भारत सरकार
अंतरिक्ष विभाग

सत्यमेव जयते

GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

वार्षिक रिपोर्ट

ANNUAL REPORT

2025-26

भारत सरकार
अंतरिक्ष विभाग

GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

वार्षिक रिपोर्ट
Annual Report

2025-2026

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Space Missions

(As per Financial Year)

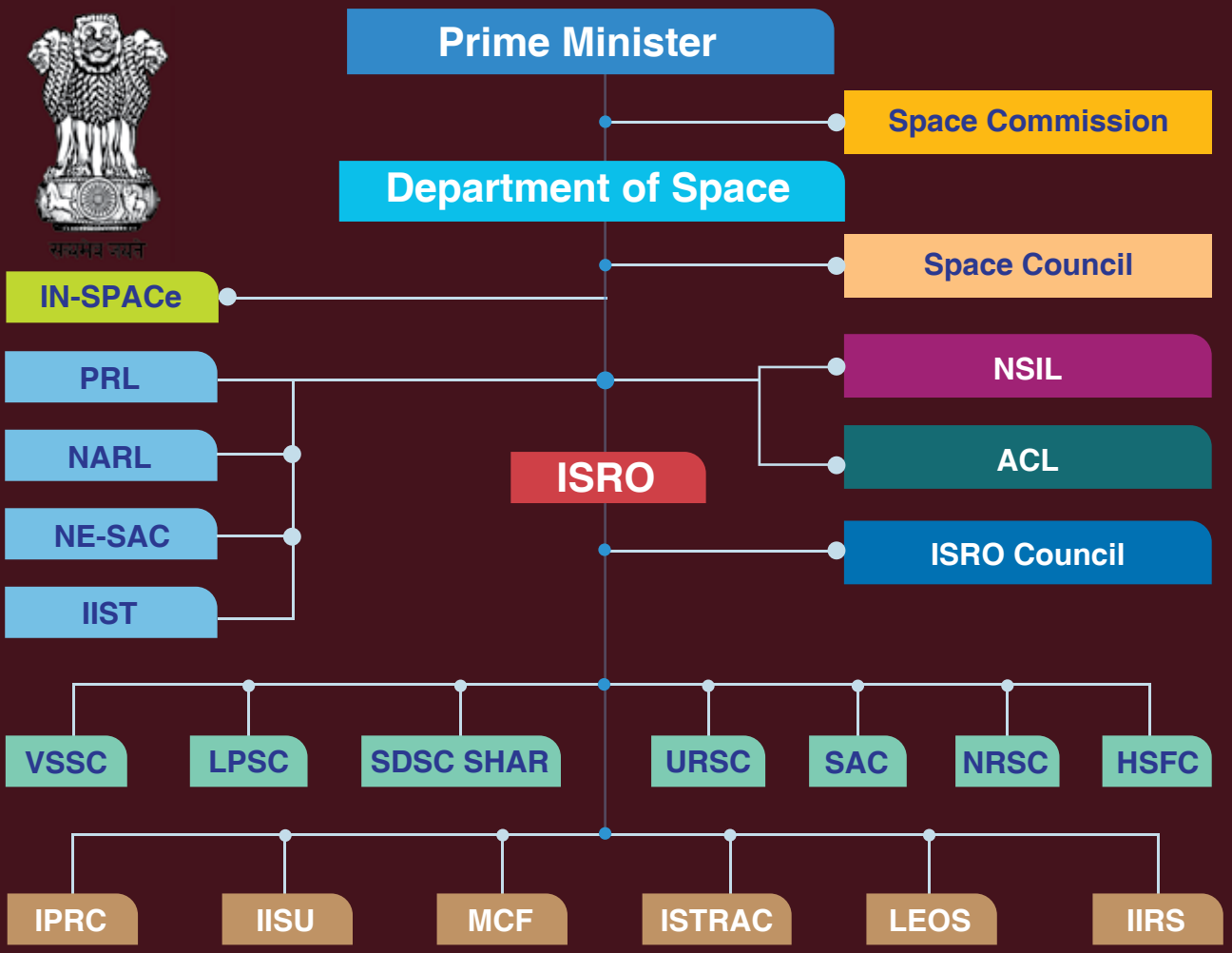
MISSION	2024-25	2025-26	2026-27
Earth Observation Satellites	1	4	3
Communication Satellites	1	1	2
Navigation Satellites	1	0	2
Space Science Satellites	0	0	0
Technology Demonstrator	4	1	3
PSLV	2	2	4
GSLV MkII	1	2	3
LVM3	0	2	1
SSLV	1	0	5
Gaganyaan	0	3	4
TOTAL	11	15	27

Note: The financial year 2025-26 includes missions which are planned by March 2026.


CHAPTER
01

The Organization

Organization Chart



ACL
Antrix Corporation Limited

HSFC
Human Space Flight Centre

IIRS
Indian Institute of Remote Sensing

IIST
Indian Institute of Space Science and Technology

IISU
ISRO Inertial Systems Unit

IN-SPACe
Indian National Space Promotion and Authorisation Centre

IPRC
ISRO Propulsion Complex

ISRO
Indian Space Research Organisation

ISTRAC
ISRO Telemetry, Tracking and Command Network

LEOS
Laboratory for Electro-Optics Systems

LPSC
Liquid Propulsion Systems Centre

MCF
Master Control Facility

NARL
National Atmospheric Research Laboratory

NE-SAC
North Eastern Space Applications Centre

NRSC
National Remote Sensing Centre

NSIL
NewSpace India Limited

PRL
Physical Research Laboratory

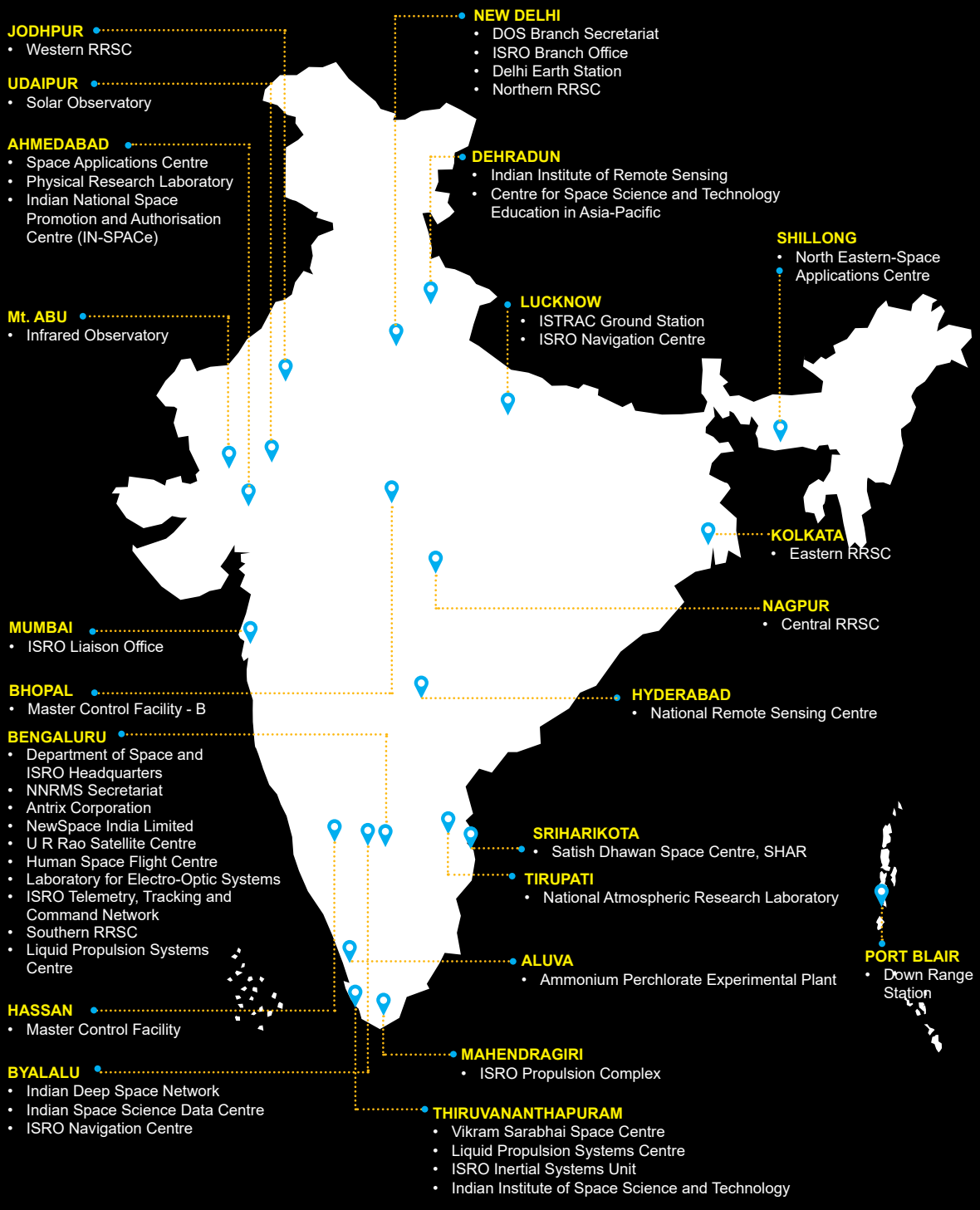
SAC
Space Applications Centre

SDSC SHAR
Satish Dhawan Space Centre Sriharikota High Altitude Range

URSC
U R Rao Satellite Centre

VSSC
Vikram Sarabhai Space Centre

DOS Establishments in India



Space activities in the country were launched with the setting up of the Indian National Committee for Space Research (INCOSPAR) in 1962. Work on the Thumba Equatorial Rocket Launching Station (TERLS) near Thiruvananthapuram was also started during the same year. In August 1969, the Indian Space Research Organisation (ISRO) was established. In June 1972, the Space Commission and the DOS were constituted by the Government of India (GoI) and brought ISRO under DOS in September 1972.

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 ISRO, Physical Research Laboratory (PRL), National Atmospheric Research Laboratory (NARL), and North Eastern-Space Applications Centre (NE-SAC). Antrix Corporation Ltd. and New Space India Limited are the two Central Public Sector Enterprises set up for the commercialization of R&D activities of DOS. IN-SPACe is a single window agency for all space sector activities of private entities, boosting the private space sector economy in India.

DOS Secretariat and ISRO Headquarters are located at Antariksh Bhavan in Bengaluru. Programme offices at ISRO Headquarters coordinate programmes like satellite communication, earth observation, navigation, launch vehicle, space science, disaster management support, sponsored research schemes, technology development, Human Spaceflight, international cooperation, systems reliability and quality, safety, budget and economic analysis, human resources and capacity building & public outreach. The major establishments of DOS and their area of activities are given in the following paragraphs.

VSSC


VSSC Main Building at Veli Range Complex

Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram

Vikram Sarabhai Space Centre (VSSC) at Thiruvananthapuram is the lead Centre of Indian Space Research Organisation (ISRO), mainly responsible for the design and development of space transportation systems and associated technologies. Major programmes at VSSC include Gaganyaan, Polar Satellite Launch Vehicle (PSLV), Geosynchronous Satellite Launch Vehicle (GSLV), Launch Vehicle MkIII (LVM3), Small Satellite Launch Vehicle (SSLV), winged Reusable Launch Vehicle (RLV), Rohini Sounding Rockets as well as development of various technologies for future. PSLV, GSLV, LVM3 and SSLV are in operational phase. The Centre has been leading the development of ISRO's Next Generation Launch Vehicle (NGLV) as well as the development of critical systems related to Gaganyaan including Human rated HLVM3, design of Crew Module, parachute systems, Crew Escape System and mission design.

VSSC has core competence in multiple disciplines and pursues advanced research & development in cutting edge technologies for space transportation systems, its overall project management, technology transfer, academic interface and enabling space industry ecosystem.

URSC

U R Rao Satellite Centre (URSC), Bengaluru

URSC is the lead Centre for design, development, realization of communication, navigation, remote sensing, scientific and Interplanetary missions. Over the past five decades, specialized teams of scientists, engineers and technicians of URSC have built more than 130 complex & advanced satellites for various applications in areas of telecommunications, television broadcasting, VSAT services, tele-medicine, tele-education, navigation, weather forecasting, disaster warning, search and rescue operations, earth observations, natural resource management, scientific and space science etc. with the support of administrative personnel.

URSC is also engaged in research and development activities involving cutting-edge satellite technologies, total management of all satellite missions, creation of a vibrant space industry for the realization of space systems, technology transfer, academia interface, etc. The Centre also houses ultra-modern design, development, fabrication and testing facilities for satellites. URSC is functioning in its sprawling 32 acres main campus, adjacent to NAL, HAL Airport Road and 110 acres ISRO Integration & Testing Establishment (ISITE) campus at Marathahalli, 8 km away from the main campus.

SDSC

Satish Dhawan Space Centre (SDSC) SHAR

Satish Dhawan Space Centre (SDSC)-SHAR, Sriharikota

Satish Dhawan Space Centre (SDSC) SHAR, Sriharikota – the Space Port of India is the backbone of Department of Space in providing the Launch Base Infrastructure for the Indian Space Programme. Envisaging the needs of the Launch vehicle & Satellite community and accordingly realizing the facilities have been the constant endeavor of this Centre.

SDSC SHAR has the State-of the art facilities for Solid Motor production, Testing & qualification of Systems, Stage Preparation Facilities, Vehicle Integration facilities, Satellite Preparation facilities, Propellant servicing systems, Mission Management systems etc., for preparation and launch of launch vehicles from the two operational launchpads and meet the ISRO's launch manifest.

LPSC


LPSC (Bengaluru)


LPSC (Valiamala)

Liquid Propulsion Systems Centre (LPSC), Thiruvananthapuram/Bengaluru

Liquid Propulsion Systems Centre (LPSC) is the lead Centre of ISRO for design, development and realization of earth-to-orbit advanced propulsion systems for launch vehicles and also space propulsion systems for spacecrafts. LPSC is vested with the responsibility of design, development and delivery of high performance space propulsion systems employing Earth Storable, Cryogenic, Semi Cryogenic and Electric Propulsion Systems for ISRO launch vehicles and Satellites.

LPSC activities and facilities are spread across its two campuses viz. LPSC, Valiamala/ Thiruvananthapuram and LPSC, Bengaluru/Karnataka. The activities in its campus at Valiamala include design and development entities for earth storable, cryogenic, semicryogenic and electric propulsions systems. The end to end design, development and realisation of flow control components and modules, advance manufacturing and proto fabrication entities, project teams, management systems activities, as well as R&D activities in the area of propulsion and structure are carried out by expert entities. LPSC activities in its campus at Bengaluru include design and realisation of propulsion systems for Earth Observation, Communication, Navigation satellites and other scientific missions. Also, development and production of transducers & sensors are undertaken here. A new campus at Tumkuru is also established for Integrated Titanium alloy Tank production and Mono propellant thruster test facility.

SAC


SAC Main Campus


SAC New Bopal Campus


SAC Bopal Technical Campus


Delhi Earth Station

Space Applications Centre (SAC), Ahmedabad

Space Applications Centre (SAC), is a major research and development Centre of the Indian Space Research Organisation (ISRO). SAC today stands high in each of its endeavor with its strong space research & development capabilities and continues to deliver world-class technologies and applications for various national, strategic, societal and technology demonstration missions of ISRO. These applications are in diverse areas and primarily meet the communication, navigation and remote sensing needs of the country. Located at Ahmedabad, SAC is spread across three campuses having multi-disciplinary activities apart from Delhi Earth Station (DES), which is located in New Delhi. The genesis of the Centre dates back to 1966, with establishment of the Experimental Satellite Communication Earth Station (ESCES), by late Dr. Vikram A Sarabhai in Ahmedabad. In 1972, the different units of ISRO in Ahmedabad pursuing research in applications of space technology were merged to form Space Applications Centre (SAC). SAC has state-of-the-art electronic and mechanical fabrication facilities, highly sophisticated payload integration, climatic & environmental test facilities, systems reliability area, image processing and analysis facilities and project management support group.

HSFC

Human Space Flight Centre

Human Space Flight Centre (HSFC), Bengaluru

As the lead Centre for the Human space activities, HSFC is undertaking multi-disciplinary R&D activities in new domains of human science and technology, while conforming to high standards of reliability and human safety. HSFC is developing expertise, building necessary infrastructure and pursuing development of enabling technologies for the sustained human space flight missions in the country. HSFC is nurturing and streamlining new technologies related to life support systems, Bio Medical Research, Bioastronautics, Space Medicine, Crew Health Management, Simulators, virtual reality, space-based habitats, Human Centric Engineering Systems including advanced Crew Training Facilities. Crew recovery operations, procedures for crew mission operations, crew aids development and inter agency coordination are also essential activities of HSFC.

