

# Organisation

The space activities in the country were initiated with the setting up of Indian National Committee for Space Research (INCOSPAR) in 1962. In the same year, the work on Thumba Equatorial Rocket Launching Station (TERLS), near Thiruvananthapuram was also started. The Indian space programme was institutionalised in November 1969 with the formation of Indian Space Research Organisation (ISRO). The Government of India constituted the Space Commission and established the Department of Space (DOS) in June 1972 and brought ISRO under DOS in September 1972.

The Space Commission formulates the policies and oversees the implementation of the Indian space programme to promote the development and application of space science and technology for the socio-economic benefit of the country. DOS implements these programmes through, mainly, Indian Space Research Organisation (ISRO), National Remote Sensing Agency (NRSA), Physical Research Laboratory (PRL), National Atmospheric Research Laboratory (NARL), North Eastern-Space Applications Centre (NE-SAC) and Semi-Conductor Laboratory (SCL). The Antrix Corporation, established in 1992 as a government owned company, markets the space products and services.

The establishment of space systems and their applications are coordinated by the national level committees, namely, INSAT Coordination Committee (ICC), Planning Committee of on Space Sciences (ADCOS).

The Secretariat of DOS, Civil Engineering Division and ISRO Headquarters are located at Antariksh Bhavan in Bangalore. Programme offices at ISRO Headquarters coordinate the programmes like satellite communication, earth observation, launch vehicle, space science, disaster management support, sponsored research scheme, contracts management, international cooperation, safety, reliability, publications and public relations, budget and economic analysis and human resources development. The major establishments of DOS and their area of activities are given in the following paragraphs:

## **Vikram Sarabhai Space Centre (VSSC)**

VSSC at Thiruvananthapuram is the lead centre for the development of satellite launch vehicles and associated technologies. The centre pursues research and development in the fields of aeronautics; avionics; composites; computer and information; control, guidance and simulation; launch vehicle design; mechanical engineering; mechanisms, vehicle integration and testing; propellants, polymers, chemicals and materials; propulsion, propellants and space ordnance; and systems reliability. Programme planning and evaluation, technology transfer and industrial coordination, human resources development, safety and personnel and general administration groups support the centre.

An Ammonium Perchlorate Experimental Plant (APEP) has been set up by VSSC at Aluva in Kerala.

The Space Physics Laboratory at VSSC carries out research in atmospheric and related space sciences.

The major programmes at VSSC include: Polar Satellite Launch Vehicle (PSLV), Geosynchronous Satellite Launch Vehicle (GSLV), Rohini Sounding Rocket, Space-capsule Recovery Experiment, Reusable Launch Vehicles and Air Breathing Propulsion.

### **ISRO Satellite Centre (ISAC)**

ISAC at Bangalore is engaged in developing satellite technology and implementation of satellite systems for scientific, technological and application missions. ISAC is functionally organised into five major areas: mechanical systems area including structures, thermal systems and spacecraft mechanisms; digital and communications area including digital systems and communication systems; integration and power area comprising spacecraft checkout, systems integration and power systems; controls and mission area consisting of control system, mission development and computer and information; and facilities. Reliability and components area and programme planning and evaluation group provide relevant support to the centre. Project management teams co-ordinate the implementation of INSAT and IRS projects. Space astronomy and instrumentation division is engaged in space science activities. ISRO Satellite Integration and Test Establishment (ISITE) including a Comprehensive Assembly, Test and Thermo-vacuum Chamber (CATVAC) provides necessary support for qualification of sub-systems and systems to meet the requirements of space environment.

### **Satish Dhawan Space Centre (SDSC) SHAR**

SDSC SHAR, with two launch pads is the main launch centre of ISRO and has facilities for solid propellant processing, static testing of solid motors, launch vehicle integration and launch operations, range operations comprising telemetry, tracking and command network and mission control centre. Management service group, advanced engineering group, reliability and Sriharikota Common Facilities support the centre.

