Technical Visit Report

on

Space Application Center (ISRO), Ahmedabad

&

Vikram Sarabhai Space Exhibition –ISRO, Ahmedabad

on 21st july,2018

For

Diploma and degree student (Sem-1st)

Organized by:

D.A.DIPLOMA ENGNEERING AND DEGREE ENGG TECHNOLOGY MAHEMDAVAD
NEAR SIDDIVINAYAK TEMPLE,KHATRAJ CHOKDI
MAHEMDAVAD

About One Day Technical Visit :-

The Department of mechanical Engineering, DADET College of Engineering, Mahemdavad organized one day technical visit to Space Application Center and Vikram Sarabhai Space Exhibition unit of ISRO at Ahmedabad on 21st july, 2018 for the students of diploma and degree 1st year student with a 05 Faculty like name Sagar sir,jayshil sir,umang sir, nilesh sir, and dinkal mam view to familiarize and educate students in the field of Remote Sensing, Space applications, Earthquake Engineering and Smart City

Planning with Green Building Concept and also to enhance their concept regarding the practical aspects of construction, launching and operation of Satellite in space and to understand origins, properties and consequences of earthquakes, earthquake monitoring through standardized surface, ocean bottom and satellite observations.

LAB 1(Satellite Navigation Centre):

At first we visited the satellite navigation lab center named GNSS(Global Navigation Satellite System). There we saw different receiving satellites for communication and tracking purpose at SAC, ISRO. At outside the lab there were many different satellites being established of different heights and different focal lengths. One was to high up to 6.3 meters and other were small satellites. Next we entered to MSS(Mobile Satellite System) were a device has been

issued to different paramilitary officers including army, navy, air force, CRPF, etc. this device contended a tracking substance so that many scientists at ISRO,SAC can locate their locations if they are been attacked or trying to betray by any enemy party. So ISRO can inform to other government authorities for help as they may cannot contact.

LAB 2 (ANTENNA TESTING AND DETECTING CENTRE):

Next around 12:00 noon we visited the lab where satellites and antenna that are to be launched into space through missiles are been aligned and detected or tested here. As we entered the lab the lab was fully centered AC with the gargantuan size of hall which consisted of triangular cones made up of polyurethane material so to stop the disturbance or reduce the unnecessary reflection of the hall at the time of testing. First the antenna to be launched is placed at some mounting device which is mobile in nature. So to align and check the focal length of antenna with its receiving efficiency. There were to large mirrors being place in that gargantuan hall for the reflection and transmitting and receiving purpose of light to antenna, with each corona of the transmitting and reflecting mirror consisted of light source, and those mirrors e=were made up of Germany weighing around in tones.

Vikram Sarabhai Space Exhibition Centre(VSSE):

Some of the major attractions of the exhibition are a 3D auditorium, light and sound show on solar system, the virtual presenter, 3D holographic display and augmented reality. You will be personally guided at the exhibition .At last on this exhibition visit our ISRO trip was concluded.

Total 82 Students along with 04 faculty members had attended this one Day Technical visit.

Sr. No.	Place	Arrival	Departure	Remarks
1	Mahemdava	--	7:00 a.m.	Start From DADET Engineering Mahemdavad
2	SAC(ISRO)	9:30 a.m.	1:30 p.m.	Reporting and visiting SAC
3	Lunch	1:30 p.m.	2:15 p.m.	At SAC canteen
4	VSSE	2:30 p.m.	3:30 p.m.	Observation of space models

- **IRNSS:- (Indian regional navigation satellite system)**

IRNSS is an independent regional navigation satellite system being developed by India. It is designed to provide accurate position information service to users in India as well as the region extending up to 1500 km from its boundary, which is its primary service area. An Extended Service Area lies between primary service area and area enclosed by the rectangle from Latitude 30 deg South to 50 deg North, Longitude 30 deg East to 130 deg East.

IRNSS will provide two types of services, namely, Standard Positioning Service (SPS) which is provided to all the users and Restricted Service (RS), which is an encrypted service provided only to the authorised users. The IRNSS System is expected to provide a position accuracy of better than 20 m in the primary service area.

Some applications of IRNSS are:

- Terrestrial, Aerial and Marine Navigation
- Disaster Management
- Vehicle tracking and fleet management
- Integration with mobile phones
- Precise Timing

- Mapping and Geodetic data capture
- Terrestrial navigation aid for hikers and travellers
- Visual and voice navigation for drivers

The IRNSS Signal-in-Space Interface Control Document (ICD Ver. 1.1) for Standard Positioning Service (SPS) is released to the public to provide the essential information on the IRNSS signal-in-space, to facilitate research & development and aid the commercial use of the IRNSS signals for navigation-based applications. IRNSS-1A spacecraft provides messaging service to users in the Indian region. The Signal-in-Space Interface Control Document (ICD Ver. 1.0) for Messaging services (IRNSS 1A) is released to the public to provide the essential information to facilitate the use of IRNSS1A Signal-in-space for development of receiver

About the Launch Vehicle-

GSLV Mk III is a three-stage heavy lift launch vehicle developed by ISRO. The vehicle has two solid strap-ons, a core liquid booster and a cryogenic upper stage.