NRSC


National Remote Sensing Centre

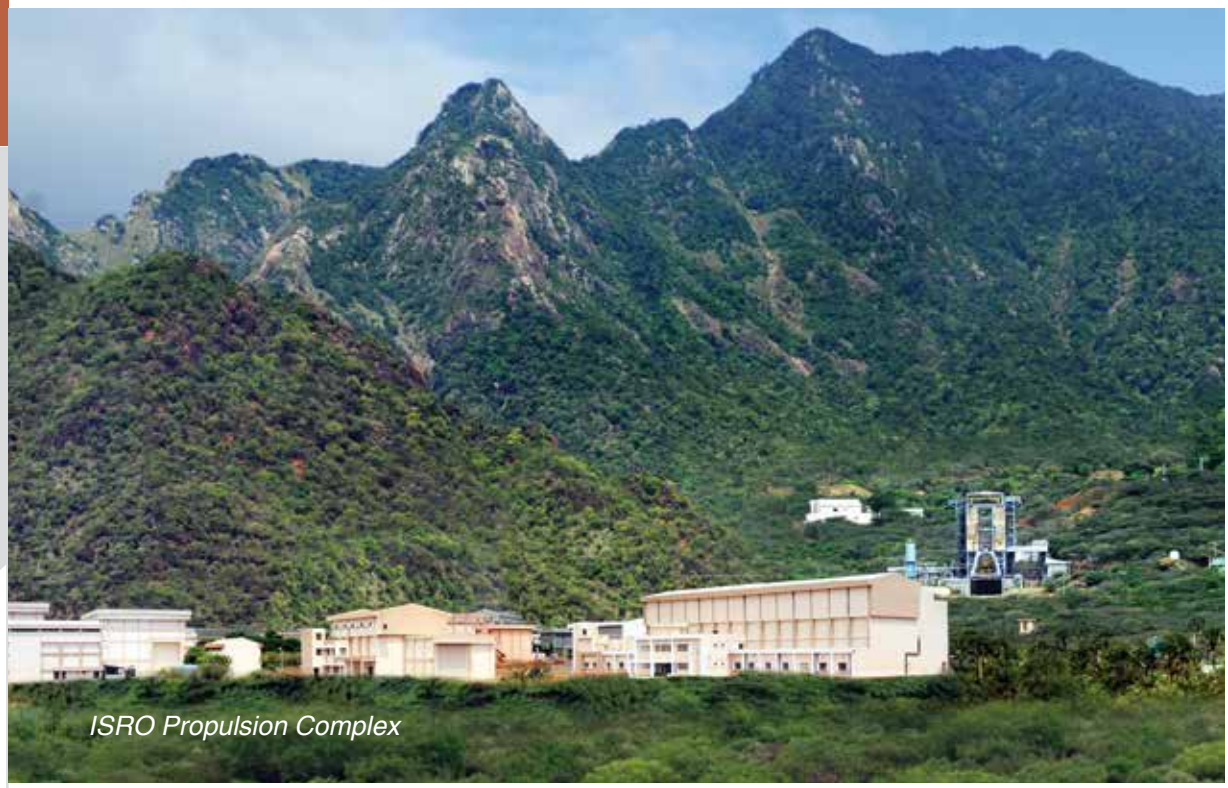
National Remote Sensing Centre (NRSC), Hyderabad

National Remote Sensing Centre (NRSC) has the mandate for establishment of ground stations for receiving satellite data, generation of data products, aerial remote sensing data acquisition, dissemination to the users, development of techniques for remote sensing applications including disaster management support, geospatial services for good governance and capacity building for professionals, faculty and students.

NRSC operates through multiple campuses to meet national and regional geospatial needs. NRSC has three campuses at Balanagar, Shadnagar and Jeedimetla in Hyderabad and a hired facility at Old Airport, Begumpet and five Regional Remote Sensing Centres (RRSCs) in Bengaluru, Jodhpur, Kolkata, Nagpur and Delhi for promoting remote sensing applications for various states. Main Campus is at Balanagar, Hyderabad for Administration, Remote Sensing Applications and Aerial Services. The Campus at Shadnagar hosts the Integrated Multi Mission Ground Segment for Earth Observation Satellites (IMGEOS) facility. The aircraft operations are carried out from old airport, Begumpet.

The areas of Satellite Data Reception, Data Processing and Dissemination, Bhuvan Geoportal and Web Services, Earth and Climate Studies, and Disaster Management Support services operate from IMGEOS, Shadnagar. Bhuvan, Bhoonidhi and NDEM are the geoportals of NRSC for dissemination of satellite data and geo-spatial products and services in the country. Outreach facility at Jeedimetla in Hyderabad for providing training for professionals, faculty and students and for general outreach.

IPRC



ISRO Propulsion Complex

ISRO Propulsion Complex (IPRC), Mahendragiri

ISRO Propulsion Complex (IPRC), Mahendragiri is responsible for Assembly, Integration and Testing of liquid propulsion systems for operational and developmental launch vehicles. IPRC is also responsible for development, qualification and acceptance testing of Earth storable engines, Cryogenic engines, Semi cryogenic engines, spacecraft engines and thrusters and also provides platform for simulation trials for interplanetary missions. IPRC is equipped with state-of-art facilities necessary for realising the cutting edge technology products for ISRO's space program.

ISTRAC


ISRO Telemetry Tracking and Command Network

ISRO Telemetry Tracking and Command Network (ISTRAC), Bengaluru

ISRO Telemetry Tracking and Command Network (ISTRAC), a unit of ISRO, is entrusted with the primary responsibility of providing TTC and mission control services to major Launch Vehicle and LEO and Interplanetary Spacecraft missions of ISRO. It has the additional responsibility of operating the complex Ground Segment of NavIC. ISTRAC is undertaking development of radar systems for launch vehicle tracking and meteorological applications, providing Search & Rescue and Disaster Management Services and supporting space based services like telemedicine, Village Resource Centres and tele-education. ISTRAC is also entrusted with Space Situational Awareness (SSA) Activities, setting-up observational and data analysis facilities for space debris management.

In order to realize these objectives, ISTRAC has established a network of ground stations, 5 stations at Bengaluru, 3 stations at Lucknow, 2 stations each at Mauritius, Sriharikota, Port Blair, Biak, 1 station each at Thiruvananthapuram, Brunei and the Indian Deep Space Network Stations IDSN-32 and two IDSN-18 (including new indigenous) terminals. The Mission Operations Complex located at Bengaluru carries out round-the-clock mission operations for all remote sensing, science and planetary mission.

Under the NavIC Ground Segment, ISTRAC has established a network of stations consisting of 5 IRNSS CDMA Ranging stations (IRCDR) and 16 IRNSS Range and Integrity Monitoring stations (IRIMS). ISTRAC has also established the ISRO Navigation Centre-1 (INC-1), including an IRNSS Network Timing (IRNWT) facility at Bengaluru and ISRO Navigation Centre-2 (INC-2), including an IRNWT facility at Lucknow.

MCF

Master Control Facility

Master Control Facility (MCF), Hassan

Master Control Facility (MCF) is the only ISRO centre responsible for Launch & Early Orbit Phase (LEOP) or Transfer Orbit Satellite Service (TOSS), In-orbit payload testing and On-orbit operations of geosynchronous, navigational and meteorological spacecrafts of ISRO. With the Geo-arch visibility of more than 140°, it is an ideal control center in the South Asian region.

The facilities located at Hassan and Bhopal together now takes care operation of 32 Spacecrafts (20 Communication, 9 Navigation and 3 Meteorology) with payloads classified into communication, meteorological & navigational category. These satellites are placed between 32.50° E & 129.50° E in 12 orbital slots and most of them are collocated, scaling up payload capacity and optimum use of spectrum availability.

IISU

ISRO Inertial Systems Unit

ISRO Inertial Systems Unit (IISU), Thiruvananthapuram

IISU is responsible for the design and development of Inertial Systems for Launch Vehicles and Satellites. Major systems like Inertial Navigation Systems based on mechanical gyros and optical gyros, Attitude Reference Systems, Rate Gyro Packages, and Accelerometer Packages are developed indigenously and used in various missions of ISRO. IISU also designs and develops Actuators and Mechanisms, namely, Reaction Wheel, Momentum Wheel, Solar Array Drive, and Scan Mechanisms for spacecraft and allied applications. IISU is engaged in continuous Research and Development. IISU has initiated advanced technology development programmes in niche areas focusing on miniaturisation, low power & cost, and scalable sensors and systems.

LEOS

Laboratory for Electro-Optics Systems

Laboratory for Electro-Optics Systems (LEOS), Bengaluru

Laboratory for Electro-Optics Systems (LEOS) is a premier unit of ISRO responsible for the design, development and realization of state-of-the-art attitude and navigation sensors, high performance optics and special-purpose science instruments. These sensors and optical systems have been successfully flown in various missions of the Indian Space Programme. Demand-driven indigenous developments include star sensors, earth sensors, sun sensors, magnetometers, large-area high-precision telescope mirrors, multi-band matched opto-mechanical lens assemblies, thin-film and special purpose coatings, fiber optic gyroscopes, laser and fiber optics-based navigation sensors, MEMS devices, specialty detectors, ground and on-board software. LEOS houses a spectrum of in-house metrology instruments that are developed or procured and ground-calibrated for this purpose. The multitude of sensors, optics and photonic devices developed at LEOS are embedded into various aspects of satellite attitude determination, remote sensing, meteorological applications, scientific exploration, interplanetary missions, etc.

IIRS


Indian Institute of Remote Sensing

Indian Institute of Remote Sensing (IIRS), Dehradun

Indian Institute of Remote Sensing (IIRS) is a premier institute with a primary aim to build capacity in Remote Sensing and Geoinformatics and their applications through education and training programmes at postgraduate level. It is a constituent Unit of Indian Space Research Organisation (ISRO), Department of Space, Government of India. Formerly known as Indian Photo-Interpretation Institute (IPI), founded in 1966, the Institute is first of its kind in entire South-East Asia. While nurturing its primary endeavor to build capacity among the user community by training mid-career professionals since its founding in 1966, the Institute has enhanced its capability and evolved many training and education programmes that are tuned to meet the requirements of various stake-holders, ranging from fresh graduates to policy makers including academia, industry and NGOs.

The capacity building activities of the Institute are primarily grouped into the following three domains – (1) Training & Education (2) Research and (3) Outreach. The Institute also hosts and provides support to the Centre for Space Science and Technology Education in Asia and The Pacific (CSSTEAP), affiliated to the United Nations, to conduct the remote sensing and GIS training & education programmes at postgraduate level.

PRL

Physical Research Laboratory

Physical Research Laboratory (PRL), Ahmedabad

Physical Research Laboratory is mandated to conduct fundamental research in niche areas of sciences. Its research is organized in seven major science areas: Astronomy & Astrophysics, Solar Physics, Space and Atmospheric Sciences, Planetary Sciences, Geosciences, Atomic, Molecular and Optical Physics, and Theoretical Physics. From April to December 2025, the scientists of PRL have published 170 peer-reviewed scientific papers in reputed journals.

NARL

National Atmospheric Research Laboratory

National Atmospheric Research Laboratory (NARL), Gadanki

National Atmospheric Research Laboratory (NARL) is engaged in carrying out frontline research on atmospheric, ionospheric & space weather, and planetary ionospheric sciences through observations, technique/technology, instrument development, and simulation/ modelling. NARL operates a large number of sophisticated instruments, including high power radars and lidars, measuring various atmospheric and ionospheric parameters from Gadanki, two comprehensive off-campus observatories, one at Kolkata and the other at Hyderabad, and networks of GNSS receivers and airglow imagers. NARL also has a High-Performance Computing (HPC) system for carrying out sophisticated computation, simulation and modelling for atmospheric and ionospheric research.

NARL provides weather forecasts and high-resolution upper air wind data for supporting the rocket launchings at SDSC-SHAR. NARL has a vibrant research and development program, which includes Ph. D & PDF, capacity building, and public outreach programs.

NE-SAC

North Eastern Space Applications Centre

North Eastern Space Applications Centre (NESAC), Shillong

NESAC is an autonomous organization under the Department of Space (DOS) that has dedicated more than 25 years of service to the eight states of the North Eastern Region (NER) of India through the application of space science and technology. The Centre's key objectives are: 1) to establish an operational remote sensing and geographic information system (GIS)-based natural resource information platform to support development, natural resource management, and infrastructure planning in the region; 2) to provide satellite communication services for education, healthcare, disaster management, and developmental communication; 3) to conduct research in space and atmospheric sciences and establish an instrumentation hub in collaboration with academic institutions in NER; 4) to provide integrated space-based support for disaster management; and 5) to develop regional infrastructure for capacity building in geospatial technology.

IIST


Indian Institute of Space Science and Technology

Indian Institute of Space Science and Technology (IIST), Thiruvananthapuram

Indian Institute of Space Science and Technology at Thiruvananthapuram, Kerala was established in 2007 to develop and discover possibilities of shaping manpower for Indian space programme. From its first steps in the alternate campus at VSSC, Veli in 2007, to the firm steps in Valiamala, IIST has evolved consistently, catalysing and adapting to changes. In the seventeen years of its functioning, the institute has dynamically evolved and expanded as a centre of multidisciplinary learning and research that spans themes across the fields of Aerospace, Avionics, Chemistry, Earth and Space Sciences, Humanities, Mathematics and Physics. IIST offers undergraduate, postgraduate, doctoral and post-doctoral programmes with a synergetic emphasis on Space Science & Technology applications.

ACL


Antrix Corporation Limited

Antrix Corporation Limited (ACL), Bengaluru

Antrix Corporation Limited (ACL) with its corporate office in Bengaluru is a wholly owned Government of India entity under the administrative control of Department of Space. ACL is engaged in providing space sector products and services worldwide ranging from supply of hardware and software, Earth observation and scientific missions, remote sensing data services, transponder lease services, mission support services and other allied services.

NSIL


NewSpace India Limited

NewSpace India Limited (NSIL), Bengaluru

NSIL got incorporated in 2019, as a wholly-owned Government of India Undertaking/Central Public Sector Enterprise (CPSE), under the administrative control of the DOS. NSIL has been categorized as Schedule 'A' CPSE by the Dept. of Public Enterprises (DPE) on February 06, 2020. The government of India enhanced the role and scope of NSIL to encompass more responsibilities in the primary business areas and widen the scope in June 2020. The revised mandate broadly covers (i) Owning satellites for Earth Observation and Communication applications; (ii) Providing space-based Earth Observation and Communication services; (iii) Building satellites and launching them as per demand; (iv) Building launch vehicles through Indian Industry and launch as per requirements; (v) Providing launch services and (vi) Technology Transfer to Indian Industry.

IN-SPACe

Indian National Space Promotion and Authorisation Centre (IN-SPACe), Ahmedabad

As the space sector was opened up to private enterprises and start-ups to undertake space activities; to promote, handhold, regulate and authorise their activities, an autonomous nodal agency attached to DOS - the Indian National Space Promotion and Authorization Centre (IN-SPACe) was formed. This was done to enhance the diffusion of space technology and boost the space economy within the country. IN-SPACe permits and oversees the activities of private enterprises and start-ups. It regulates space activities, including the building of launch vehicles and satellites and providing space-based services as per the definition of space activities. It permits the sharing of space infrastructure of ISRO and the establishment of temporary facilities within the premises of ISRO. It promotes the establishment of new space infrastructure and facilities, by Non-Government Entities (NGE), in pursuance of space activities based on safety norms and other statutory guidelines and necessary clearances. IN-SPACe governs the usage of spacecraft data and the rolling out of space-based services and all the associated infrastructure for the same. IN-SPACe operates with its headquarters in Ahmedabad and a directorate in Bengaluru.


CHAPTER
02

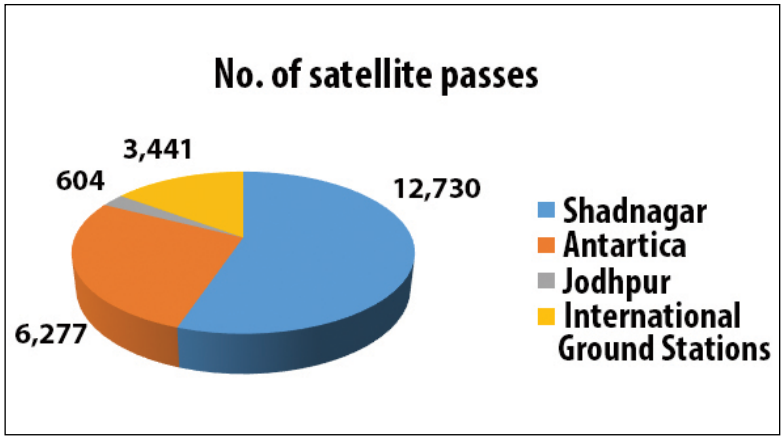
Major Activities

2.1 Earth Observation, Data Processing, and Applications

2.1.1 Satellite Data Reception

Satellite Data from different Earth Observation Satellites are received, archived and pre-processed to meet the Indian systematic coverage and global data requirements of User community.

NRSC has its ground stations at Shadnagar, Antarctica and Jodhpur, along with other International Ground Stations (IGS). There are eight three/two axis stabilized antennae, at Shadnagar & Jodhpur, receiving data in S/X/Ka bands from 27 satellites, downloading approximately 1 Terabyte data from 80-85 scheduled passes daily. Bharati Station Antarctica, with two antennae, provides visibility of 10-11 orbits transferring data to Shadnagar in near real-time via GSAT-17.



Station wise satellites passes' acquisition statistics

NISAR data reception is successfully demonstrated as pre-launch simulation in Ka-band as 'zero' bit error rate during IOT phase. Level-0 Products for S-band standalone and joint mode SAR operation are generated successfully during IOT phase. JPL Transmit Chain, at 2 Gbps data rate in OQPSK Modulation, with LDPC 7/8 decoding scheme is qualified, with in-house developed NSPARC boards via 10G Ethernet ports to meet the contingent plans of acquisition.

Upgrading existing technology in terms of Ground Station Projects for international collaborative projects as well as for upcoming stations in NESAC-Shillong and Mauritius to support Resourcesat-3 missions are carried out. Successful acceptance tests were conducted for hosted antenna in Svalbard (8.5m S/X/Ka). Upgrade for data reception at Mauritius was studied and design of 2200-2300 MHz S band reception is completed. Elevation profile and Noise survey in S, X and Ka-bands for NE-SAC, Shillong location completed and site is cleared for establishment of new antenna.

Proprietary hardware and software is developed in-house to maintain technological independence. As part of this, NSPARC, a next-generation data ingest FPGA based unit capable of 2 Gbps data rate is realised. Other Technology Developments comprise of TCP/IP based data acquisition module, module for time synchronisation using generic GPS receiver, firmware of PMAC 1020 ARM CPU to augment antenna control, low noise amplifiers with filters, traveling wave-based multimode mono-pulse Coupler for Ka-band tracking chain and Ka-band Compact Monopulse Comparator (MPC) for 2x2 array.

PMAC 1020 ARM CPU

Specialized services such as Ground Station as a Service (GSaaS) are offered which included noise surveys in S, X and Ka bands as well as tracking of Elevation-1(XE1) satellite during IOT phase.