### **Liquid Propulsion Systems Centre (LPSC)**

LPSC is the lead centre in the development of liquid and cryogenic propulsion for launch vehicles and satellites. The activities are spread across Thiruvananthapuram, Mahendragiri and Bangalore. LPSC at Thiruvananthapuram carries out design and system engineering of earth storable and cryogenic engine and stages for launch vehicles, design and development of bipropellant thrusters and electric propulsion thrusters for spacecraft, control components and control systems. LPSC, Mahendragiri carries out assembly, integration and testing of earth storable and cryogenic engines and stages, high altitude testing of upper stage engine and spacecraft thrusters, as well as testing of subsystems. This centre also has facilities for storage of earth storable and cryogenic propellant including an Integrated Liquid Hydrogen Plant. LPSC at Bangalore carries out design, development and testing of propulsion systems for spacecraft. It also carries out transducer design and development.

## **Space Applications Centre (SAC)**

SAC at Ahmedabad is engaged in the development of payloads for communication, meteorological and remote sensing satellites. SAC also carries out research and development on various space applications programme. The activities are grouped under microwave systems, satellite communication applications, sensor developments, image and information processing and remote sensing applications. Programme planning group, systems reliability group and library and documentation group support the centre. SAC also operates Delhi Earth Station (DES) for satellite communication.

## **Development and Educational Communication Unit (DECU)**

DECU at Ahmedabad is involved in the conceptualisation, definition, planning, implementation and socio-economic evaluation of space applications. The major activities of DECU at present include: EDUSAT projects, their implementation and utilisation; Training and Development Communication Channel (TDCC), Village Resource Centres (VRC), tele-medicine, science channel and new satellite communication development and applications.

## **ISRO Telemetry, Tracking and Command Network (ISTRAC)**

SRO Radar Development Unit (ISRAD) at Bangalore, working under the overall umbrella of ISAC has been integrated with ISTRAC. Research and development in the area of radar systems needed for space programme like tracking radars, wind profile radar and weather radars needed for meteorological applications are being undertaken.

ISTRAC provides mission support to low-earth orbit satellites as well as launch vehicle missions. ISTRAC has its headquarters and a multi-mission Spacecraft Control Centre at Bangalore. It has a network of ground stations at Bangalore, Lucknow, Sriharikota, Port Blair and Thiruvananthapuram in India besides stations at Mauritius, Bearslake (Russia), Brunei and Biak (Indonesia). ISTRAC activities are organised into network operations, network augmentation, mission operation and spacecraft health monitoring, communications and computers and control centre facilities and development projects. Programme planning and reliability groups support ISTRAC activities. ISTRAC also operates the Local User Terminal / Mission Control Centre (LUT/MCC) under the international programme for satellite-aided search and rescue. An Indian Deep Space Tracking Network station at Bangalore for India's mission to moon, Chandrayaan-1, is being established by ISTRAC.

## **Master Control Facility (MCF)**

MCF at Hassan in Karnataka and Bhopal in Madhya Pradesh monitors and controls all the geo-stationary satellites of ISRO. MCF carries out operations related to initial orbit raising of satellites, in-orbit payload testing, and on-orbit operations throughout the life of these satellites. The operations involve continuous tracking, telemetry and commanding, special operations like eclipse management, station-keeping manoeuvres and recovery in case of contingencies. MCF interacts with the user agencies for

effective utilisation of the satellite payloads and to minimise the service disturbances during special operations.

### **ISRO Inertial Systems Unit (IISU)**

IISU at Thiruvananthapuram carries out research and development in inertial sensors and systems and allied satellite elements. IISU is organised into research and development groups in the areas of launch vehicle inertial systems, spacecraft inertial systems, inertial system production and reliability and quality assurance. It has facilities for precision fabrication, assembly, clean room and integration and testing.

### **Laboratory for Electro-Optic Systems (LEOS)**

LEOS at Bangalore carries out research and development in the field of electro-optic sensors and cameras required for satellites and launch vehicles.

