A Giant Leap Towards The Moon

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It was on July 20, 1969 that "Eagle", the lunar module landed on moon and American Astronaut Neil Armstrong took "that one small step" paving way for "a giant leap for mankind".

Millions of people all over the world watched this event on Television and heard about the historic flight on radio. It has been described as one of the greatest moments in human history.

The moon landing marked the pinnacle of the space race that was going on for a decade between the two powers, the United States and the then Soviet Union. Neil Armstrong along with Edwin "Buzz" Aldrin and Michael Collins left the moon's orbit on 22 July and returned to Earth on 24 July.

Thirty-six years afterward, the echoes of man's first steps on the moon can still be heard around the world.

After the initial rush of lunar programmes in the 1960s and early 1970s there was a lull in investment in the space expeditions. But when a low-cost US spacecraft called Clementine reached lunar orbit and mapped the moon in 1994, it reappeared on the exploration radar screen.

The craft measured the moon's shape and aspects of its mineralogy, and conducted radar observations that appeared to suggest tantalizing deposits of water ice in permanently shadowed polar craters.

Lunar Prospector, a NASA spacecraft launched four years later, made

detailed measurements of the moon's near-side gravitational field, discovered indications of hydrogen—potentially related to water ice—in the polar regions, and found indications of new crustal magnetic signatures.

A New Wave

Now there is a global interest in the moon mainly because it is the scientific gateway to understanding the formation and evolution of the inner solar system and the early crusts of Earth and Mars. Being relatively easy to get to it could be used by beginners as a stepping-stone to explore Mars.

The moon is also being explored for its natural resources that could prove beneficial to earthlings. Among them is helium 3, a nonpolluting fusion fuel source. Scientists believe there are about 1 million tons of helium 3 on the moon - enough to satisfy Earth's energy needs for thousands of years.

Another way to supply Earth with energy is to harvest solar power from the moon. According to scientists harnessing just 1 percent of the moon's solar energy could replace fossil fuel power plants on Earth.

No wonder there is a new wave of research beginning with several countries racing towards the moon. Many spacecraft are lined up to arrive in lunar orbit. Europe's SMART-1, arrived in lunar orbit last November.

It will be followed by two Japanese spacecraft, Lunar-A and Selene in 2006. In 2007-08, India will launch Chandrayaan-1, which will be closely followed by China's CHANG'E-1. In 2008, the US will send the Lunar Reconnaissance Orbiter (LRO) to help scout locations for human exploration. The US is also planning a $700 million Moonrise mission

which will be launched in 2009–10.

Chandrayaan-1

Today India is confident of undertaking a complex space mission because of its indigenously developed launch vehicle and spacecraft capabilities. Indian Space Research Organization (ISRO) is spearheading all activities in this field.

Whether India should embark on a manned mission or not is a subject of national debate since sending a man to the moon is a very costly affair. A manned mission would take seven to ten years to accomplish, and would cost at least $2.2 billion. Besides, as G. Madhavan Nair, Head of ISRO, puts it, whatever a man can do in space, it can be done with instrumentation also.

Chadrayaan-1, India's first unmanned mission to moon was announced on August 15, 2003. The ambitious programme represents the country's foray into a planetary exploration era in the coming decades.

The Chandrayan-1 mission envisages placing a 525-kg satellite in a polar orbit 100-km above the moon and it will have a lifetime of two years. The satellite will be launched using a modified version of India's indigenous Polar Satellite Launch Vehicle (PSLV).

The spacecraft will initially be launched into Geo-synchronous Transfer Orbit, and subsequently maneuvered into its final lunar orbit using its own propulsion system.

The main objectives of Chandrayan-1 include obtaining imagery of the moon's surface using high-resolution remote sensing instruments in the visible, near infrared, low and high-energy X-ray regions. International Co-operation

Each mission has its own objectives and emphasis though many of the instruments on these spacecraft have similar capabilities. Despite having nationalistic lunar goals, nearly all the space agencies are discussing collaboration through organizations such as the International Lunar Exploration Working Group.

There are many bilateral and other negotiations going on. For example, Russia is contributing a neutron detector to LRO. European Space Agency, ESA and NASA are working with their Japanese counterpart.

Considering the interest expressed by the international scientific community, a provision has also been made to accommodate instruments from other countries on Chandrayaan-1.

Recently, ISRO signed an agreement with ESA for including European instruments on board Chandrayaan-1.

The European contribution will include a low energy (0.5-10 keV) X-ray spectrometer called Chandrayaan Imaging X-Ray Spectrometer from Rutherford Appleton Laboratory, UK, to measure elemental abundance distributed over the lunar surface using X-ray fluorescence technique, a near Infra-Red (IR) Spectrometer from Max Planck Institute of Aeronomie, Germany, to detect and measure lunar mineral abundances, Sub keV Atom Reflecting Analyser from Swedish Institute of Space Physics, developed in collaboration with India, to measure volatiles generated due to solar wind impacting on lunar surface and determine the surface magnetic field anomalies.

Europe will also contribute to the Indian experiment, namely, High Energy X-ray Spectrometer. The European instruments are to complement the main Indian experiments. The US is also considering placing up to two instruments on Chandrayaan-1.

The lunar gold rush is bound to produce remarkable new data sets about the moon by the end of the decade and the world will watch that one small step indeed turning into a gaint leap towards the moon.

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