2.1.2 Data Processing and Product Dissemination

The processing of satellite data, generation of data products, and their dissemination to the user community through Bhoonidhi portal are done for operational EO missions. Currently, data from 29 satellites (15 IRS, 13 non-IRS, and NISAR mission) are acquired. Data quality evaluation, mission performance, and feedback to mission are also done routinely. Calibration of optical and microwave sensors are also done to ensure that data products meet defined specifications. Automatic workflows were developed to enable end-to-end product archival, cataloguing, and dissemination of data in Bhoonidhi and also streamlining access to new products including NISAR data, EOS-04 Ship Detection, MetOp-B/C Level-1C, Cartosat-2S and Cartosat-3 FCC-NCC (MX), NOAA-19 Level-1C, and EOS-06 OCM Albedo. The Bhoonidhi Forum application was implemented to improve user interaction through discussions and feedback mechanisms.

Enhanced Near Real-Time (NRT) information product generation includes quick-look imagery from optical and SAR data, improved throughput using advanced computing systems, and specialized products such as NDVI composites, high-resolution merged

2.1

Earth Observation, Data Processing, and Applications

datasets, and GPU-accelerated workflows. Furthermore, a Spatio-Temporal Asset Catalog (STAC)-based product catalogue and API-driven download services have been implemented on Bhoonidhi, along with object-based product archival and retrieval capabilities.

a. NSPARC Data Ingest Hardware

The Next Generation SPARC (Satellite data Processing, Acquisition and Reconfigurable Card) Data Ingest Hardware is a PCI Express–based system built around the Xilinx UltraScale+ Kintex FPGA. It receives data from the demodulator via both 10G Ethernet and differential ECL interfaces. The hardware has been successfully tested with ground checkout data during Level-0 and DRS Test & Evaluation (T&E) phases, confirming data integrity. It is currently deployed in data ingest systems at Shadnagar, Antarctica, and Svalbard for ingesting JPL chain data at 2 Gbps.

b. Optical Sensor Data Processing

A total of 25 lakh data products were generated from IRS and foreign satellites. The IMGEOS DPGS throughput has been scaled up to 8,000 products per day, increasing from 4 products per minute (January 2025) to 6 products per minute currently. Of these, 17 lakh products have been made available under the Open Data Policy through Bhoonidhi. Throughput for Carto-2S and Carto-3 DPGS systems was also enhanced by integrating new high-performance computing systems.

c. Microwave Data Product Generation

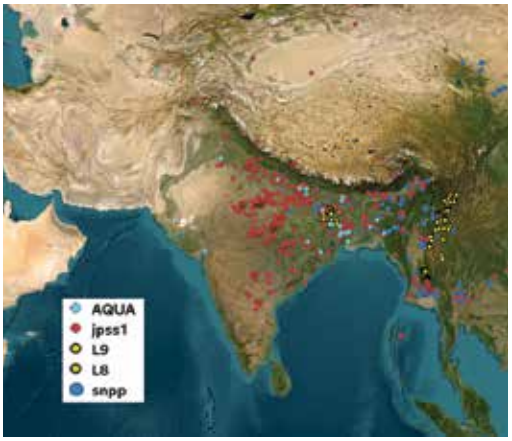
A total of 2,85,365 data products were processed from microwave sensors onboard various IRS and non-IRS satellites.

d. Data processing and product generation for NISAR S-band

The world's first SweepSAR S-band Dither PRF high-resolution wide-swath (>240 km) image was processed and generated without transmit gaps. Image focusing was successfully achieved for all acquired data, with good SNR observed across the entire swath. Geo-location accuracy was within one product pixel (~10 m).

e. Near Real-Time (NRT) Fire Alert Framework

A new NRT Fire Alert system has been implemented using data from six satellites—JPSS-1, JPSS-2, MODIS, Landsat-8, Landsat-9, and SNPP. The system's Turnaround Time was optimized from 40 minutes to 15 minutes, significantly improving alert timeliness.



Fire Alerts generated using NRT data for 20 Nov 2025

f. GPU-Based Global products from OCM-3

A GPU-enabled processing chain was developed to generate global chlorophyll products and vegetation phenology parameters from EOS-06 OCM-3 NDVI datasets. This capability supports both national and global studies by enabling rapid, high-resolution production of key oceanic and terrestrial ecological indicators.

g. New algorithm for INSAT-3DS data product

A Sounder geometric processing algorithm to address momentum dumping anomalies and updated vicarious calibration coefficients for Visible and SWIR channels was developed. Net Effective Radiation (NER) product for INSAT-3DS was released.

h. AVHRR Data Product Generation (NOAA-19, MetOp-A/B/C)

Full India coverage is acquired six times daily from AVHRR sensors on-board NOAA-19, MetOp-B, and MetOp-C missions at IMGEOS. An automated framework has been established to generate Level-1C (radiometrically calibrated and geo-tagged) products in Near Real-Time, which are now accessible on Bhoonidhi.

i. 17-Day Full India Water Layer Mosaic

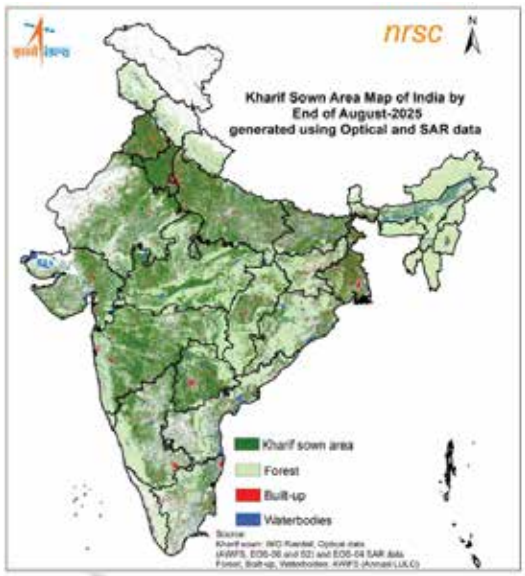
An automated framework has been implemented at IMGEOS to generate cycle-wise (17-day) water layer mosaics using EOS-04 MRS data. These products are released on Bhoonidhi as 10 × 10 km tiles, enabling detailed analysis of surface water dynamics across India.

2.1

Earth Observation, Data Processing, and Applications

j. National-Level Kharif Sown Area Map (2025)

An automated processing framework is established at IMGEOS for Kharif Sown Area Mapping, using images from multiple sensors—EOS-04 (MRS), RISAT-2 (AWiFS), OCM-3, and Sentinel-1. It was operationally executed for 2025 using images of the period from June to August 2025. It provides an accurate national-scale assessment of crop sown area during the Kharif season.



Kharif Sown Area Map of India by the end of August 2025

k. Web-Based Framework for Real-Time Visualization (GeoPixel-2D)

GeoPixel-2D, a web-powered visualization platform, was developed and deployed at IMGEOS to facilitate real-time monitoring and analysis of satellite data products. The system supports Live Mode (automatically updates with newly processed datasets) and Archive Mode (allows users to browse and analyze historical satellite data). The framework enables quick analysis, status tracking, and efficient data discovery for both operational and research users.

l. Aerial & UAV Data acquisition and processing

Airborne and UAV-based geospatial data acquisition and processing services using LiDAR, digital cameras, multispectral, hyperspectral, and UAV sensors are done to support national projects such as Large-scale GIS Database generation of various facilities, biomass estimation for forestry applications, ISRO's Disaster Management Support Programme (DMSP) and also to the State Government Projects of Bihar and Telangana.

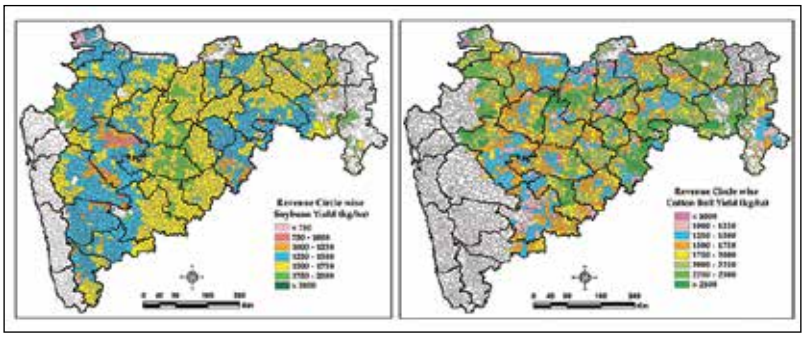
2.1.3 Agriculture & Soil resources applications

a. Support to PMFBY

As part of PM Fasal Bima Yojana (PMFBY), ISRO is the mentoring institution to 11 states and Technology Implementation Partners (TIPs) (including NGEs) for the model yield estimation of Kharif & Rabi under YES-TECH initiative (Yield Estimation System based on TECHnology). TIPs of the respective states carry out the area and yield estimation as per

the identified methodologies (simulation modelling and machine learning). About 5000 farmers got benefitted over two districts of AP through claim settlements using YES-TECH yield for Maichung cyclone damage. Model-based yield estimates for kharif and rabi rice crops in states like Haryana, Assam, and Andhra Pradesh were verified. Yield loss factors due to floods in Assam were computed using SAR data. Crop growth simulation model-based revenue circle level cotton and soybean crop yield is illustrated.

b. MahaAgritech



Revenue circle level simulated soybean and cotton yield in Maharashtra

It is a collaborative flagship satellite-based agricultural monitoring between Government of Maharashtra and ISRO. It provides crop area and crop yield estimates along with sown area and harvest progress as well as crop condition, by integrating multisource satellite data and weather information. Major cash crops such as cotton and sugarcane are mapped annually, allowing systematic analysis of their area dynamics, inter-annual variability, and long-term trends. A prototype Sugarcane Information System has also been developed. Initiative provides evidence-based agricultural planning, enhances disaster and drought response, as well as promotes climate-resilient farming practices.

c. EO based agricultural monitoring in Madhya Pradesh (MP-AgriGIS)

Collaborative efforts with MP Government wherein yield estimation of major crops i.e., Soybean, Paddy (Irrigated, Rainfed), Wheat, Gram and Mustard are being carried out through trained ensemble Machine Learning (ML) models, built at different cluster level. Models are trained using historical years yield data and validated with the current years measured yield (CCE) datasets. In rabi 2024-25, yield reduction of more than 20% lies in around 2000 halkas out of insured 22,846 halkas was observed.

d. Synergistic use of EOS-04 SAR and optical data for kharif sown area estimation

Accurate monitoring of sown areas by the end of August is vital for drought assessment,

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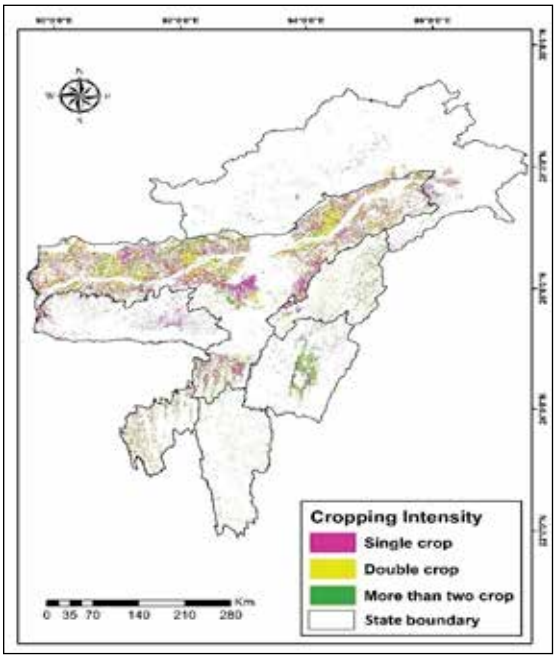
contingency planning, and crop insurance decisions, as per the Manual for Drought Management (2020). For the 2025 Kharif season, NRSC mapped sown areas using EOS-04 SAR and optical data from AWiFS, EOS-06, and Sentinel-2, along with IMD rainfall inputs, estimating about 1,215 Lakh hectares sown. The framework of kharif sown area estimation is operationalised in IMGEOS. (Figure "Kharif Sown Area Map of India by the end of August 2025" in Data Processing area).

e. Cropping system and cropping intensity analysis for NER

A first of its kind exercise on cropping system and cropping intensity analysis for the NER was conducted for the period 2022–2025 using a knowledge-based supervised classification approach on multispectral satellite imagery. The workflow comprised satellite data acquisition, image enhancement and layer stacking, NDVI-based thresholding, and the application of crop-specific indices to estimate cropping intensity and analyze crop rotation patterns within a crop year.



Cropping Intensity of NER (2024-2025)

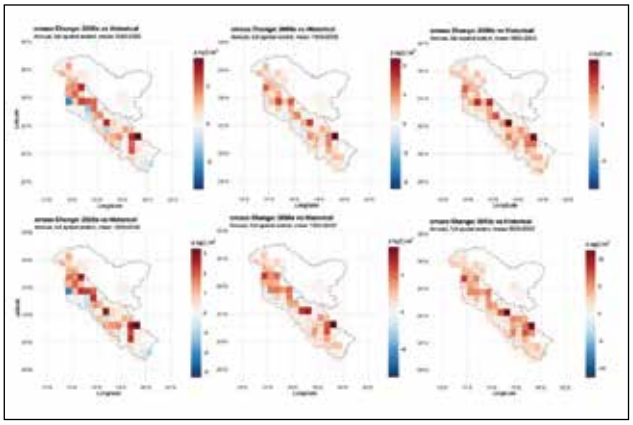
The cropping system analysis revealed substantial underutilized agricultural areas across the NER. In Assam, during 2022–2025, long-term Rabi fallow accounted for 10,69,051 hectares, of which 1,01,313 hectares remained continuously fallow throughout the Rabi season. Similar patterns of significant Rabi fallow were observed in other states. The average cropping intensity index across the region ranged from 111% in Sikkim to 181% in Tripura.

2.1.4 Bio-resources & Environment

a. Climate Change studies: Assessment of Mountain ecosystem services in North Western Himalayas

Behaviour of vegetation in altered climate scenario due to possible development pathways (called SSPs, Shared Socioeconomic Pathways) is modelled using LPJ-GUESS

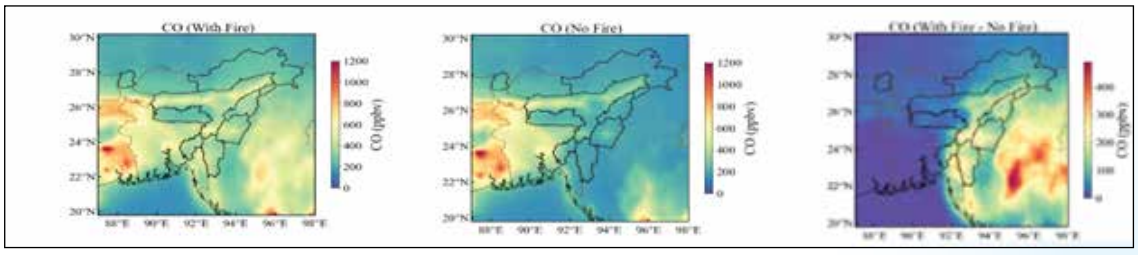
(Lund–Potsdam–Jena General Ecosystem Simulator). LPJ-GUESS is widely applied model among various process-based Dynamic Global Vegetation Models. They couple biogeochemical and biophysical processes to simulate terrestrial ecosystem dynamics over time. Two alternate SSPs viz., SSP 2- 4.5 and SSP 5-8.5 representing cases of a) development combined with a moderate level of climate policy action (upper row in the Fig. 999) and b) development combined with a very high level of emissions and minimal climate policy respectively, were integrated to observe impacts. In the latter instance, Himalayan vegetation exhibited pronounced northward and elevational expansion of dense forest PFTs, showing up to 40–60% higher biomass accumulation, particularly in lower valley slopes and middle hill ranges.



Vegetation simulation in different development scenarios showing increased vegetation activity in SSP 5-8.5 (lower row) due to increased carbon content in the system over long term periods (2050 and 2090s)

b. ISRO Geosphere Biosphere Studies

Spatiotemporal variability of gaseous air pollutants from biomass burning in shifting cultivation landscapes of northeast India has been analysed. Significant fire episodes were observed, totalling 16,664 and 9,961 fire counts during specific periods in March and April 2024, compared to only 670 counts in November 2023. Satellite Observations (TROPOMI) confirmed a substantial increase in pollutants during fire activity: Nitrogen Dioxide by 109.9% & Carbon Monoxide by 45.9%. The WRF-Chem model was used to



Spatial distribution of WRF-Chem simulated surface level CO concentration with biomass burning, without biomass burning, and the difference between these two scenarios during fire affected period.