GSLV Mk III is designed to carry 4 ton class of satellites into Geosynchronous Transfer Orbit (GTO) or about 10 tons to Low Earth Orbit (LEO), which is about twice the capability of GSLV Mk II.

The two strap-on motors of GSLV Mk III are located on either side of its core liquid booster. Designated as ‘S200’, each carries 205 tons of composite solid propellant and their ignition results in vehicle lift -off . S200s function for 140 seconds. During strap-ons functioning phase, the two clustered Vikas liquid Engines of L110 liquid core booster will ignite 114 sec after lift -off to further augment the thrust of the vehicle. These two engines continue to function after the separation of the strap-ons at about 140 seconds after lift -off.

Vehicle Specifications

Height	: 43.43 m
Vehicle Diameter	: 4.0 m
Heat Shield (Payload Fairing) Diameter	: 5.0 m

Number of Stages	: 3
Lift Off Mass	: 640 tonnes

Satellite Communication utilisation has become wide spread and ubiquitous throughout the country for such diverse applications like Television, DTH Broadcasting, DSNG and VSAT to exploit the unique capabilities in terms of coverage and outreach. The technology has matured substantially over past three decades and is being used on commercial basis for a large number of applications. Most of us are touched by satellite communication in more ways than we realise.

The potential of the technology for societal applications continue to fascinate ISRO and efforts are on to leverage the benefits of technology to the betterment of mankind. Important initiatives pursued by ISRO towards societal development include Tele-education, Tele-medicine, Village Resource Centre (VRC) and Disaster Management System (DMS) Programmes. The potential of the space technology for applications of national development is enormous.

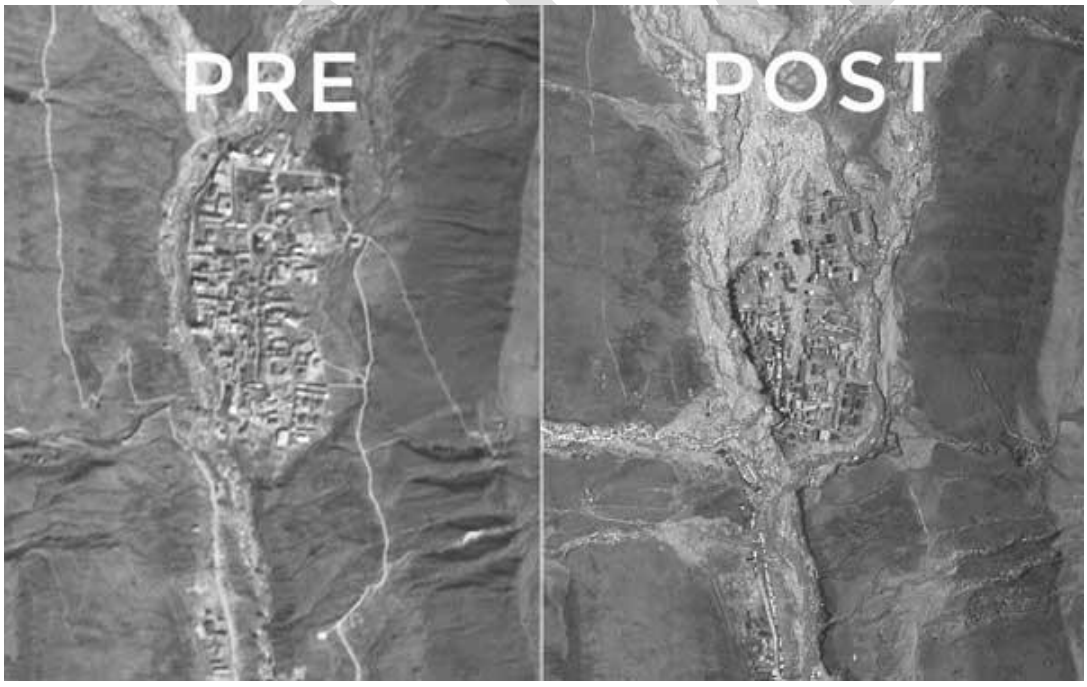
Applications-

- Telecommunication
- Tele-Medicine
- Tele-Education
- Mobile Satellite Services
- Radio Networking

- Village Resource Centre
- Satellite Aided Search and Rescue
- Satellite Navigation Programme
- Satellite News Gathering and Dissemination
- Standard Time and Frequency Signal Dissemination Services
- Television
- Training and Developmental Communications Channel (TDCC)
- Satellites for Communication

Disaster Management Support Programme-

India has been traditionally vulnerable to natural disasters on account of its geo-climatic conditions. Floods, droughts, cyclones, earthquakes and landslides have been recurrent phenomena. About 60% of the landmass is prone to earthquakes of various intensities; over 40 million hectares is prone to floods; close to 5,700 km long coastline out of the 7,516 km, is prone to cyclones; about 68% of the cultivable area is susceptible to drought. The Andaman & Nicobar Islands, the East and part of West coast are vulnerable to Tsunami. The deciduous/ dry-deciduous forests in different parts of the country experience forest fires. The Himalayan region and the Western Ghats are prone to landslides.



