SPACE SCIENCE

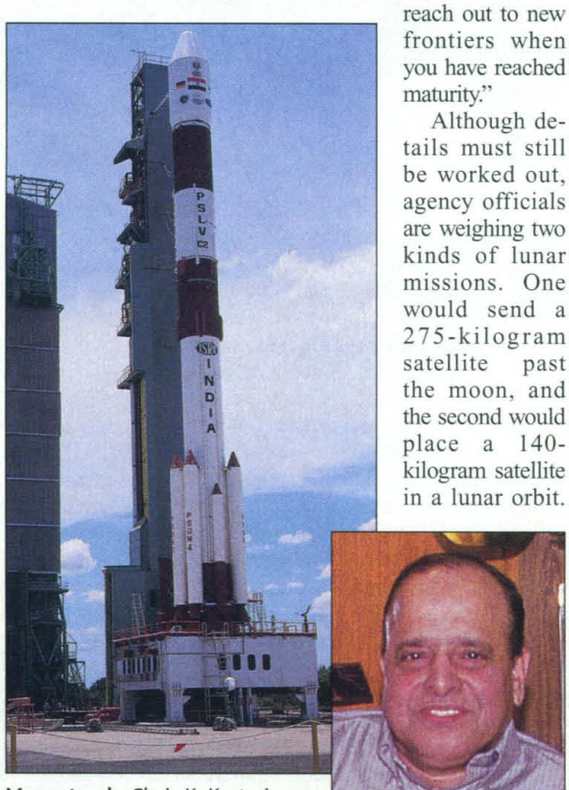
Indian Agency Eyes Moon In Shift Toward Research

A new rocket able to deliver lunar payloads complements efforts by the Indian Space Research Organization to focus more on scientific challenges

LUCKNOW, BANGALORE, AND NEW DELHI—After 3 decades spent focusing on the earthly pursuits of weather forecasting and communications, India's space agency is lifting its sights. The Indian Space Research Organization (ISRO) is putting together plans for a mission to the moon, and it is also hoping that private industry will take over its launch and communications satellite business so it can concentrate on scientific payloads and advanced technology.

Krishnaswamy Kasturirangan, ISRO's chair, floated the idea of going beyond Earth orbit last spring after the successful launch in May of the country's new Polar Satellite Launch Vehicle (PSLV). He noted that the 300-ton rocket, which placed three satellites into orbit, "can [also] undertake a mission to the moon." Toward that end, ISRO convened a symposium at this fall's annual meeting of the Indian Academy of Sciences* entitled "An Indian Case for Going to the Moon." Scientists from the space department showcased the agency's willingness and capacity to undertake such a scientific mission and received a positive response from the 200 researchers in attendance, many of whom see it as a matter of national pride as well as technological prowess. "We cannot *not* afford to go to the moon," asserts Narendra Bhandari, a planetary scientist at the Physical Research Laboratory in Ahmadabad who has worked extensively on moon rock samples and asteroids.

Kasturirangan believes that the country's political leaders, who must approve such a plan, also may be ready to take the next step. He points to a 20% rise in the agency's space science budget in the past 2 years, to $8.9 million in 2000, built in part on a success rate of 75% for nearly two dozen launches with a variety of payloads. The proposed moon mission is also seen as a way to galvanize support for other basic research projects. And space officials from other countries believe that India is up to the task. "ISRO is today technically fully capable to take on a mission to the moon," says Serge Plattard, director of international relations for CNES, the French space agency. "It is natural to reach out to new frontiers when you have reached maturity."



Moonstruck. Chair K. Kasturirangan *(inset)* says ISRO's new rocket can take India to the moon.

Although details must still be worked out, agency officials are weighing two kinds of lunar missions. One would send a 275-kilogram satellite past the moon, and the second would place a 140-kilogram satellite in a lunar orbit. Those payloads are comparable in weight to recent U.S. missions like the Lunar Prospector and Clementine. The spacecraft would carry out studies of the moon's core and collect high-resolution images of its surface. The first mission could also include a gamma ray spectrometer to map the surface of the moon at a resolution of about 10 meters, a fourfold improvement over previous efforts.

However, while Kasturirangan talks of a launch late in the next decade, NASA's James Dodge of the Mission to Planet Earth office warns against overoptimism. "ISRO should keep in mind that the moon is an expensive business," he says. "India could well undertake quite a few Earth missions at the cost of a single moon mission."

But even as ISRO looks toward the moon, it is keeping its eye on earthly applications. Last month India signed a preliminary agreement with France to launch the first-ever Indo-French space mission to study tropical weather and climate. The 500-kilogram payload, christened Megha-Tropiques, will help in the study of moisture and temperature convective systems that are particularly intense in intertropical regions. The two countries will split the $100 million cost of the project: The satellite bus is to be provided by France, the scientific instrumentation developed jointly, and the finished satellite launched from India on the PSLV in 2005.

ISRO sees the French mission, which uses optical instruments, as one of a series of custom-made remote-sensing satellites it hopes to develop. It wants to improve synthetic aperture radar and other sophisticated sensors and cameras that can look through the thick band of clouds that envelops India during the monsoon season. It also plans to continue work on launchers such as the Geo-Stationary Satellite Launch Vehicle, capable of orbiting 2000-kilogram satellites, that is scheduled to make its debut early next year.

To do that, however, ISRO must withdraw from more mundane commercial jobs such as the development of communications satellites and new launchers. "The private sector has to take over this activity," says Kasturirangan, who compares India's situation to what France faced 25 years ago before it created Arianespace Corp. as the commercial arm of CNES. Science and technology cabinet minister Murli Manohar Joshi echoed that sentiment recently at an international space science symposium in New Delhi, noting that "it is not always possible to maintain many [space] systems with taxpayers' money. Suitable mechanisms should be developed to recover costs from the beneficiaries." A policy of transferring ISRO's know-how to domestic industry also is in keeping with other government efforts to bow out of many sectors of the economy.

By spinning off its launchers, says India specialist Didier Aubin, an electronics engineer and director of sales and marketing at Arianespace, ISRO "can focus its energies on new opportunities." And that's exactly what it should do, says Narendra Kumar, director of the Raman Research Institute in Bangalore and president of the Indian Academy of Sciences, which hosted the ISRO symposium. "ISRO has really come of age, and this shift toward research-oriented outer space missions is a necessary step." —**PALLAVA BAGLA**

CREDIT: P. BAGLA

* 65th annual meeting of the Indian Academy of Sciences, Lucknow, 30 October 1999.