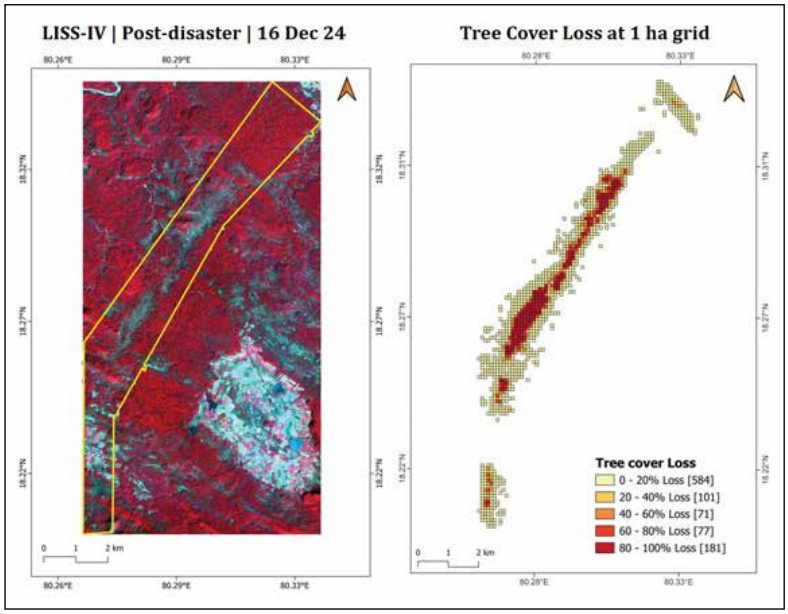
simulate the spatiotemporal variability of gases and it matched the measured quantities with high confidence. WRF-Chem sensitivity simulations are carried out with and without biomass burning emissions to quantify the enhancement in air pollution. The increase in surface concentrations of CO, NO_2 and O_3 are found to be 31%, 23% and 6%, respectively, over this region due to the slash and burn agriculture practice.

c. Forest Resource Analysis & Management System (FRAMS)

FRAMS is an AI-powered geospatial intelligence platform developed by NESAC/ DoS. It is designed to enable real-time, data-driven forest governance. Equipped with advanced analytical tools, AI-based alerts, and a mobile app for geotagged field validation. FRAMS provides actionable insights through its interactive dashboard. It was released Hon'ble Governor of Manipur in October, 2025.

d. Tree-cover loss and enumerate individual fallen logs in Tadvai Forests

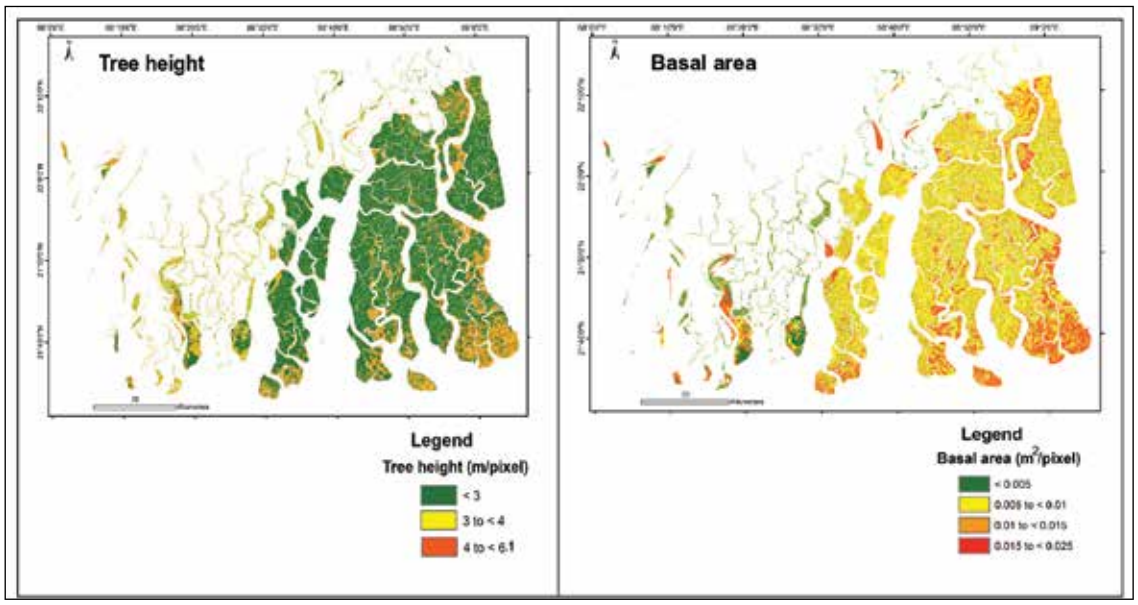
Climate events are inducing extreme damage to forest resources. In a severe windthrow event large tract of Telangana forests, in Tadvai were damaged. Multiscale approach involving LISS IV and Planet scope data with 8 cm imagery from UAV employing computer vision technique could map 315 ha of disturbed forest area, wherein 61,000 fallen trees were identified. Significant biomass loss was observed due to damage to mature trees (more than 10 m long boles) in 68% of impacted area. Gridded approach showed most of the area with low to moderate damage (<120 fallen trees) while limited extents with severely affected level (>240 trees).



Tree cover loss at 1-ha scale derived from LISS and Planetscope imagery using IFZ method

e. Characterization of Sundarbans mangrove forests using C-band SAR EOS-04 data and field measurements

Using EOS-4 (RISAT -1A) C band polarimetric SAR (Fine Resolution Stripmap-2 RISAT-1A) derived parameters, basal area, tree height, and canopy diameter were estimated applying Extreme Gradient Boosting Model (XGBoost) machine learning algorithm. It was trained with polarimetric backscatter, textural measures and structural indices using field measurements and results showed satisfactory accuracy. While basal area ranged from 0.001 to 0.023 sq.m., canopy diameter and tree heights ranged from 0.3 to 4.2 m and 0.32 to 6.01 m respectively.



Tree height and basal area estimates obtained using XGBoost over Indian Sundarbans found in the Phoenix Spp. community.

f. Assessment of Sun-induced chlorophyll fluorescence (SIF) dynamics and its determinants in Indian Forests and its relation to GPP

Sun Induced Chlorophyll Fluorescence (SIF) is a reliable proxy for understanding the efficiency of photosynthetic apparatus so as to detect vegetation stress in early stage, hence forest health over long term. It also supports computation of Gross Primary Productivity. Study analysed seasonal and inter-annual SIF variability (2014–2024) for nine major forest biomes and evaluated how SIF responds to key environmental drivers and

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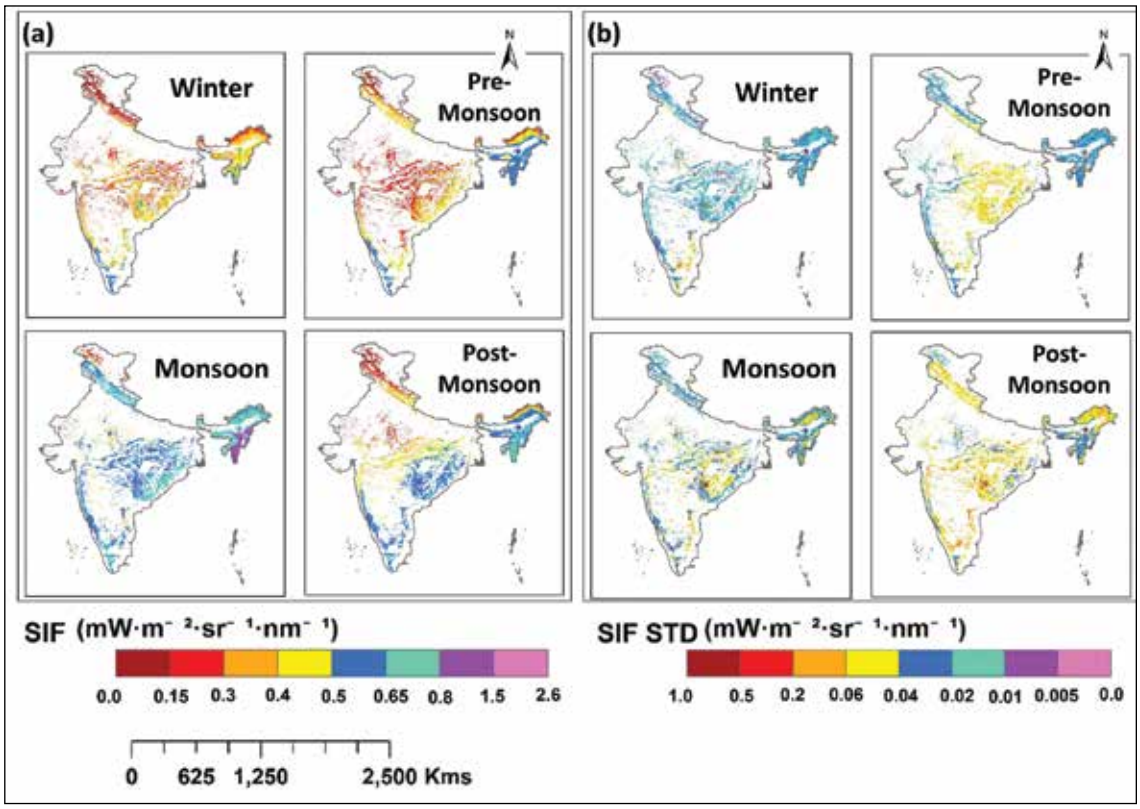
GPP models. SIF sensor data on board different satellite sensors (MetOp-GOME & Envisat-SCIAMACHY & Sentinel-5P-TROPOMI) has been used. Wet evergreen forests exhibited highest productivity by showing peaks during the monsoon. Key environmental drivers were found to be air temperature and humidity.



(a) Mean SIF (2014-2024): Seasonal Dynamics, (b) Interannual Variability of SIF (2014-2024): Seasonal StDev

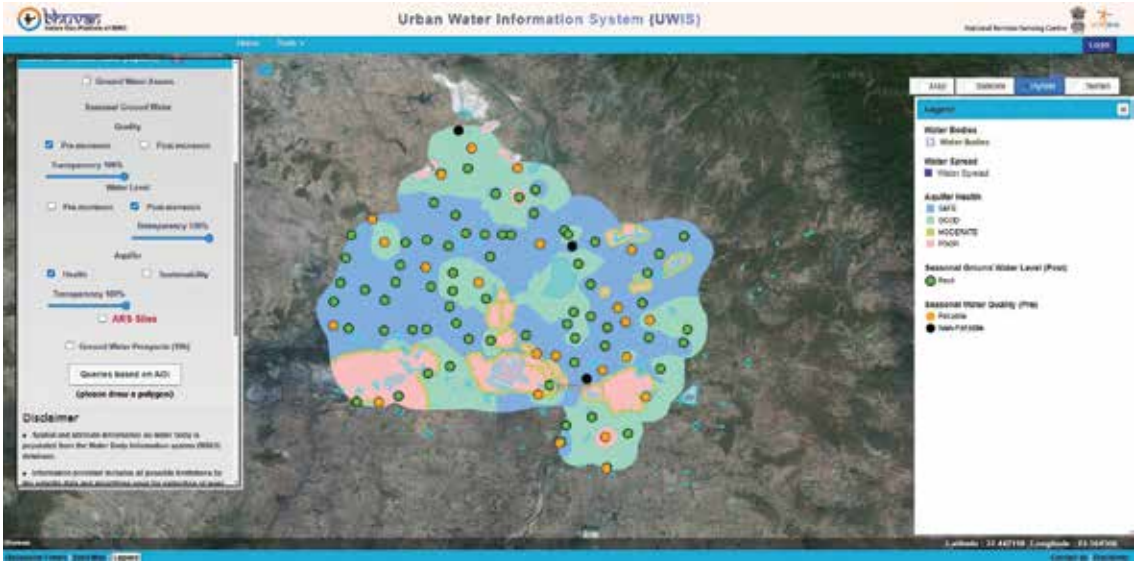
2.1.5 Water Resources & Cryosphere

a. National Hydrology Project (for MoJS)

NRSC/ ISRO as one of the Central Implementing Agencies, has successfully completed National Hydrology Project (NHP) funded by Ministry of Jal Shakti, including the submission of the project report. The major deliverables include operational daily Actual Evapotranspiration (AET) monitoring system for India, GLOF modelling & risk assessment for selected glacial lakes in Indian Himalaya, spatial snowmelt runoff product for the Indian Himalayan region, hydrological modelling framework for grid-wise water balance components & inflow estimates into 150 Indian reservoirs, etc.

b. Aquifer Sustainability Management System (ASMS) for AMRUT cities

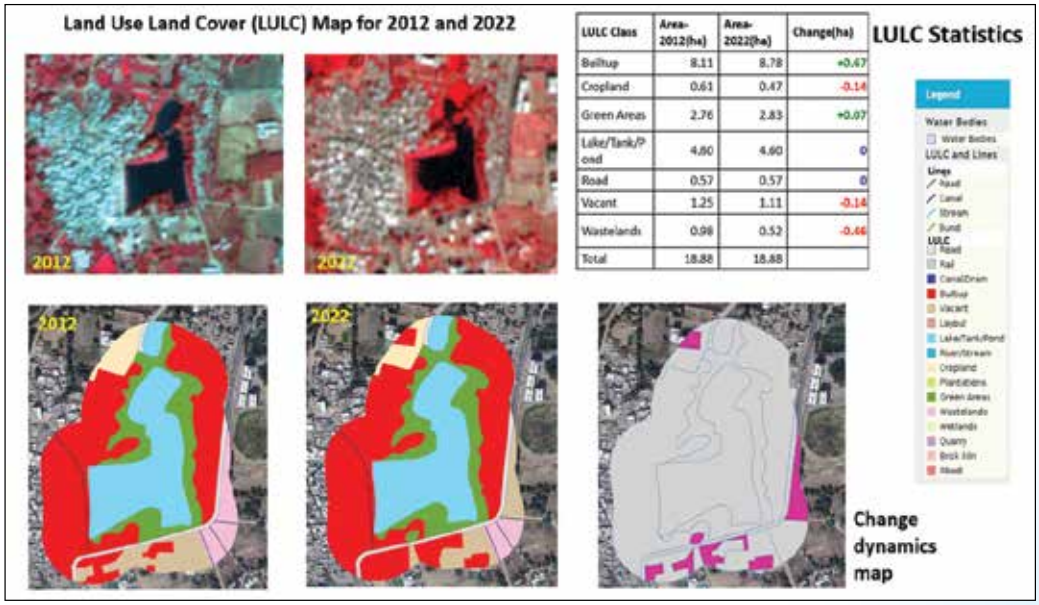
Scientific database was developed for detailed aquifer information, groundwater management as well as urban aquifer health & sustainability assessment for ten AMRUT cities, covering diverse hydrogeological provinces.



Urban aquifer Health, Korba city, Chhattisgarh

c. Urban Water body Information System UWaIS (MoHUA)

As part of the AMRUT 2.0 Mission, NRSC/ISRO has undertaken the Urban Water Body



Urban Water Body Information System (UWaIS)Decadal Land Use/ Land Cover dynamics, Bhayli Lake, Vadodara, Gujarat

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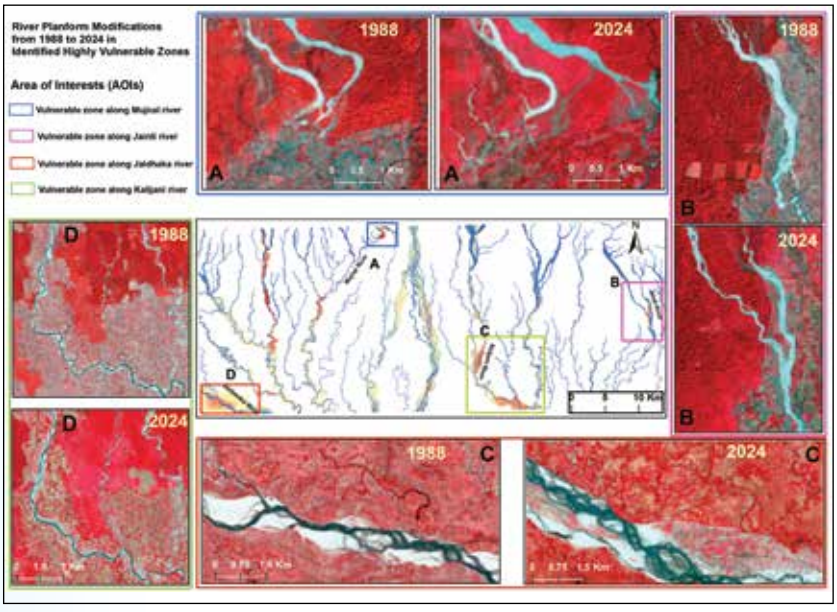
Information System (UWaIS) for about 500 AMRUT cities. The project generates information on waterbody inventory, sustainability, water spread dynamics, and water quality, supporting efforts towards their conservation and rejuvenation. Dynamic information is being hosted on Bhuvan portal, in addition to Land Use/Land Cover (LULC) assessment within a 100 m buffer around selected waterbodies. Analysis for 325 towns has been completed.

d. Framework for evolving secure and sustainable groundwater resources management plan

A framework has been developed comprising of various space-based inputs and ground investigations for evolving sustainable management plan for ground water resources. The integrated approach combines Electrical Resistivity Tomography (ERT), Ground Penetrating Radar (GPR) and hydrogeological analysis using space based inputs for identifying zones for groundwater exploration, and recommending sustainability measures such as artificial recharge interventions, runoff management, and periodic monitoring. The approach was executed at NRSC Shadnagar campus and Central University of Karnataka, Kalaburagi campus, and is being done for Mayabunder area, in Middle Andaman.

e. River Dynamics in the prominent River Basins of West Bengal

Planform changes of the rivers of West Bengal over 36 years (1988 to 2024) were analysed



Selected River planform modifications during 1988-2024 in identified highly vulnerable zones

using Landsat and IRS datasets. The changes were assessed to have been caused by various factors such as tectonic activity, relative sea-level changes, climatic variabilities, anthropogenic modification and rivers' natural dynamics. The study highlights the need for targeted river basin management and flood risk mitigation for rivers in the North Bengal.

f. Geospatial support for National Mission for Clean Ganga

Geo-Ganga portal has been implemented alongwith all the relevant geospatial data. The information layers comprise of terrain data, soil parameters, hydro-metrological information, satellite data-derived water quality, historical flood data & flood hazard etc.

Geo-Ganga geoportal

g. Glacier mapping in Himalayan region using IRS data (2020-23)

Himalayan glaciers in Indus, Ganga and Brahmaputra basins have been mapped using IRS LISS-III data of 2020-23 timeframe, alongwith other available satellite data. The attributes of the glaciers such as sub-basins, latitude & longitude, area, elevation, etc. have also been extracted. 16,808 glaciers have been mapped across 22 sub-basins in these basins.