Satellite images showing the damages at Kedarnath village caused by the flash floods in June 2013

Under the DMS programme, the services emanating from aerospace infrastructure, set up by ISRO, are optimally synthesized to provide data and information required for efficient

management of natural disasters in the country. The Geostationary satellites (Communication and Meteorological), Low Earth Orbiting Earth Observation satellites, aerial survey systems together with ground infrastructure form the core element of the observation Systems for disaster management.

The Decision Support Centre established at National Remote Sensing Centre (NRSC) of ISRO is engaged in monitoring natural disasters such as flood, cyclone, agricultural drought, landslides, earthquakes and forest fires at operational level. The information generated from aero-space systems are disseminated to the concerned in near real time for aiding in decision making. The value added products generated using satellite imagery helps in addressing the information needs covering all the phases of disaster management such as, preparedness, early warning, response, relief, rehabilitation, recovery and mitigation.

Earth Observation:-

The Indian Remote sensing programme is driven by the user needs. In fact, the first remote sensing based pilot project was carried out to identify coconut root-wilt disease in Kerala way back in 1970. This pilot project led the development of Indian Remote Sensing (IRS) satellites. Varieties of instruments have been flown onboard the IRS satellites to provide necessary data in a diversified spatial, spectral and temporal resolutions to cater to different user requirements in the country and for global usage.

These IRS satellites observe the planet Earth from space and provide us periodically synoptic and systematic information pertaining to land, ocean and atmosphere and several aspects of environment. This information is a key ingredient in the programmes of the government at the Centre and State towards ensuring food and water security, sustaining our environment and eco-system, understanding weather and climate, monitoring and management of natural resources, planning and monitoring of developmental activities, support to management and mitigation during disaster events, and information for better governance.

The remote sensing applications and geospatial technology oriented projects at National, Regional, State and local levels are carried out through a well-established multi-pronged implementation architecture of National Natural Resources Management System (NNRMS) in the country. Major ISRO/ DOS Centres, namely, National Remote Sensing Centre and Space Applications Centre (SAC), spearhead all such applications development and implementation initiatives.

Regional Remote Sensing Centres (RRSCs) of NRSC, North-Eastern Space Applications Centre (NE-SAC), Shillong and respective State Remote Sensing Applications Centres play a major role in applications and addressing local requirements for effective utilisation of the technology. User Ministries of State and Central Government departments and others institutions play a major role

in utilising the technology in their own departments through the NNRMS system. In addition, private sector, Non-Governmental Organisations and academia also play a major role in the usage of this technology in different developmental sectors of the country.

Scramjet Engine – TD:-

The first experimental mission of ISRO's Scramjet Engine towards the realisation of an Air Breathing Propulsion System was successfully conducted on August 28, 2016 from Satish Dhawan Space Centre SHAR, Sriharikota.

After a flight of about 300 seconds, the vehicle touched down in the Bay of Bengal, approximately 320 km from Sriharikota. The vehicle was successfully tracked during its flight from the ground stations at Sriharikota. With this flight, critical technologies such as ignition of air breathing engines at supersonic speed, holding the flame at supersonic speed, air intake mechanism and fuel injection systems have been successfully demonstrated.

The Scramjet engine designed by ISRO uses Hydrogen as fuel and the Oxygen from the atmospheric air as the oxidiser. This test was the maiden short duration experimental test of ISRO's Scramjet engine with a hypersonic flight at Mach 6. ISRO's Advanced Technology Vehicle (ATV), which is an advanced sounding rocket, was the solid rocket booster used for the test of Scramjet engines at supersonic conditions. ATV carrying Scramjet engines weighed 3277 kg at lift-off.

ISRO's Scramjet Engine Technology Demonstrator Successfully Flight Tested-

Today, satellites are launched into orbit by multi-staged satellite launch vehicles that can be used only once (expendable). These launch vehicles carry oxidiser along with the fuel for combustion to produce thrust. Launch vehicles designed for one time use are expensive and their efficiency is low because they can carry only 2-4% of their lift-off mass to orbit. Thus, there is a worldwide effort to reduce the launch cost.

Nearly 70% of the propellant (fuel-oxidiser combination) carried by today's launch vehicles consists of oxidiser. Therefore, the next generation launch vehicles must use a propulsion system which can utilise the atmospheric oxygen during their flight through the atmosphere which will considerably reduce the total propellant required to place a satellite in orbit.

Also, if those vehicles are made re-usable, the cost of launching satellites will further come down significantly. Thus, the future re-usable launch vehicle concept along with air-breathing propulsion is an exciting candidate offering routine access to space at far lower cost.