Essay No. 01

Indian Space Programme-ISRO

or

Space Programme of India

Astronomy and Space Science is an ancient science researched in India right from early civilization. Details of the solar system, planets, stars and other phenomenon like eclipse and records of comets have been found in the Vedic times.

The modern branch of space research started with the setting up of the Indian Meteorological Department at Colaba, Bombay (Mumbai) in the year 1823. The Calcutta (Kolkata) University started the study of space and ionosphere, located in the upper regions of our atmosphere, around the mid – 20's of the last century followed by higher studies in the field of astrophysics. This gained momentum in the 50's spreading to other centers over the country followed by the setting up of high-power telescopes at the Madras (Chennai) and Kodaikanal observatories.

Modern space programme received an impetus with the leadership of Dr. Vikram Sarabhai and facilities developed at Thumba, near Thiruvananthapuram, Kerala for lunching of space vehicles. This facilitated the two stage launch of a Soundind Rocket in 1969 and India was on its way.

Indian Space Research Organization functioning under the aegis of Department of space, Government of India is the apex body for providing direction of our space programme in terms of scientific and administrative functioning. It is overall responsible for execution, planning and management of space related technology and applications. There are several units and auxiliary wings functioning in tandem with ISRO which are the SHAR center at Sriharikota, the Vikram Sarabhai Centre at Thiruvananthapuram, the Space Application Centre at Ahmadabad, ISRO Satellite Centre located in Bengaluru etc.

The expense incurred are quite mind-boggling but it has been found necessary for weather survey, geological mapping and survey, satellite communication and remote sensing. They are also of help in the research of atmosphere and meteorology. And for these we need indigenous technology for developing rockets and satellite to help in the research activities.

ISRO has successfully developed various types needed to reach different levels of the atmosphere and to be remote controlled to send back the necessary dat. The range is wide from a rocket able to lift a 10 kgs payload to a height of 10 kilometers to the one capable of rising to more than 300 kilometers with a heavier pay load of about a 100 kgs.

Several launch vehicles have been successfully used by ISRO in the SLV series and the PCLV series which have resulted in our country being bracketed in the category of countries capable of launching Intermediate Range of Ballistic Missiles. The necessity of developing these IRB missiles was felt as Pakistan, our neighbor and enemy country was already into this with their Ghaurim Ghazanavi and HATF missiles tested and deployed against us. China has been covertly and overtly transporting the necessary know how to them over the decades the developed countries of the Western hemisphere have been unduly pressuring India to ban its space programmes while they have not been able to restrain Pakistan.

We deserve kudos for being successful in our developments under a total ban on any supply of missile technology from any country at all whereas Pakistan had the advantage of dedicated help form China and North Korea. The development of this technology, although more expensive for us, was needed to ward of threat from our neighbors, right fully acting as a deterrent. The Vikram Sarabhai Space Centre was entrusted the task of the Augmented Satellite Launch Vehicle and the Polar Satellite Launch Vehicle, ASLV and PSLV, which they successfully did.

The first satellite developed and launched by us was the ‘Aryabhatta’ in April 1975, although it was out in orbit by a Soviet Cosmos Rocket from a Soviet cosmodrome. This marked the first step in competent satellite technology. A remote sensing satellite ‘Bhaskara’ followed in June 1977 again from the erstwhile USSR. This contained two TV cameras and three microwave radiometers to transmit remote sensing imagery. Bhaskara II followed in 1981 and was in use till recently for imageries. Other functions and experiments are still continuing.

The more versatile INSAT series was planned for domestic telecommunications, geological and meteorological surveys and direct television transmission, all over the country network for beaming rural programmes. Unfortunately, the first in the series INSAT-1A launched in 1982 could not be fully activated initially. In needed the support of the multipurpose satellite INSAT-1B launched in August 1983, to restore its operating capability. The use of the US space shuttle Challenger was instrumental for its launch.

The first experimental geostationary communication satellite INSAT-1C was launched in July 1988 from French Guyana. It was not indigenous and was assembled at the Ford aerospace. The purpose was to expand television and

telephone capacities and collect meteorological data. However, this satellite was not up to the demands made and had a very short span due to short circuit.

In the same year, 1988, there was the launch of the just Remote Sensing Satellite IRS-1a by a Soviet Rocket 'Vostok'. The satellite weighing nearly a tone was put in a Polar Sun Synchronous orbit at the height of more than 900-kilometer, charge coupled devices, providing four band data. Three of these are of viable nature and the fourth one nearly infra-red. The National Remote Sensing Agency at Hyderabad monitors the data and makes it available.

US help was again needed for the launch of INSAT-1D. the MeDonnel Douglas Corporation of USA blasted this off its Delta 4925 rocket successfully a long need felt after the failure of INSAT-1C. This has been of great help with its

C-Band transponders for public utilities and Government telecommunication transmission facilities. The S-B transponders are being utilized for television broadcast.