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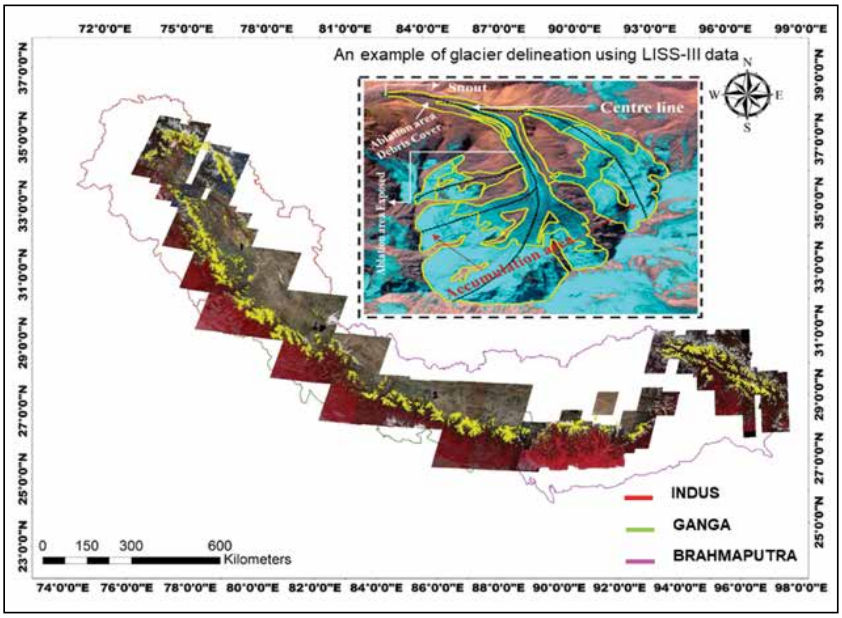
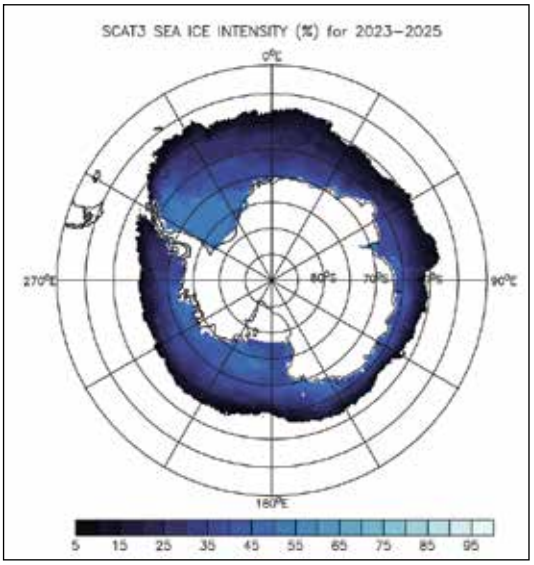


Inventory of Glaciers in the Himalaya

h. Monitoring Antarctic Sea-Ice Dynamics

Antarctic Sea ice functions as a critical climate regulator, influencing global albedo, insulating the Southern Ocean, and driving ocean circulation through brine rejection. Scatterometers, particularly ISRO's SCATSAT-1, have proven useful for distinguishing open water, first-year, and multi-year ice. An algorithm using SCATSAT-1 Normalized Radar Cross-Section (NRCS) was developed to estimate daily ice extent, intensity, and age during 2017-2020. Results show minimum ice coverage in March (austral summer end) and maximum in September (Antarctic winter peak).

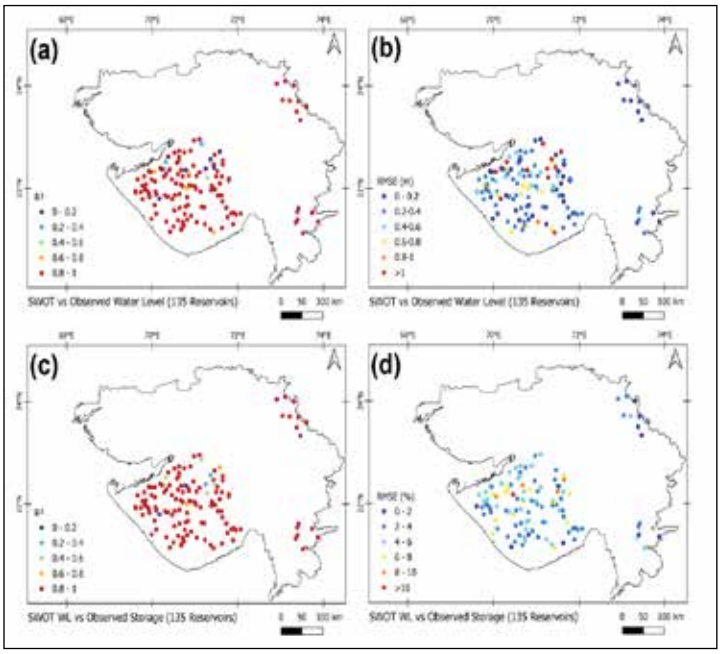


Four years Sea-Ice Intensity derived using SCATSAT-1

i. SWOT data for Reservoir monitoring and River discharge estimation

Surface Water and Ocean Topography (SWOT) mission uses the Ka-band Radar Interferometer (KaRIn) with dual antennae to capture Water Surface Elevation (WSE)

along with the water-surface slope and spatial extent. Gauge-based observations from 135 reservoirs and dams of Gujarat were used to assess the utility of the SWOT pixel cloud in estimating both WSE and total reservoir storage. SWOT-derived WSE showed excellent agreement with gauge measurements of reservoir water level, with a median R^2 of 0.972. In terms of storage estimation, R^2 values showed a median of 0.982, with 115 out of 135 reservoirs exhibiting R^2 values greater than 0.9. Comparative analysis of SWOT derived river discharge with GLoFAS discharge, showed that over morphologically stable reaches of River Ganga, SWOT captured seasonal discharge variability and flood peaks effectively.



Comparison of reservoir storage in terms of R2 in Gujarat (left) & Comparison of Global Flood Awareness System (GloFAS) model discharge against SWOT-derived discharge for the Ganga River (Gandhighat gauge station) (right)

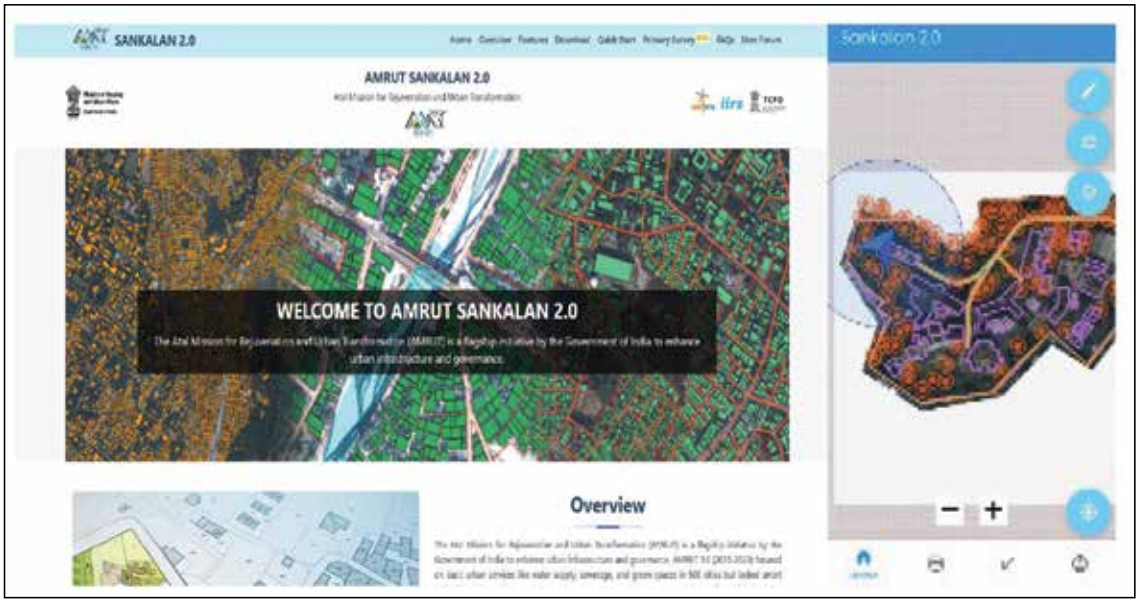
2.1.6 Urban & Heritage Studies

a. AMRUT 2.0 GIS-based Master Plan formulation

As part of AMRUT (Atal Mission for Rejuvenation & Urban Transformation) 2.0 GIS-based Master Plan formulation for Class-II towns, NRSC has undertaken the creation of 1:4000 scale urban geospatial database for 71 towns using Very High-Resolution Satellite Imagery (<1m). Satellite data acquisition has been completed for 48 towns. Geodatabase creation (Pre-field/Base Map) is completed for 2 towns and is currently in progress for 25 towns. As part of AMRUT 2.0 Capacity building initiatives, NRSC has conducted Tier-I and Tier-II training programs to strengthen stakeholders' capabilities in utilizing geospatial technologies for various aspects of planning and to support data-driven decision-making. A Virtual Desktop Infrastructure (VDI) enabled system has been designed and deployed to support 100 concurrent users for the Urban Geodatabase creation.

b. Mobile application for AMRUT Phase 2.0

Sankalan 2.0 is a GIS-based mobile application is developed under the AMRUT 2.0 sub-scheme to streamline ground data collection, validation, and integration for urban planning. Jointly initiated by the IIRS/ ISRO and the Town and Country Planning Organization (TCPO) under the Ministry of Housing and Urban Affairs (MoHUA), the application plays a pivotal role in enhancing GIS-based master plan formulation for small and medium towns across India.



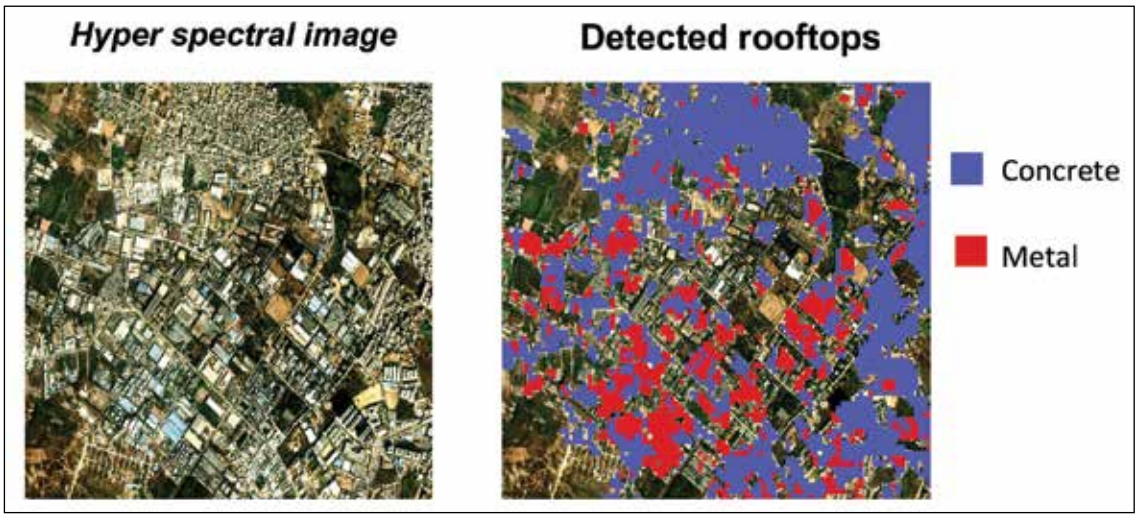
Sankalan 2.0 application for AMRUT Phase 2.0

Sankalan 2.0 streamlines ground data collection, validation, and integration for urban planning. It aims to simplify data acquisition, automate GIS workflows, and enhance spatial analysis capabilities. Its architecture integrates a mobile application and a QGIS plugin with two modules: Data-to-Mobile and Data-from-Mobile, ensuring seamless synchronization between field and desktop environments.

c. Rooftop Material Mapping using AI & Hyperspectral Data

An AI-based rooftop material classification model was developed using EnMAP hyperspectral imagery, focusing on large rooftops such as industrial sheds, warehouses, and commercial complexes. The system leverages Random Forest (RF) and 1D-CNN models to classify materials by capturing both global and local spectral patterns. Validated over Hyderabad city, the RF model achieved high accuracy (recall ~ 0.97 for metal roofs, recall

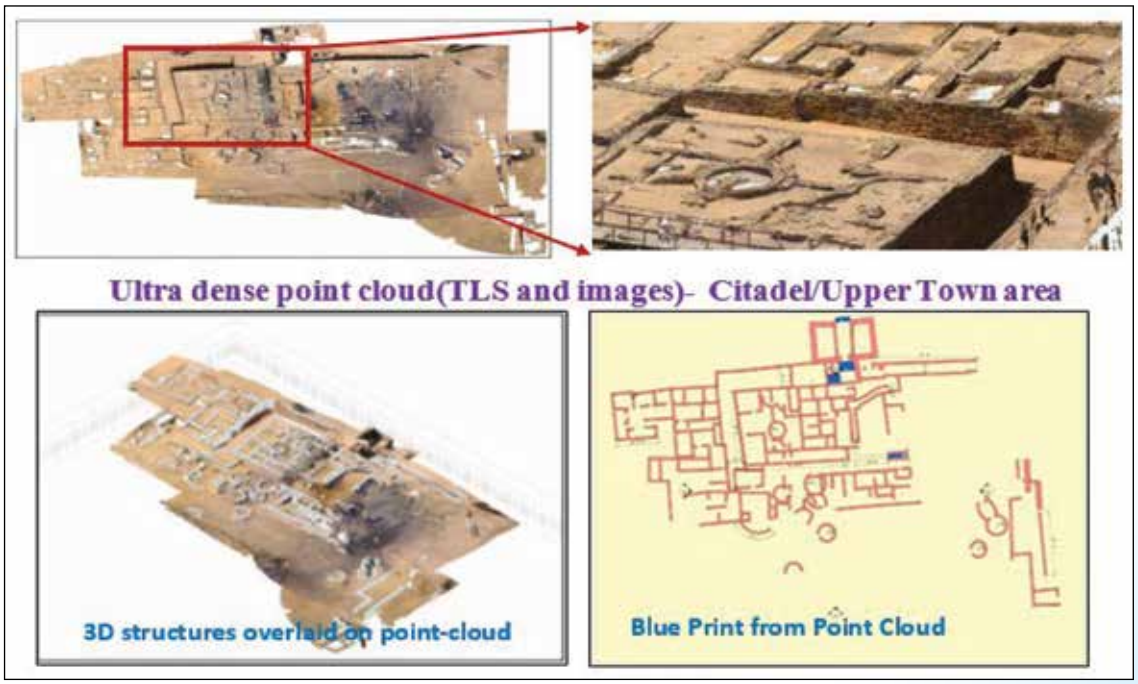
~ 0.867 for concrete roofs). These rooftop material maps provide actionable insights for urban planners and energy analysts, with potential to scale for city-wide solar potential mapping and material-specific monitoring.



Roof top material mapping using Hyperspectral data

d. Heritage studies

Integrated use of Active and Passive EO and Ground based data for Archaeological Investigations is carried out to achieve Digital Documentation of Monuments. Integrated



Remote sensing & ground observations for investigation of Archaeological sites

framework using multi-sensor and multi-platform remote sensing (LiDAR, SAR, optical, hyperspectral, and thermal imagery) for advanced archaeological investigation is envisaged. UAV photogrammetry and terrestrial laser scanning capture detailed surface structures, while SAR and GPR data reveal subsurface features. Comprehensive 3D digital models generated are compiled into a web-based platform for visualization, analysis, and long-term digital preservation that would support the conservation and sustainable management of cultural heritage sites.

2.1.7 Support to Governance

a. LCLU Mapping

Land Cover and Land Use (LCLU) is one of the 14 Fundamental Geospatial Data Themes (FGDTs) identified under the National Geospatial Policy–2022 for development of national geospatial information infrastructure in support of Sustainable Development Goals (SDGs). NRSC/ISRO, identified as the nodal agency for generation, updating, and maintenance of the national LCLU database is implementing two datasets: i) Annual Assessment of Land Cover and Land Use (1:250K) and ii) LCLU Assessment and Change Analysis (1:50K; Five-Year Interval). Annual mapping showed that multi-season cropping systems have increased from 794.25 lakh hectares (2023-24) to 822.90 lakh hectares in 2024-25. reflecting its resilience and economic value. Database at 1:50,000 scale is being prepared for 2020-21, 2025-26 using a refined 54-class classification system, towards which signing of MoUs and sensitization of partner institute is accomplished.

b. Monitoring Watershed Development and Rural Employment Generation Activities

Very High resolution remote sensing data from Cartosat-2S and 3 are employed to monitor 1150 micro-watershed projects through customized Bhuvan interface. Study addresses three stages viz., pre, mid and post implementation to assess outcomes of holistic restoration programme spread over 6 year period (2023-29). More than 5600 satellite scenes are being analysed to understand impact around 5.13 lakhs locations treated under 296 types of activities after training 700 officials across 12 states for applying Geo-ICT solutions on Bhuvan.

Under Geo-MGNREGA, which provides EO based geospatial solution for monitoring and planning of rural employment activities done mainly under natural resources

management sector, the impact of interventions on betterment of rural landscapes has been analysed. Monitoring uses an improved mobile app (Version 3.6) measuring and reporting linear and area extents of treated sites for verficiation against high resolution satellite data. Planning portal Yuktdhara under Geo-MGNREGA is adopted as part of standard approach to identify locations for treatment. Puseri Village, Ramanathapuram in Tamilnadu and Kannolli village, Jamkhandi Block, Bagalkot, Karnataka have witnessed substantial restoration due to creation of farm ponds in turn supporting horticultural plantation based economy, which is verified using satellite based analysis.

2.1.8 Ocean & Meteorology Applications

A satellite-derived ocean surface current product at 25 km spatial and daily temporal resolution has been developed for the global ocean for the period 1993–2024 using a diagnostic approach, enabling comprehensive. analysis of inter-annual, seasonal, and intra-seasonal variability of ocean current systems

Winter Algal Blooms (WAB) in the Arabian Sea (AS) was monitored using the integration of EOS-04 SAR with Chl-a data in 2025. EOS-04 data was used for detecting Oil spill monitoring of MSC ELSA3 ship capsize and sinking event of Kerala coast in May 2025.