### **National Remote Sensing Centre (NRSC)**

NRSC at Hyderabad has been converted into a full-fledged centre of ISRO since September 1, 2008. Earlier, NRSC was an autonomous body called National Remote Sensing Agency (NRSA) under Department of Space (DOS). The Centre is responsible for remote sensing satellite data acquisition and processing, data dissemination, aerial remote sensing and decision support for disaster management. NRSC has set up data reception station at Shadnagar near Hyderabad for acquiring data from Indian remote sensing satellites as well as others. The Centre is also engaged in executing remote sensing application projects in collaboration with the users.

Indian Institute of Remote Sensing at Dehra Dun, which conducts training courses in remote sensing for user agency personnel at different levels, functions under NRSC. IIRS also hosts and supports the Centre for Space Science and Technology Education (UN centre) in Asia Pacific.

### **Physical Research Laboratory (PRL)**

PRL at Ahmedabad, is an autonomous institution supported mainly by DOS. It is a premier institute engaged in basic research in experimental and theoretical physics, astronomy and astrophysics, earth, planetary and atmospheric sciences. The activities cover a wide spectrum of competitive research in all these areas. PRL is also involved in conducting extensive academic programmes for Doctoral and Post Doctoral research and also has an Associate-ship programme for university teachers. It is also entrusted with the management of the Udaipur Solar Observatory (USO).

### **National Atmospheric Research Laboratory (NARL)**

NARL at Gadanki near Tirupati is an autonomous society supported by DOS. It is a centre for atmospheric research with facilities like mesosphere-stratosphere-troposphere radar, LIDAR, lower atmospheric wind profiler, disdrometer, optical rain

gauge and automatic weather station along with associated facilities. NARL is available for national and international scientists to conduct atmospheric research.

### **Regional Remote Sensing Service Centres (RRSSC)**

Five RRSSCs have been established by DOS at Bangalore, Jodhpur, Kharagpur, Dehradun and Nagpur. RRSSCs support various remote sensing tasks specific to their regions as well as at the national level. RRSSCs participate actively in areas like disaster management, software development, agro-climatic planning, national drinking water mission, national resources census, large scale mapping, etc, besides taking up projects for various ministries and departments.

### **North Eastern-Space Applications Centre (NE-SAC)**

NE-SAC, located at Shillong, is a joint initiative of DOS and North Eastern Council to provide support to the North Eastern region in using space science and technology for development. The centre has the mandate to develop high technology infrastructure support to enable NE states to adopt space technology inputs for their development. At present, NE-SAC is providing developmental support by undertaking specific projects, utilising space technology inputs – remote sensing, satellite communication and space science.

### **Antrix Corporation Limited**

The Antrix Corporation Limited, Bangalore is the marketing agency under DOS with access to resources of DOS as well as Indian space industries. Antrix markets subsystems and components for satellites, undertakes contracts for building satellites to user specifications, provides launch services and tracking facilities and organises training of manpower and software development.

### **Semi-Conductor Laboratory (SCL)**

The administrative control of Semi-Conductor Complex Limited, Chandigarh, a public sector undertaking under Ministry of Communications and Information Technology (MCIT) was transferred to Department of Space during March 2005. DOS has re-structured SCL company and has registered SCL as a research and development society in November 2005. SCL is entrusted with design and development of Very Large Scale Integration (VLSI) devices and development of systems for telecommunication and space sectors. SCL has facilities for fabrication of micro-electronic devices in 0.8 micron range and Micro Electro Mechanical Systems (MEMS). Actions to upgrade the facilities to fabricate advanced devices in 0.25 micron range have been initiated.

### **Indian Institute of Space Science and Technology (IIST)**

IIST, an institute of excellence has been established with the objective of offering high quality education in space science and technology to meet the demands of Indian

Space Programme. IIST was inaugurated on September 14, 2007 at Thiruvananthapuram.

The institute offers Bachelors Degree in Space Technology with specialisation in Avionics and Aerospace Engineering and Integrated Masters Programme in Applied Sciences with special emphasis on space related subjects. IIST will be a residential institute and is being developed on a picturesque site near Thiruvananthapuram.

140 students from various parts of the country have enrolled for under graduate and masters courses. Presently, the courses are being conducted at the alternative campus developed at Vikram Sarabhai Space Centre, Thiruvananthapuram.