The INSAT-1 series of satellites were quite a drain on our resources worth nearly Rs. 60 crore each and that too in foreign exchange. The INSAT-2 series were planned in 1990 with an estimated cost of Rs. 40 crore each. The experiment was to reduce the payload of each satellite and try place two smaller ones in orbit, near each other and working in tandem. The signals to be received and transmitted were to perpendicular to the other satellites. Five of the series were launched starting with INSAT-2A in July 1992 and ending with INSAT-2E in April 1999. The latter was a launch with minimum hassles and will remain operational for more than a decade. The vehicle carries 17 transponders with Intel Sat the global consortium cornering the bulk in lease.

The data is to be used mainly for communication and weather monitoring m specially advanced information on destructive storms. The other important purpose, which is beneficial to the Cable TV operator, is that most of the channels are using these for TV broadcast and the operator needs to align his dish antennae with them for maximum signals. ISRO took its first giant step towards commercial utility of its launches by launching three satellites at one go with the help of a single launch vehicle PSLV-C2 or the polar satellite launch vehicle. The three launched were, a massive one tone Ocean sat-1 of ours and two smaller one's form Germany and Korea. The feasibility was proved and we already have bookings form some developed countries for future launches.

Experiments on fitting cryogenic engines for the next generation of rockets the GSLV or Geosynchronous Satellite Launch Vehicle is at the final stage. A commercial wing of Antrix Corporation has been formed in line with the

Western corporation. The sanctions were earlier to avoid this new competition from a third world country and stands exposed. The Western corporations will do the best to ensure that this venture is not a success and we should be prepared to tack them on. We are entering a new threshold and need to be dedicated and clear-eyed about our goal.

Essay No. 02

India's Own Satellite Programme

A satellite is a rocket that runs round the Earth, Moon or other planets. India has been following her own Satellite programme. The first two Indian satellites, Aryabhatta and Bhaskara were launched from Russia by Russian vehicles. Rohini is India's third satellite which was very important for this country. It was the first to be launched from Indian soil. It weighted about 35 kilograms. It was launched on July, 18, 1980. It was great pride for our nations. It was sent up by a rocket called SLV-3. It took 12 minutes for the rocket to put Rohini in its orbit round the Earth.

The 22.7 meters rocket weighs 17 tones. It did a perfect take off from Sriharikota in Andhra Pradesh. The satellite has been designed by the Indian Space Research Organization. Dr. S. Dhawan, the Chairman of ISRO, said that the rocket and the satellite was conceived, designed and built by the Indian scientists. The import content was a mere 15 per cent of the total equipment. The latest models in computers were employed to beam signals from the satellite.

On May 4, 1994, India took a significant step towards becoming a global space power with the successful launch of the fourth developmental augmented Satellite launch vehicle (ASLV-D4) from the Sriharikota Range in Andhra Pradesh. The second successful Launch of ASLV also injected the 113-kg stretched Rohini Satellite series (SROSS – C2) into the orbit of 437 km perigee and 938 km apogee after the tremendous lift off.

The launch was cent per cent success and went off as per schedule without any hitch. The SROSS-C2 carries two payloads, namely the Gamma- Ray Burst experiment developed at the Bangalore based ISRO Satellite center for detecting celestial Gamma –ray bursts, and the retarding potential analyzer designed by the National Physical Laboratory to investigate the characteristics of the equatorial and low latitudes ionosphere and thermosphere.

All the events are monitored using a network of telemetry and tracking stations at Sriharikota, Bangalore, Thirurranatha -puram and Car- Nicobar. The Vikram Sarabai Space Centre at Thiruvananthapuram is the lead Centre for the design development , integration and flight testing of the design development , integration

and flight testing of the ASLV. The Liquid Propulsion Systems Centre nearby is entrusted with the task of the design and development of all the central power plants for both the launch vehicle and the Satellite. The military significance of the project is obvious. The success of India's satellite launch means that India now has the capability of Launching Intermediate Range Ballistic Missiles (IRBM)- flying bombs which can destroy far off cities from India in other countries.

Essay No. 03

Indian Space Programme

Indian mythology is full of stories of interplanetary travels 1 and flights. From the very beginning of civilization, space-flights have fired the human imagination. The modern space-age can be said to have begun with the launching of the Sputniks by Russia. Since then research and efforts in space travel have assumed many dimensions. The landing of man on the moon, the launch of space shuttles, and stations, etc. and the spectacular success of such spaceships as Mir, Viking, Voyager, Galileo, Ulysses, etc. reflect the strides taken in space by man. In the words of American President, Mr. Bush, "The infrastructure of space launch capability would be to the 21st century what the great highways and projects were to the 20th. Reliable space-launches would provide the 'highway' to solar system in the next century. We are well underway with unmanned explorations of the solar system."