ISRO starts generation and dissemination of Globally gridded daily, 8-day and monthly ocean colour parameters such as chlorophyll-a concentration (chlor_a) and diffuse attenuation coefficient at 490 nm (Kd_490) from the Reprocessed EOS-06 OCM3 data.

Analysis of 25 years (2000–2024) of satellite-derived chlorophyll-a data was used to examine how the El Niño–Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD) influence marine productivity. The results reveal a significant long-term decline in biological productivity across the Northern Indian Ocean, with the most pronounced reductions observed in the Arabian Sea and Somali Basin.

High-resolution PM2.5 and PM10 products have been generated using machine learning–based retrievals from satellite-derived Aerosol Optical Depth (AOD) and Normalized Difference Vegetation Index (NDVI). The models have been rigorously validated and thoroughly evaluated for performance. The novelty of this work lies in its capability to produce instantaneous PM concentration maps across the entire Indian landmass, enabling timely air quality assessment and management.

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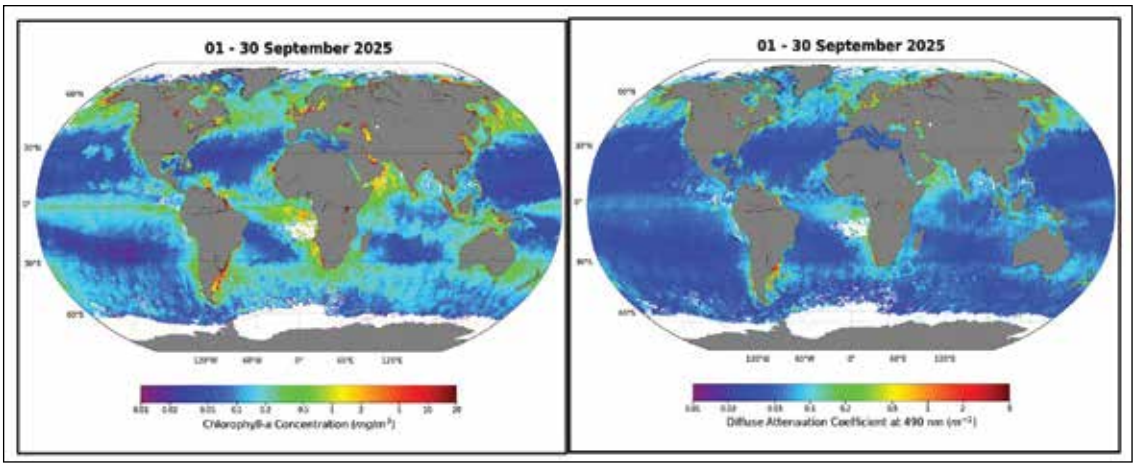


Global Level-3 monthly products of chlor_a and Kd_490 from EOS06 OCM3

A program was developed to utilize data from the 1,200 GNSS receivers of the Survey of India's Continuously Operating Reference Station (CORS) network. This program generates pan-India maps of Total Electron Content (TEC) and Integrated Water Vapour (IWV), providing valuable insights for ionospheric and atmospheric studies across the country.

2.1.9 Disaster Management Support

As part of the ISRO's Disaster Management Support Programme (DMSP), space based inputs were generated and disseminated, towards disaster- preparedness, response, and mitigation for major natural hazards. Database, DSS tools, products and services of National Database for Emergency Management (NDEM) were also extended for DMS. The major beneficiaries included State/Central Disaster Management support organizations, nodal departments/ ministries for various natural hazards and general public.

a. Operational implementation of Spatial Flood Early Warning System (under NHP)

Spatial flood early warning systems developed by NRSC/ ISRO for Godavari and Tapi river basins under the National Hydrology Project are successfully migrated to CWC, Delhi, alongwith its Technical

Inauguration of C-Flood, the Unified Inundation Forecasting System

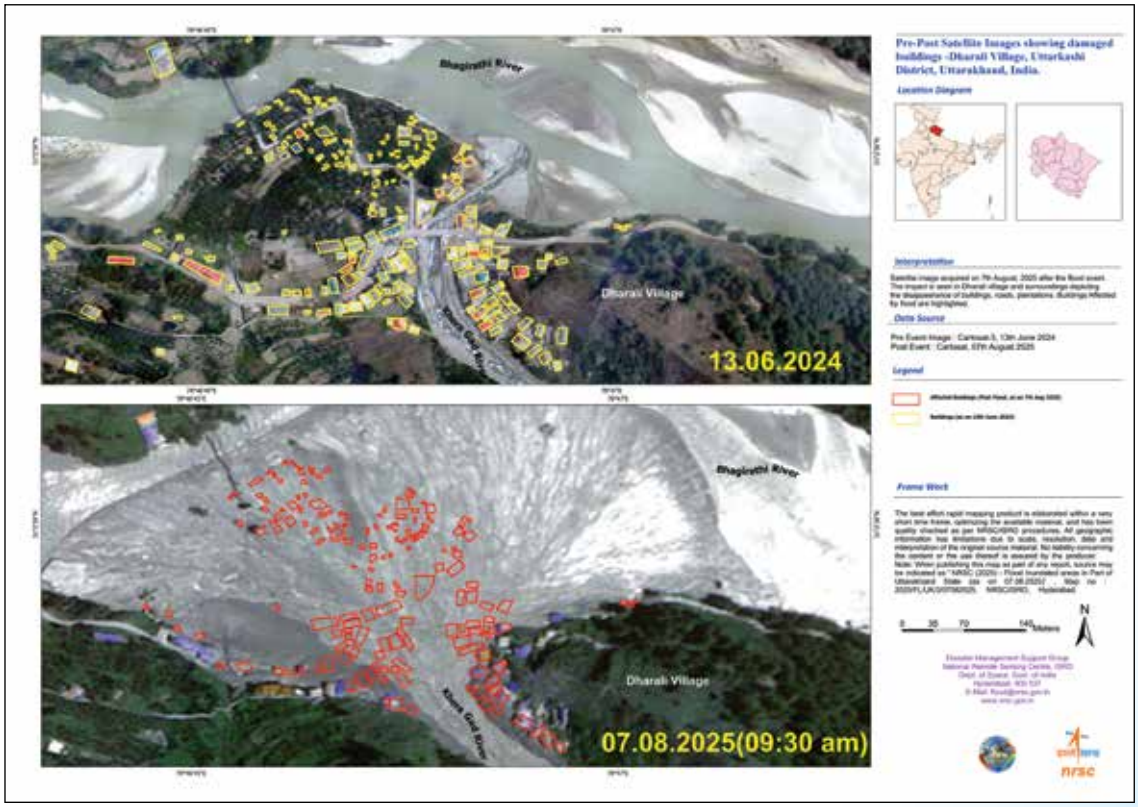
Document, Performance Report, and Standard Operating Procedure (SOP) for operational implementation. NRSC has extended the backend support to CWC, which has operationally run the system during 2025 flood season.

b. ISRO's contribution Unified Flood Inundation Forecasting Platform

The Spatial Flood Early Warning System developed by NRSC/ ISRO for Godavari and Tapi rivers is an integral component of C-FLOOD, the web-based Unified Inundation Forecasting System implemented by MoJS. The unified portal empowers disaster management agencies and state authorities with near real-time spatial inundation forecasts, for timely evacuation planning, optimized reservoir management, and risk reduction measures.

c. Near Real Time flood Inundation Mapping and Hazard Assessment

During 2025, extensive monsoon flooding was witnessed across the Indo-Gangetic plains and the northeast. More than 310 flood inundation maps and value-added products were generated across 23 states/UTs during May 2025 to November 2025, covering monsoon-



Satellite data showing the extent of mud flow in Dharali village, Uttarakhand.

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related flood inundation, cyclone-induced flooding, and flash-flood events in regions such as Uttarakhand and Himachal Pradesh.

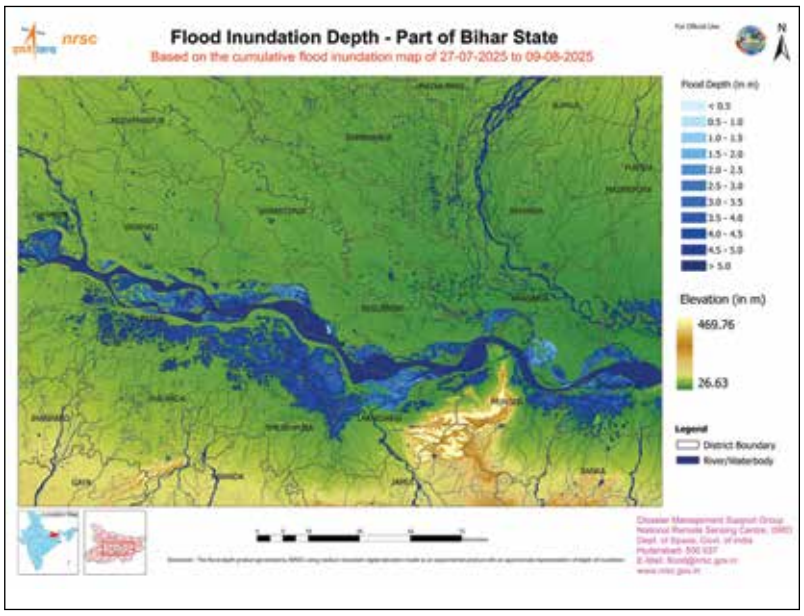
The 3rd version of Flood Hazard Zonation Atlas of Assam prepared using flood inundation information from satellite data of 1998-2023 was released in June 2025 by Honourable Union Home Minister. Flood Hazard Zonation is a non-structural measure for minimising the flood damage and helps decision support during developmental planning.

d. Flood Early Warning Systems Assam (FLEWS)

FLEWS, being one of the flagship programs of NESAC, is operational since 2012. This project covers all the flood prone districts of Assam. Currently, it is running in its fifth phase (2024-2026). In the last monsoon season, the GIS-Hydrological based flood forecasting system achieved flood alert/warning lead time of 12 h, 24h and 36 h depending on case-to-case basis due to various basin sizes. About 35 flood alerts (2025) were issued to the Assam State Disaster Management Authority, covering 20 districts. The success score was maintained at 85% (Absolute and partial success).

e. Flood Depth Modelling

A new method has been implemented to estimate flood depth using surface topography data and satellite data-based flood extent. The flood depth products (cumulative extent/ fortnight cumulative extent) are being distributed through NDEM geoportal. A total of 63 flood depth layers over 18 States were generated and disseminated during monsoon 2025.



Flood depth map (part of Bihar, 27 Jul-09Aug, 2025)

f. Monitoring, Modelling and Management of Glacial Lake Outburst Floods (GLOF) in catchments of Hydroelectric Projects

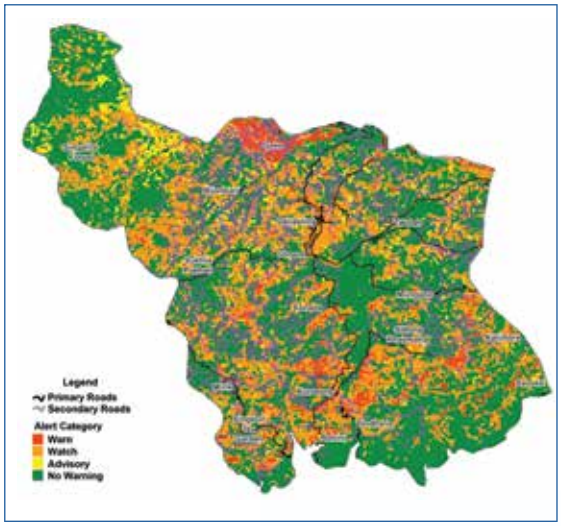
2,024 glacial lakes of size ≥ 1 ha in the catchments of 26 HEPs of NHPC Ltd were monitored for the monsoon months (June–September) of 2025 and compared against baseline data from 2016 to identify changes in water-spread areas, in addition to their prioritization, and detailed GLOF modeling.

g. Remote sensing enabled Online Chemical Emergency Response System (ROCERS)

A decision support system for chemical emergencies developed by NRSC/ ISRO for Government of Kerala was released in 2025 (https://rocers.fabkerala.gov.in). It is a web-GIS based DSS, including weather & dispersion models from IGCAR/DAE. ROCERS addresses emergencies using the state-of-the-art geospatial technology and weather & dispersion models for monitoring chemical spreads, including integration of live sensors for various chemicals like Ammonia, LPG and other hazardous chemicals.

h. Satellite Integrated Landslide Assessment and Alert System (SILAAS)

Under the Satellite Integrated Landslide Assessment and Alert System (SILAAS) project, a landslide alert product has been developed, integrating landslide susceptibility, trigger (rainfall) probability and slope deformation. Experimental alerts generated are being hosted on the NDEM portal of NRSC since June 2025. Ground validation of the alerts were also done in Darjeeling district, West Bengal.

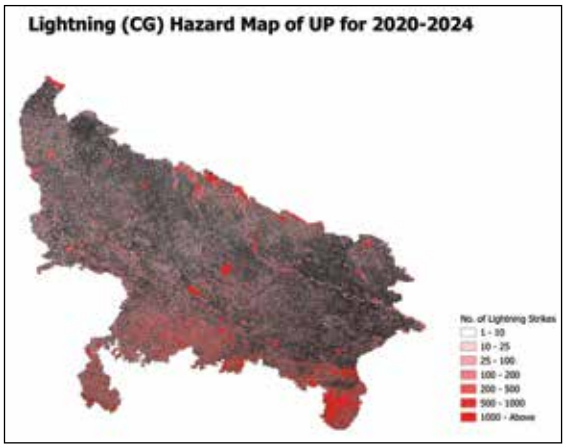


Landslide alert map, Darjeeling

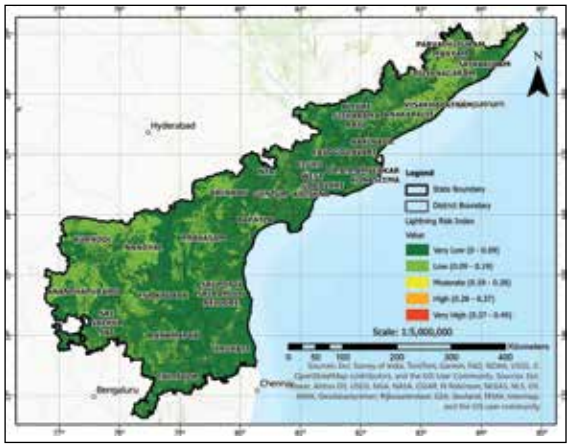
i. Lightning Hazard, Risk and early warning

Lightning hazard assessment of Uttar Pradesh state has been done using NRSC/ ISRO's Lightning detection sensor network data. Village level lightning hazard assessment shows that most of the villages located in south Uttar Pradesh are vulnerable to CG

lightning occurrences. A reproducible lightning-risk framework for India is also developed and is demonstrated for Andhra Pradesh and Sikkim. It has been shown that satellite based products (INSAT-3DS and MSG_SEVIRI_IODC) improved early warning alerts of thunderstorm and lighting in Bihar during 2025.



Village level lightning hazard, UP



Lightning risk map, Andhra Pradesh

j. Development and Operationalization of an Integrated Severe Weather and Lightning Nowcasting System for the North Eastern Region of India

Severe weather and lightning tracking system for the NER of India using the lightning data from Indian Institute of Tropical Meteorology (IITM), Pune network was developed and operationalised. The lightning nowcasting is also done over the NER of India with lead time upto 6 hours by assimilating INSAT 3DR/3DS and the ground-based lightning data in the WRF-Elec model. The alerts are disseminated to the concerned State Disaster Management Authority through NER-DRR web portal. A Deep Learning based system has also been developed for high-resolution probabilistic lightning nowcasts (30-120 minutes) using data from INSAT-3DR/3DS and ground-based lightning data.

k. Launch of Integrated Control Room for Emergency Response (ICR-ER)

Honorable Union Home Minister launched ICR-ER, the state-of-the-art facility established by MHA for Disaster Management, in June 2025.

ISRO's contribution to ICR-ER includes provision of the technical design & implementation plan, National Database for Emergency Management (NDEM, Version 5.0) as a key

technological backbone and NDEM at NRSC/ ISRO Shadnagar campus functioning as a Disaster Recovery (DR) node & continuous data provider node for ICR-ER, to ensure system redundancy and reliability.

NDEM v5.0 Operationalized in ICR-ER DM Control Room

l. Nowcast techniques for severe weather indicators

Overshooting cloud top (OTs) are strong indicators of catastrophic weather such as heavy and sudden downpour, destructive winds, lightning, thunderstorms and hailstorms. INSAT-3DS data is utilized to develop OT nowcast (60 min lead time) method over India and surrounding ocean. In addition, INSAT-3DS based Convective Initiation (CI) nowcast (90 min lead-time) is developed to identify the locations of deep convection.

m. Advanced Research initiative for Disaster Management Support

Advanced R&D projects were executed involving premier academic and R&D institutes for contributing to Disaster Management Support programme. It aimed development of new methodologies & algorithms for hazard assessment and early warning systems, along with the integration of Artificial Intelligence (AI) and Machine Learning (ML). IITs, NIT, IISER, CBRI etc. were part of this initiative, contributing to development of avalanche hazard & early warning, AI based lighting & hailstorm alerts, permafrost destabilization induced mass wasting, SAR data for detecting partially inundated vegetation etc.

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n. NDEM Lite Ver. 2.0 Mobile Application

NDEM Lite Ver. 2.0 mobile application was launched by the Hon. Union Home Minister at Vigyan Bhavan, New Delhi in June, 2025. It provides real-time disaster data and essential tools in a portable format, enabling field officers to access critical information on the go. It ensures disaster response teams are connected, informed, and are able to act quickly in remote locations.

o. Launch of Smart AXOM Mobile App

The SMART AXOM mobile application, an integrated WebGIS platform developed by the North Eastern Space Applications Centre (NESAC), Department of Space in collaboration with the Assam State Disaster Management Authority (ASDMA), was officially released by Hon'ble Minister of Revenue and Disaster Management, Science & Technology and Climate Change Department, Government of Assam.

