metsat weather satellite, which was launched

in September 2002. Metsat has been renamed Kalpanasat after Kalpana Chawla, the Indian-born astronaut who died in the Space Shuttle Columbia accident in February 2003.

Annadurai said the design configuration of the lunar orbiter would be frozen by the end of March and the experimental payloads finalized by the end of the year. ISRO also has reserved 10 kilograms of capacity aboard the satellite for a payload supplied by an international partner.

According to J.N. Goswami, an ISRO planetary geologist, eight proposals have been received so far, including concepts from the European Space Agency, Israel and a private laboratory in the United States. ISRO has announced that it will consider all proposals submitted before March 24 for inclusion in its moon mission.

“Out of these, we will select the ones that are either new or that will complement data from our own experiments,” said Naresh Bhandari, head of ISRO's Planetary Sciences and Exploration program.

During its two-year mission, Chandrayaan-1 will obtain high-resolution geological, mineralogical and topographical maps of the moon's surface, Bhandari said. Together with a

variety of international probes either on their way to the moon or in the planning stages, Chandrayaan-1 “will provide more than five years of continuous observation of the moon,” he said.

Plans call for a modified version of India's Polar Satellite Launch Vehicle to launch the spacecraft into a geostationary transfer orbit. The spacecraft will then undertake two maneuvers using its onboard propulsion system to raise its apogee to about 386,000 kilometers, bringing it within striking distance of the moon. The propulsion system will fire again to place Chandrayaan-1 into a lunar capture orbit of 1,000 kilometers, which then will be lowered to the mission orbit of 100 kilometers. The entire sequence is expected to take five days.

Annadurai said the launch approach adopted for the mission that exploits the slingshot effect from the moon's gravity is the most economical in terms of fuel consumption. “Our calculations show that communications satellites today can extend their life by seven years if they adopt the same approach and fly by the moon before taking position in geostationary orbit,” he said.

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