India's entry into space-age is rather late, but it is said that better late than never. The beginning was made in 1975, when India launched its first scientific satellite Aryabhatta I into space, in collaboration with the U.S.S.R. As we did not have our own rocket-launcher, we were helped by the Russians. However, it gave the country space status. The second satellite, Bhaskara I, was launched on 7th June, 1979 from a Soviet commodore. This 444 kg experimental satellite contained instruments for carrying out remote sensing experiments. Then, an improved version of Bhaskara I, Bhaskara II was launched on 20th November, 1981, with the help of a Soviet booster-rocket- Rohini was the first Indian satellite to be launched from the Indian soil, using the indigenous SLV-3 vehicle on July 18, 1980. The launch rocket took 12 minutes to put Rohini in its orbit round the earth. Rohini made a perfect take- off from Sriharikota in Andhra Pradesh. With this India became the sixth country in the world to possess satellite launching capability. The other members of the space club were the U.S.S.R., the U.S.A., France, China and Japan.

The Indian- Space Research Organisation (ISRO) is responsible for the planning and execution of the space programme in India. It develops and fabricates rockets and satellites, etc. for different uses. It has its own rocket launching station at

Thumba, near Thiruvananthapuram. It has a great location advantage being very close to the magnetic equator. There is no other rocket launching station in the world close to the magnetic equator. The U.N. has recognised it as an international facility.

The Indian National Satellite System (INSAT), a multipurpose operational satellite system, was established in 1983. Since then it has successfully launched a series of INSATs including more advanced ones like INSAT-2C. Similarly, operational Indian Remote Sensing Satellites have made phenomenal progress. The series began with IRS-IA in March 1988. The IRS-IC had much better spectral and spatial resolutions, more frequent revisits, stereo viewing and on-board capabilities. It was followed by IRS-ID, IRSP4, INSAT-3B, GSLV-D1 and GSLV-D2.

India has now deployed such Intermediate Range Ballistic Missiles (IRBM) like the Prithvi, Nag, etc., which have been very successfully tested many a time. India's ambitious plan in rocketry, space research and missile technology have opened the path for continuous space exploration and self-reliance. The success of these space efforts marks a great advancement and proof of the scientific, engineering and technological capabilities of the Indian scientists.

In the field of developing and manufacturing of space-launch vehicles, as well as components, India has been a leader among the developing countries. It has already developed Polar Satellite Launch Vehicle (PSLV) capable of launching 1000-kg class of satellites into a polar sun synchronous orbit. It will soon develop and manufacture Geosynchronous Satellite Launch Vehicle, GSLV, incorporating cryo-engine technology, capable of placing 2,500 kg INSAT class of satellites in geosynchronous transfer orbit.

The space programme in India primarily aims at providing space-based services in the areas of communication, meteorology, resources survey and management. In these areas, India has already made significant progress through a well-integrated, self-reliant programme. Indian space research has not only enhanced the communication capabilities, but now it is also being widely used for providing advanced disaster warning, search and rescue measures, and distance education in remote areas. Similarly, space remote •sensing is providing vital inputs for agriculture, soil, forestry, land and water resources, environment, minerals, ocean development, and in the management of drought and flood disasters.

The wide network of space centres and units include Vikram Sarabhai Space Centre (VSSC) Thiruvananthapuram, ISRO Satellite Centre (ISAC), Bangalore, Space Application Centre (SAC), Ahmedabad, SHAR Centre Sriharikota in Andhra Pradesh, Development and Educational Communication Unit (DECU), Ahmedabad, ISRO Telemetry Tracking and Command Network (ISTRAC),

Bangalore, and Master Control Facility at Hassan in Karnataka. The scientists, technologists, engineers and technicians working in these prestigious institutions ensure steady progress in the field as they are exceptionally talented, devoted and ambitious. India is sure to achieve much more, in the use of space, both for the purpose of peace and for defense.

Squadron Leader Rakesh Sharma was the first Indian to go into space. He was launched into space, aboard the Soviet spaceship Soyuz T II along with Yuri Vasilevich and Gennady Mikhailovich, the two Russian cosmonauts. It happened on 3rd April, 1984, at Baikanourcosmodrome in Kazakhastan. Thus, India became the 14th nation to have sent a man into space. Dr. Kalpana Chawla became the first Indian lady to go into space in November, 1997. She was chosen out of 2,962 applicants by Johnson Space Centre in Houston, Texas, U.S.A. The 42 years old dynamic lady had the proud and rare privilege to embark on her second space voyage on January 16, 2003. But, tragically, on her return journey aboard the space shuttle, Columbia, on February 1, 2003, there was an explosion minutes before landing, killing her and all the other crew members.