The platform enables real-time dissemination of early warnings and alerts related to hazards such as floods, lightning, and other natural calamities, sourced from authoritative agencies including IMD, CWC, and NDMA's SACHET. SMART AXOM provides location-based information about nearby relief camps, hospitals, shelters, police stations, and supports emergency calling, helping people take quick and informed decisions during disasters.

p. International Cooperation in Disaster Management

- ISRO's Successful Leadership of the International Charter 'Space and Major Disasters: India, through ISRO, has successfully led the Charter for six-months during April–September 2025, reaffirming the nation's global commitment to leveraging space technology for humanitarian causes. ISRO's lead role period saw nearly 40 Charter Activations with seamless information flow among the stakeholders, onboarding of new Authorized Users, Organisation of 53rd Charter meeting, and smooth working of the functional structure of the Charter. 43 Charter requests were serviced and 167 IRS products were supplied.

- Support to Sentinel Asia: During 2025, ISRO has supported management of 33 disaster events in 14 countries with the help of 82 IRS multi-sensor satellite datasets. ISRO has also activated Sentinel Asia during the Kerala Oil Spill, Assam Floods. ISRO has been regularly participating in various Sentinel Asia Steering Committee (SA-SC) meetings, and telecons. ISRO has also participated in the APRSAF-31 Meeting held at Philippines

during November, 2025 and made detailed presentation on the activities of Sentinel Asia during this period as part of SA-SC Co-Chair.

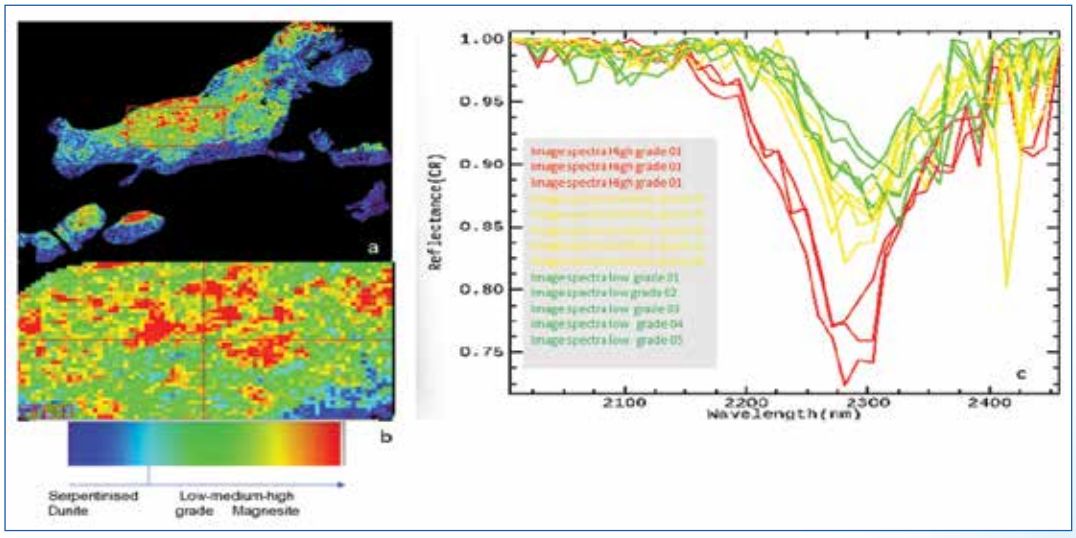
2.1.10 Geoscience, Mineral Exploration & Renewable Energy

a. Exploration of Lithium and associated minerals in Raichur, Karnataka

Li-bearing pegmatites were studied using an integrated hyperspectral, geophysical and geochemical approach. AVIRIS-NG data helped to delineate silica-rich areas dominated by minerals such as spodumene and lepidolite. 3D integration of magnetic data with resistivity and chargeability highlighted Li-bearing pegmatites within high-resistivity, high-chargeability and low-magnetic zones. The geophysical anomalies correlated strongly with the AVIRIS-NG-derived spectral map, validating the identified Li-bearing pegmatite zones.

b. Magnesite exploration in Tamil Nadu, India, using ENMAP Hyperspectral data

ASTER and ENMAP datasets were used for delineating dunite, within which magnesite is occurring as vein-type deposit, in the study area. ENMAP data helped detection of magnesite rich zones within dunite. Relative mineral grade assessment was done using relative spectral band depth information generated using the hyperspectral data and X Ray Fluorescence analysis of laboratory samples.



Colour graded RBD image and image spectra. Red pixels are indicative of higher grade magnesite while yellow zone is of intermediate and blue zone is of low grade

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c. Exploring the Possibility of White Hydrogen Occurrences in Indian Ophiolitic context

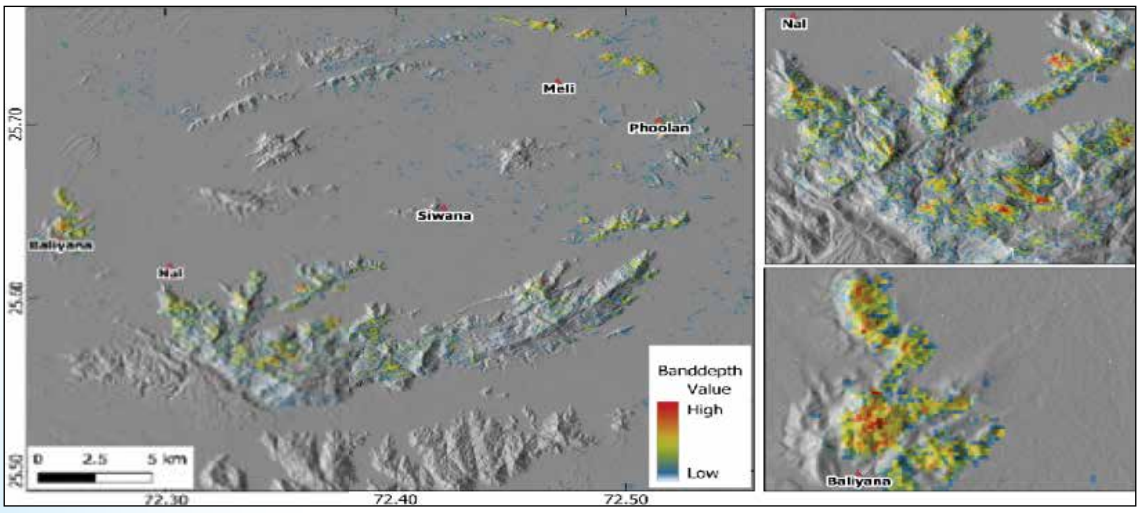
Potential for white hydrogen occurrences in Indian ophiolitic terrains, focusing on the Nidar and Spongtang ophiolites in Ladakh, using integrated remote sensing and geochemical approach was explored. White hydrogen (H_2), is naturally generated through geological processes like serpentinization. Spectral and chemical analyses showed presence of serpentine, olivine, and alteration minerals, with serpentinization levels-upto 48% in peridotitic zones. This highlights the strategic significance of Indian ophiolites as unexplored white hydrogen provinces.

d. Spectroscopic oriented approach for REE prospect modelling

A spectroscopic oriented framework for estimating the spectral abundances of Rare Earth Element (REE) is developed to support the REE exploration. The approach exploits two diagnostic sharp and narrow absorption features of REEs located near 744 and 800 nm. The algorithm computes the band depth of absorption feature by removing the continuum in spectral range 712-840 nm. The approach was implemented to identify REE enriched zones in parts of Siwana Ring Complex (SRC) using EMIT hyperspectral datasets. The inter-comparison of REE enriched zones derived from airborne AVIRIS-NG and EMIT show a similar pattern of REE enrichment in parts of Nal, Siwana suggesting the potentials of EMIT for REE related prospecting. The results were validated using bed rock Neodymium concentration obtained from geochemical analysis of 137 rock samples.

e. Development of AI/ML model for gold prospect modelling

AI/ML based model for gold prospect modelling was developed leveraging airborne



The REE abundance map of Siwana Ring Complex (SRC) derived from EMIT image

hyperspectral and aero-geophysical datasets. The spectral abundances of major alteration and indicator minerals such as calcite, chlorite, biotite, actinolite were estimated from hyperspectral datasets of AVIRIS-NG. The potassium enrichment, potassium deviation parameters, U and Th concentration and information about shear zones and chemical traps were derived from aero-geophysical (radiometric and magnetic) datasets. Using these geological predictors, an AI/ML model was developed to identify the mineral prospects in Hutti-Maski schist belt.

f. Assessment of Wind and Solar Pathway to 2050 for Decarbonizing India's Power Sector

Quantitative assessment of realizable renewable potential from current ground-mounted solar PV and wind turbine technologies using multi-year reanalysis and satellite-based land-use/land-cover data is done, and its distribution across national and regional power grids is assessed. Solar power density is relatively uniform (49 – 57 W/m2) across India, while wind power exhibits high spatial variability, concentrated mainly offshore (110 – 200 W/m2) and in a few onshore (80 – 120 W/m2) areas. The study indicates that wind and solar energy may altogether supply 48% of electricity generation (~4,301 TWh) and comprise 74 % of installed capacity by 2049–50. Optimal sites with minimal monthly variability are identified to meet these targets, requiring 5% of India's onshore and 3% of offshore area.

2.1.11 Updates on Geoportals

Earth Observation System delivers data, geospatial database products and services through various web portals addressing different aspects of applications in the domains of land, ocean, atmosphere. Due to the specificity involved in each domain following Geoportals are designed and implemented; Bhuvan, Bhoonidhi, VEDAS, MOSDAC, NICES Portal, NDEM, NERDRR.

a. Bhoonidhi

Bhoonidhi, a key portal for Indian Open Data, has been revamped and expanded addressing automation, interoperability, expansion of data portfolio, data products as well as provision of tools. Automation has been implemented across complete data cycle from archival, cataloguing and dissemination. Bhoonidhi deploys STAC as its data catalogue, thereby enhancing interoperability and aligning with the latest geospatial cataloguing frameworks.

Implementing the current data policy, 17 lakh data products are generated and made available to the user community.

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Using C band SAR data, High Resolution (500m) Soil Moisture Product, Ocean Surface Wind Speed Product (WW) information are operationalized using data acquired over Indian terrain every 17 days. These products can be downloaded from Bhoonidhi web portal.

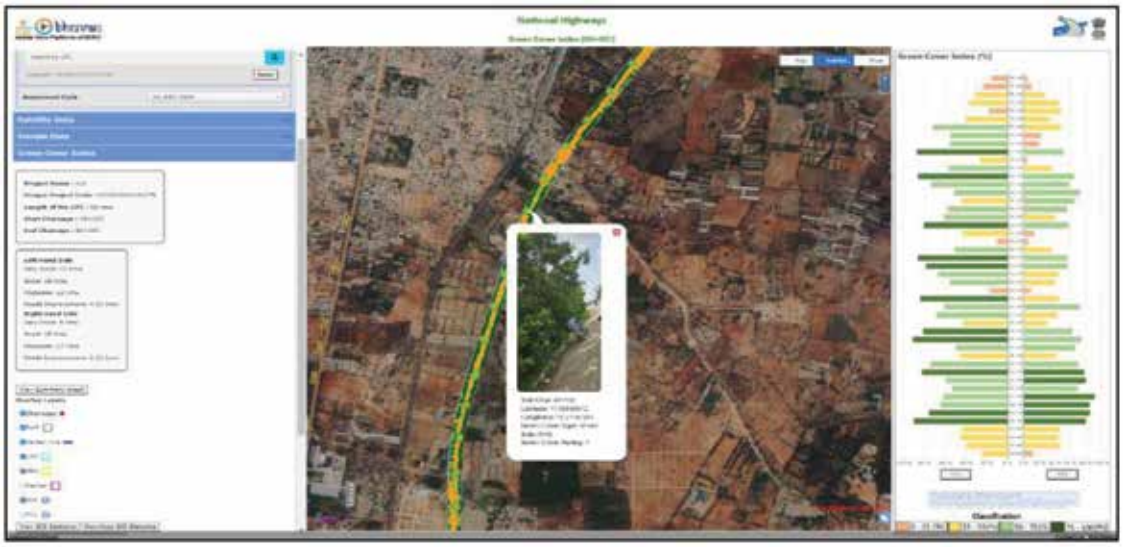
An automated framework has now been implemented at IMGEOS to generate cycle-wise 17-Day Full India Water layer mosaic layers from EOS-04 MRS data. These products are being released on Bhoonidhi as 10 × 10 tiles.

Data dissemination at Bhoonidhi is facilitated via GUI as well as a STAC catalogue and API with built-in optimizations for handling high-volume datasets.

SARPOLTool 3.0, developed as an advanced multi-SAR mission data analysis toolbox integrated with QGIS, is hosted in Bhoonidhi to user community for free access.

b. Bhuvan

Bhuvan is serving as geoportal for satellite data visualisation, dissemination of data products & services and hosting of data & applications of the user community. Key performance indicators for Bhuvan showed 11,400 Million hits and 1,00,126 data downloads accessed by 217 Lakh unique IPs between January to November, 2025.



NH-GCI Portal Interface and Key Functional Features

A web based solution was implemented for National Highways Authority of India to monitor green cover along high ways using high resolution multispectral data to categorise three levels of green cover manifestation. It provides informative dashboard to support

optimisation of afforestation planning, environmental compliance using algorithm driven image analytics.

Bhuvan Aadhar Inspection Solution under Bhuvan–UIDAI collaboration focuses on providing a geospatial solution for Aadhaar enrolment centre inspections. During this period, several key enhancements were implemented in the Bhuvan Aadhaar Inspection Solution.

Bhuvan has also featured other governance tools related to MGNREGA wherein customised app for mapping cover features on the ground through navigation was standardised. Active agricultural and forest fire monitoring were implemented in Bhuvan where automated processing and alert generation for JPSS-2 fire detections were reactivated, with correct handling of time-stamps and date-of-pass information for new fire events.

Geospatial technology support to Pro-Active Governance and Timely Implementation (PRAGATI) development has led to creation of geospatial maps for national projects using existing authentic information as well as generation of satellite based evidence. A total of 269 projects were processed during this period, resulting in comprehensive geospatial layers, satellite evidence products, and structured presentations that support decision-making and review at the highest administrative level.

As part of the Bhuvan NextGen enhancements, the Bhashini multilingual AI translation framework—an initiative of the Government of India—was integrated into the platform.

Bhuvan NextGen implementation

The Bhashini Multilanguage Feature API, supporting 22 Indian languages, was incorporated into Bhuvan NextGen.

c. MOSDAC

The fire detection algorithm of the INSAT-3DS Imager was updated, and the Active Fire (AF) product was operationalized on MOSDAC (https://mosdac.gov.in/).

ISRO developed a dedicated MOSDAC-IN web portal for the Indian Navy, enabling satellite data assimilation to generate weather and ocean outlooks. This capability empowers the Navy to achieve self-reliance in this domain.

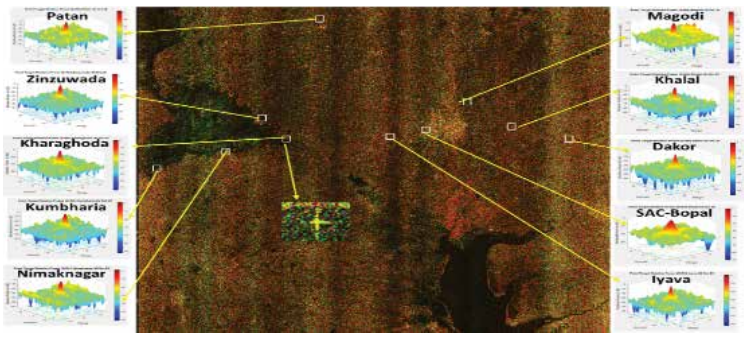
d. NICES

Carbon Cycle Estimates are developed over India using a multi-model framework driven by Remote Sensing and GIS data. Terrestrial analysis using the CASA model (2001–2024) shows India as a net carbon sink.

Gridded lower-stratospheric water vapour profiles using SABER and MLS satellite measurements, Antarctic Sea-Ice Dynamics from SCATSAT-1 satellite data, Cloud cover changes over Indian subcontinent using INSAT-3D during the recent decade (2014–2023) etc. are also implemented.

2.1.12 NISAR Science and Applications

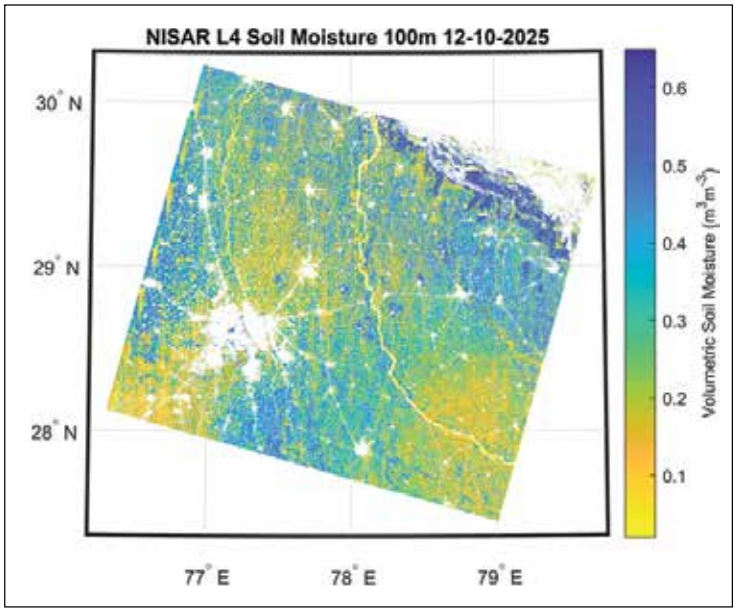
NISAR Observation Plan has been formulated primarily over Indian subcontinent, Antarctica and global cal/val targets using various L- & S-SAR mode combinations. A large number of science products have been identified for operationalization which will enable studies for dynamics in Ecosystems, Cryosphere, Solid Earth and Coasts & Oceans. Algorithms and software for these science products have been developed and cleared by respective review committees, this year.



