

Asking for the Moon

Back to Basics in Space

By J V Narlikar

In modern times, scientists have viewed the moon as the first step to mount in a campaign aimed at conquering space. During the first flush of enthusiasm of the sixties and the early seventies, partly fuelled by the Cold War rivalry, both the Soviet Union and the US organised several space missions to the moon, including the historic human landing on the moon in the Apollo-11 mission. However, afterwards interest in the subject waned.

Now, the moon is enjoying a revival of interest amongst the space agencies of several countries. Indeed, the progress of the new lunar pilgrims is about to begin with a European spacecraft this year followed by a Japanese one next year. China has its own rather ambitious programme for space, starting with placing an astronaut in an earth-orbit within a year, the moon itself being on the space-menu for around 2010. Now the Indian Space Research Organisation (ISRO) has come out with its plan for an expedition to the moon.

ISRO has over the last few years steadily built up a solid reputation of capability of all the different steps needed for a moon mission, starting with launching payloads, designing them, and controlling them remotely. Against this background of technological capability, future generations would point an accusing finger at ISRO if it now rested on its laurels instead of joining the above company. So, its proposed enterprise called *Somayana*, deserves to be welcomed as the Indian response to the lunar challenge.

The *Somayana* (the word means a lunar vehicle) will be a spaceship launched from the earth with the intention of reaching the neighbourhood of the moon, then descending to a pre-specified orbit so as to move round the moon for a couple of years. During this period it will do remote-sensing of the moon from a height, ideally of 100 km.

During its two years of active life in orbit, the *Somayana* will carry a terrain-mapping camera for high resolution photography of the lunar surface. Taking into consideration the location of the sun which determines the illumination of the moon, it turns out that of one year, only around 120 days are suitable for this kind of photography... these are two periods of 60 days separated by 120 days. Keeping these limitations in mind a strategy will have to be worked out on how and which part of the moon will be imaged and when.

Additionally, there will be X-ray payloads to cover the moon. There will be provision for measuring the X-ray fluorescence from the lunar surface over a 'footprint' of size 10 km. At higher energies, there will be X-ray mapping to detect degassing faults

which may shed some light on how the volatiles are transported on the moon. On the vertical scale, lunar laser ranging instrument will measure for us the ups and downs in the lunar surface on scale of 10 metres. Likewise, one hopes that analysis of slight changes in the orbit over the two-year period will tell us something about the gravity anomalies on the moon.

To operate and control the spacecraft, a deep space network (DSN) will have to be created in addition to what already exists. The DSN will be a permanent asset as it can be used for future missions as well and also offered for use by missions of other countries.

Launch technology capability decides the weight of the payload. The *Somayana* can weigh just over half a tonne. This limit, in turn, decides what scientific and other equipment can be accommodated. The preliminary report of *Somayana* is based on deliberations by scientists on these issues, including the technological developments needed to make the mission a success. Thus development of lithium-ion batteries, advanced antenna system, miniaturised communication system, miniaturised star sensor and bus management unit will be

prompted by this particular enterprise. The spin-offs of these technologies for other 'down to earth' purposes will of course be there. Recall that even the teflon (non-stick) pans in the kitchen were spin-offs from space technologies.

The question naturally arises as to whether we are reinventing the wheel, as other more advanced nations may already have done this

work. As of now, the projected studies do not suffer from this criticism. And since the 'wheel' is often invoked by the detractors of any new scientific enterprise, perhaps it should be stated that even the wheel has to be re-invented if it is needed and there is an embargo on its export by those who made it first.

If the project is approved, it will take five years to complete and will carry a price tag of around Rs 400 crore. Again, sceptics may ask, could not this money be diverted towards providing water to the remote areas, to rural development in general. Certainly there are many priority areas where money is sorely needed, but a lot more than the above amount could reach them from their actual allocations if only efficient management and plugging of fund-leakage were possible.

But in the last analysis there is also the intellectual challenge that comes now and then and prompts an individual or a civilisation to rise and meet it. India has a tradition of taking up such challenges, vide its stake in Antarctica. You climb the Everest because it is there. You go to the moon because it is there.

