AOGS 2005

Planetary Exploration: Chandrayaan-1 Mission to Moon and Beyond

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The Indian Space Research Organisation (ISRO) has started a new initiative to launch dedicated scientific satellites earmarked for planetary exploration, astronomical observation and space sciences. The Chandrayaan-1 mission to Moon is one of the approved missions of this new initiative.

The basic objective of the Chandrayaan-1 mission, scheduled for launch in late 2007, is photo-selenological and chemical mapping of the Moon with better spatial and spectral resolution. Consistent with this scientific objective, the following baseline payloads are included in this mission: (i) Terrain mapping stereo camera (TMC) with 20 km swath (400-900 nm band) for 3D imaging of lunar surface at a spatial resolution of 5m. (ii) Hyper spectral wedge filter camera in the 400-920 nm band with 64 channels and spatial resolution of 80m (20 km swath) for mineralogical mapping. (iii) Collimated low energy (1-10keV) X-ray spectrometer using swept charge detector with a field of view of 20 km for chemical mapping of the lunar surface (iv) High-energy X-ray (20-250 keV) spectrometer employing CdZnTe solid-state detectors having a footprint of 40 km for study of volatile transport on Moon and (v) Laser ranging instrument with vertical resolution of ~10m.

ISRO also offered opportunity to the international scientific community to participate in Chandrayaan-1 mission and four payloads that complement the basic objective of the Chandrayaan-1 mission have been selected for inclusion in this mission. These are: a miniature imaging radar instrument (Mini-SAR) to look for presence of ice in the polar region, near infrared spectrometer (SIR-2) for mineralogical mapping in the infra-red regions (0.9 – 2.4 micron), a sub-keV atom reflecting analyzer (SARA) for detection of low energy neutral atoms emanated from the lunar surface and a radiation dose monitor (RADOM) for monitoring energetic particle flux in the lunar environment.

The mission will be implemented using indigenous Polar Satellite Launch Vehicle. The lunar-craft will be placed in an elliptical transfer orbit and subsequently into a lunar transfer trajectory for lunar orbit insertion. The lunar-craft will be placed in a 100 km circular lunar polar orbit. The lifetime of the mission will be two years.

At present, several proposals are under consideration as follow-ups of the Chandrayaan-1 mission. These include soft landing to carry out experiments on the lunar surface as well as exploration of other planets and minor objects (asteroids, comets) in the solar system.