

India Launches Strategic Satellites

by Ramtanu Maitra

On Oct. 22, the Indian space program reached a significant milestone, when the Polar Satellite Launch Vehicle (PSLV) put three satellites on a Sun-synchronous orbit. One of the satellites is the Technology Experiment Satellite (TES), widely acknowledged as the forerunner to the military spy satellite which India is in the process of developing.

The other two satellites put into orbit were the Bispectral and Infrared Remote Detection (BIRD) of Germany, and Project for On-Board Autonomy (PROBA) of Belgium. By placing the PROBA in an elliptical orbit of 638 kilometers apogee (farthest from the Earth), after the other two were placed in the circular orbit of 568 km, the Indian Space Research Organization (ISRO) has displayed its newly acquired capability of a multiple-orbit injection of multiple payloads.

ISRO, the keeper of India's space program, hopes to eventually use the PSLV launch vehicle to place satellites weighing more than 3,000 kilograms into low Earth orbit (400 km), and 1,000 kg satellites into geo-synchronous transfer orbit. With the expected indigenous development of cryogenic engines, giving India the capability of geo-synchronous satellite launch, India would rank among the nations on the front line of space development.

The PSLV C3 launch with the TES payload could not have been better timed. Present strategic conditions require not just an Indian presence in space, but an independent capability for high-resolution imaging. This is what the TES, a 1,108 kg satellite, aims to achieve. Technically, the TES should be able to provide images of vital strategic importance. The TES is important for India on two counts: better preparedness through reliable surveillance, and innumerable benefits for domestic planning and development. The economic gains of this technological advance should also translate into additional income from the sale of satellite photographic data. In addition to the high-resolution imaging capabilities, the space technology improvements that have gone into the program are considerable.

Perhaps the most important aspect of the launch is the Indian payload. The TES has a panchromatic camera capable of producing images of one-meter resolution, meaning that two objects on the Earth, separated only by a distance of one meter, could be distinguished in the images produced from orbit by the camera. Apart from use in various remote-sensing civilian applications, it gives for the first time an independent

capability of high-quality imagery intelligence, a vital input in assessing strategic threats from hostile powers. With two of India's neighbors possessing nuclear and missile capabilities, such intelligence, obtainable almost on a real-time basis (not older than three days), would be value added. A one-meter resolution would give the capability to detect vehicles and surface-to-surface missiles (SSMs) and surface-to-air missiles (SAMs).

Ensuring simplified designs and low-weight spacecraft, the solid-state recorder installed within the TES helps in downloading data captured by the satellite when it is not in visible range of the Indian ground stations. The Phased Array antenna with X band brings out the possibility of weather and daylight-independent imaging of desired regions. The revisit capability of this satellite, which would normally be around 20 days, could be reduced to three days by the satellite-tilting technology. It has a "step and stay" capability to look at the same spot for longer duration.

Broader Objective

India's space program in general, and its satellite imagery capabilities in particular, have a broader objective. India's top rocket scientist, and the mainstay in India's burgeoning missile program, Dr. A.P.J. Abdul Kalam, speaking at a conference earlier this year, said: "India is contemplating a move to send its first satellite mission to the Moon. We have placed several satellites on orbit successfully. I think we will do it [sending satellite to moon] also."

Referring to *Millennium Vision 2020*, a book he has co-authored, Dr. Abdul Kalam said that the time is not far off when India will also become a developed nation. "Dream, dream, dream, dream transfers into thought. And thoughts result in action," the father of India's missile program said. He said that more than 500 experts from all over the country are working to complete an "action-oriented plan" to place India in the category of the developed nations in the next two years.

India is now also looking seriously at developing a national missile defense system. India and Russia recently tested a jointly developed, state-of-the-art supersonic cruise missile, which may be unrivalled in the region. With a range of 280 km, the missile "is the first of its kind in the world," and will be simultaneously inducted into Indian and Russian arsenals, likely within the next two years, after several additional tests. One of its features is that it can be launched from land by a mobile launcher, or from a ship, submarine, or aircraft, to target warships at very long distances.

India is also in negotiations with Russia to purchase a missile defense system. Indian Prime Minister Atal Behari Vajpayee is scheduled to visit Russia on Nov. 4-7, to discuss enhancing Indo-Russian cooperation. It is almost certain that the missile defense system will be discussed. In October, Russian President Vladimir Putin made it known that Russia is willing to provide India with a defensive system against incoming missiles.