Impulse responses of CRs across full-swath at Gujarat, during Desc pass on 26 Oct, 2025

ISRO and JPL/NASA science teams have been working jointly to synergize the science outcome from both the instruments of L- and S-band SAR. In this regard, a joint (ISRO &

NASA) science team meeting was held at IIT-Madras on 28-29 July, 2025, just prior to the launch, to formulate plans on joint science studies and validation.



NISAR derived 100m resolution soil-moisture over New Delhi & surroundings

With launch on 30 July, 2025, NISAR embarked on its Commissioning phase during which S-band SAR calibration was a prime activity, feeding into S-SAR data-processing chain. A two-flanked approach was adopted for this: 1) Full-swath (240km) calibration in campaign mode, where 17 corner reflectors (CRs) (trihedrals & dihedrals) deployed across 10 locations in Gujarat, catered to ascending & descending passes. This campaign for more than 4 months generated invaluable data for S-SAR calibration. SAC built Polarimetric Active Radar Calibrator (PARC) was also used during full-polarimetry observations. 2) In parallel, Pan-India calibration, with CRs at 9 locations falling in unique S-SAR beams, was also exercised. This will continue beyond commissioning phase to generate inputs on calibration stability.

NISAR Science team has been analysing initial S-band SAR data for radiometric and polarimetric performance, and found to be promising. The data has been processed with above-mentioned science algorithms and preliminary results are generated for soil-moisture retrieval, vegetation-classification, surface-water extent, glacier facies & sea-ice classification, ocean wind speed, internal-waves, repeat-pass interferometry, etc. As an example, the soil moisture product of Delhi and surrounding shows strong spatial variability at field scale, driven by land use, irrigation, and surface wetness patterns, and demonstrates NISAR's capability to provide high-resolution, all-weather soil moisture information for hydrological and agricultural applications.

One of the USPs of NISAR is its capability to provide repeat-pass interferometry enabled by stringent orbit maintenance. Interferometric processing of data of Afghanistan,

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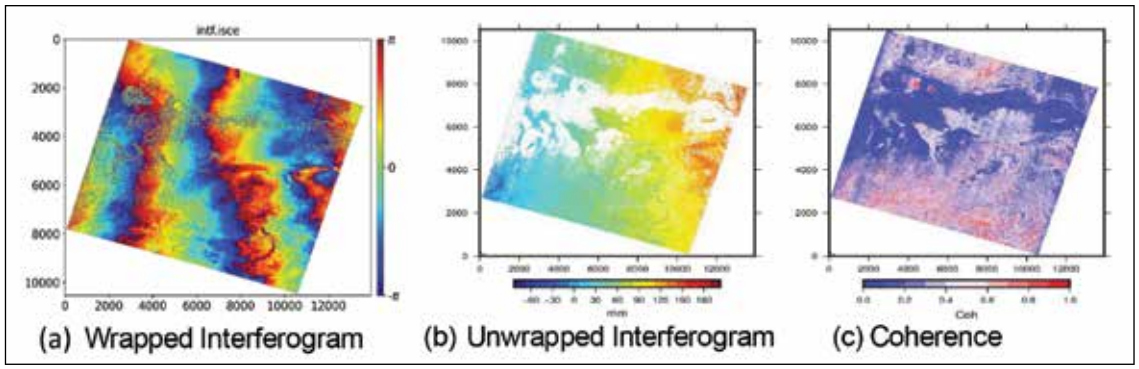
with interferogram fringes (wrapped and unwrapped) along with coherence image are illustrated.



NISAR derived repeat-pass InSAR results (data pair: 25 Oct & 06 Nov, 2025, over Afghanistan)

2.1.13 Conduct and outcome of National Meet 2025

A decade after the National Meet organised for Enhancing the use of Space Technology & Applications in Governance and Development in 2015, Government has assessed the current status of Space Technology and Applications across the user segment, to drive its contribution towards Viksit Bharat 2047.

63 Central Ministries/ Departments and 36 States/ UTs formed their respective teams and interacted with concerned teams from ISRO/ DoS and assessed the current & future requirement of space technology in the respective domains. More than 300 one-to-one meetings were held between teams of ISRO & Ministries/ Departments/ States/ UTs, in addition to 8 regional meetings (with State Governments & UTs) and 3 State level meetings, with participation of more than 700 officials. Through these interactions, the current and future needs of space technology were assessed, and 91 requirement documents were generated.

National Meet 2025 was held on August 22, 2025 towards "Leveraging Space Technology & Applications for Viksit Bharat 2047". It was attended by about 1,500 delegates (650 officials from Ministries/ Departments/ States/ UTs, 50 representatives from NGEs and 800 officials from ISRO). 100 presentations were made by the stakeholders & NGEs on the current and future needs of space technology, in 11 technical sessions during the meet.

The roadmap of the space missions for the next 15 years to meet the user requirements was prepared as an outcome of the National Meet 2025. It envisages 103 Operational Missions (to be realised through industry) and 16 Technology Demonstration Missions (to be pursued by ISRO).

2.2 Space Applications

2.2.1 Satellite Communication Applications

Satellite links are the primary means of connectivity to remote, far flung and difficult to access regions of the country and play the role of backup links for large number of services on terrestrial connectivity. A fleet of 19 communication satellites are operating over India with communication transponders in C-band, Extended C-band, Ku-band, Ka/Ku band and S-band. Out of these, 12 communication satellites are owned and operated by M/s New Space India Limited, a CPSE under Department of Space.

GSAT-N2 satellite launched in November 2024 has commenced its operational services in Jan 2025. CMS-03 satellite was launched onboard LVM3-M5 on November 02nd, 2025. CMS-03 is a multi-band communication satellite that has wide coverage including the Indian landmass.

All the 19 satellites together provide 304.5 operational bent-pipe transponders and 73 Gbps High Throughput Satellite (HTS) capacity. These satellites support services like television broadcasting, DTH television, telecommunication, Very Small Aperture Terminal (VSAT) services, radio networking, Headend In The Sky (HITS), Digital Satellite News Gathering (DSNG), In-Flight and Maritime Connectivity (IFMC), societal applications (like tele-education, tele-medicine and disaster management), and strategic communication. The prominent users of the transponders are government & strategic users, Prasar Bharati, DTH and TV operators, public sector units (BSNL, ONGC, AAI, ECIL etc.), private VSAT operators, banking and financial institutions, etc.

In order to meet additional transponder requirements from various user sectors, leased foreign capacity is being hired from international satellite operators on a back-to-back arrangement or directly by users on IN-SPACe authorized satellites. In addition, about 40 transponders in C-band, are directly leased by the broadcasters for TV uplinking. Thus, satellite communication is playing a major role in the socio-economic development of the country.

2.2.2 Television

Doordarshan (DD) is presently operating 35 satellite channels and has a vast network of studios throughout length and breadth of the country and terrestrial transmitters of varying power at strategic areas. DD has 40 C-band earth stations for programme contribution and distribution of DD channels and one C-band DTH earth station for providing DTH service to Andaman and Nicobar Island where Ku-band DTH footprints are not available. Satellite communication has played a key role in capturing live news and events through DSNG

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services. DD is using a total of 20.36 transponders (12.03 C band & 8.33 Ku band) of 36 MHz each on GSAT system.

2.2.3 Satellite Radio Networking

Satellite based connectivity was started in 1985 with 5 satellite radio channels in S-band (analog). The connectivity has been expanded to 90 digital channels (through captive earth station – 80 channels & DSNG – 10 channels) for national, regional and Vividh Bharati networking through GSAT-10 (for coverage over Indian mainland) and GSAT-18 (for coverage over Andaman & Nicobar and Lakshadweep Islands). All India Radio has setup 44 captive earth station & DSNG and 505 downlink radio network terminals. It is also broadcasting 48 radio channels (Ku-Band) on DTH platform of Doordarshan 'DD Free Dish'.

2.2.4 Telecommunications

Indian communication satellites have been supporting telecommunication applications for providing voice, data and broadband services. Satellite links are the primary means of connectivity to remote, far flung and difficult to access regions of the country and play the role of backup links for large number of services on terrestrial connectivity.

At present, the licensed SATCOM network in the country consist of more than 38 teleport operators with 72 teleports, 32 VSAT operators with 60 VSAT hubs, about 2.75 lakh VSAT terminals, 5 DTH operators, 1 HITS operator, and 47 DSNG operators. They are operating in satellite networks of BSNL, government users, captive CUG VSAT users, commercial VSAT users, and TV broadcasters. This network is being utilised for telecommunications and broadcasting applications. Satellite based captive networks are operational using VSAT systems for establishments like NTPC, ONGC, IOCL, ERNET, Indian Railway, Karnataka Power Transmission Corporation Ltd., etc. apart from private enterprises. In addition, GSAT satellites cater to captive government networks of various ministries and strategic agencies. In the year 2025 (till November 2025), ISRO and SATCOM Monitoring Centre (SMC), DOT resolved 74 major interference issues observed / reported by the licensees / satellite operators.

2.2.5 Telemedicine

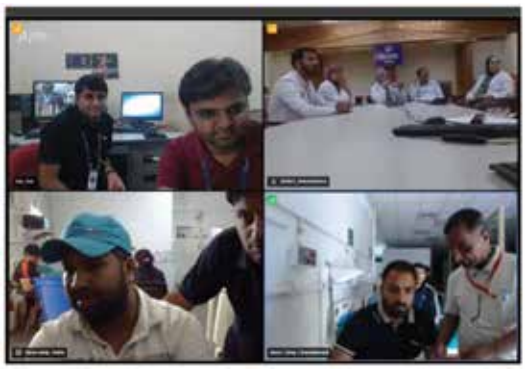
Satellite communication based telemedicine is one of the unique applications of space technology that is being utilised for the benefit of the society. Telemedicine technology utilises information & communications technology (ICT) based system consisting of customised telemedicine software integrated with computer hardware and medical diagnostic instruments connected to the commercial VSATs. Telemedicine enables patients to 'see & interact' with the doctor live through video links. ISRO's telemedicine

programme connects various remote / rural medical colleges and hospitals to major speciality hospitals in cities and towns using satellite communication.

ISRO is providing telemedicine services for various users across India. Several telemedicine nodes for defence & paramilitary forces have been established in inaccessible and high-altitude areas such as Jammu & Kashmir, Leh, Ladakh, etc. as well as in glacier regions like Siachen. At present, around 179 telemedicine nodes are operational. Out of these, around 80 telemedicine nodes are located in high altitude regions. All the 179 nodes were upgraded with UHP-100 modems.

As part of ISRO's efforts to provide telemedicine facilities to Shri Amarnath Ji pilgrims, six telemedicine nodes were established along the route to Holy Cave Shri Amarnath Ji in collaboration with the Directorate of Health Services (DoHS), Jammu & Kashmir, These nodes are strategically located at Holy Cave, Lower Holy Cave, Sheshnag, Chandanwadi, Baltal & Panjtarni. These nodes are equipped to facilitate telemedicine consultation and multiparty video conferencing. These nodes are connected to DoHS through the ISRO telemedicine network.

Shri. Amarnath Yatra nodes



Live session between VSAT nodes

Continuing Medical Education (CME) programmes are conducted on telemedicine network, where doctors and paramedical staff at remote nodes are educated through interactions with experts from specialty hospitals. 12 CMEs have been conducted so far in in last one year. More than 9500 doctors / paramedical staff have benefitted.

100th CME lecture was conducted on 30th June, 2025 on "Exercise, Diet & Cardiovascular Health" by Dr. Tejas Patel, Apex Hospital, Ahmedabad. Around 88 remote telemedicine nodes participated in the lecture. More than 900 doctors and paramedical staff at remote hospitals were benefitted.

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100th CME from SAC, ISRO

2.2.6 Tele-education

Satellite communication plays an important role in providing tele-education programs to students in the remote areas using live and recorded broadcast. It supplements curriculum based education for primary & secondary schools as well as under-graduate & post-graduate students. It also provides teachers' training as and when required. Satellite capacity and technical support was provided to BISAG-N for 200 educational channels under PM-eVidya programme.

2.2.7 Satellite Aided Search and Rescue (SAS&R)

The Satellite Aided Search and Rescue (SAS&R) programme has been providing operational services to the users in India and seven neighbouring countries for the last 35 years with the aid of GEO and LEO local user terminals (GeoLUT & LeoLUT) and Indian Mission Control Center (INMCC). The LUTs and INMCC provide round the clock distress alert location services to all ships, aircrafts and individual users. It also maintains the database of all registered 406 MHz beacons belonging to Indian ships, aircrafts and other users.

INMCC provided search and rescue support to 09 real distress incidents in Indian service area and contributed in saving 47 human lives during this period. Till date, there are 1203 registered users and the total number of registered beacons is 21045.

In order to enable MEO-based SAR and in accordance with the COSPAS-SARSAT programme, a 6+1 channel MEOSAR ground segment (MEOLUT) has been indigenously developed. The various sub-systems include antenna, RF, servo system, digital receiver, and scheduler & location estimator. All sub-systems are centrally monitored and controlled by in-house developed system.

MEOSAR ground segment commissioning tests were completed and report was submitted to COSPAS-SARSAT Expert Working Group (EWG-4C) in February 2025. Based

on the results, EWG-4C declared Initial Operations Capability (IOC) for India MEOLUT. Currently, data is being analyzed in real-time for initiating IOC. Once IOC is initiated, after successful 90 days of operations India MEOLUT will be declared Full Operations Capability (FOC) and subsequently India MEOLUT can then disseminate MEOLUT alerts nationally & internationally.

INMCC participated in the Joint Committee meeting held in Abu Dhabi during the period 27th May 2025 to 05th June 2025. The meeting carried out discussion regarding MEOLUT commissioning test.

COSPAS-SARSAT Joint Committee meeting held in Abu Dhabi

INMCC presented a paper to COSPAS-SARSAT Open Council meeting (CSC-73) held in the month of October-2025 at Doha, Qatar, for commissioning of Indian LGM-MCC. CSC-73 recommended that commissioning of India LGM-MCC will be commenced soon.

INMCC participated in National Maritime Search and Rescue Board annual meeting 2025 in Gandhinagar, Gujarat. INMCC supported testing of 406 MHz UHF beacon to be used during Gaganyaan TV-D2 & G1 missions. INMCC supported the testing of location beacons to be carried in Gaganyaan.

2.2.8 Distress Alert Transmitter - Second Generation (DAT-SG)

ISRO has developed a low cost UHF Distress Alert Transmitter (DAT) for fishermen to support emergency message reporting for maritime search and rescue operations. A multi-user web-based Network Management System (NMS) known as “Sagarmitra” is developed to display the information about distress alerts on GIS map. It offers

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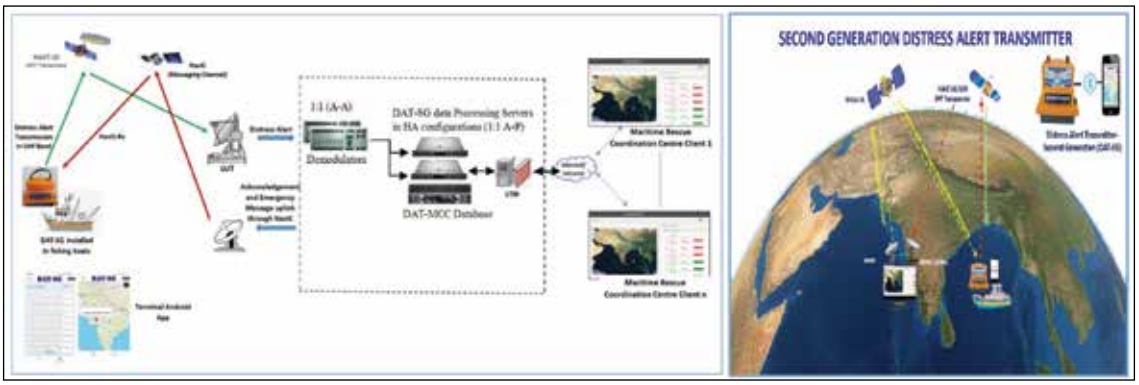
Space Applications

various kinds of monitoring and management functionality based on the type of user. NMS website of Sagarmitra has been hosted on internet.

DAT-SG hub was established at INMCC, ISTRAC Bengaluru to provide DAT-1G as well as DAT-SG network services. Hub baseband system consists of servers, storage, SMS gateway, switches, and burst demodulator. Backup is established at SAC ISRO, Ahmedabad to provide DAT-1G service.



DAT-SG Network Diagram

All authorized users can access the Sagarmitra website through Internet using any web browser like Mozilla/Firefox. SMS notifications for distress alerts will be sent to concerned person for rescue operation. Upon reception of distress alert, acknowledgement message will be sent to the terminal through NavIC message broadcast.

3.8 meters C-band earth station has been established at Delhi Earth Station (DES), ISRO as a stand-by hub for DAT-SG including NMS for receiving and logging of the data. Hub support is being provided to various users for testing of DAT-SG terminals.

The network service is operationalized and used by Indian Coast Guard since 15th January 2024. Till now, it has located and rescued fishing boats while saving more than 30 precious human lives.

2.2.9 Mobile Satellite Services (MSS)

Mobile Satellite Services encompass a comprehensive SATCOM network for communication using handheld and portable devices. Through this network and infrastructure, ISRO supports various communication applications for different user groups namely Indian Railways, Ministry of Home Affairs and other special user groups. 6.3 meters and 11.5 meters C-band earth stations at Ahmedabad and Delhi with necessary baseband sub-systems have been established to provide uninterrupted services and demonstration. The services support vessel communication, first generation distress alert terminal (DAT), etc.

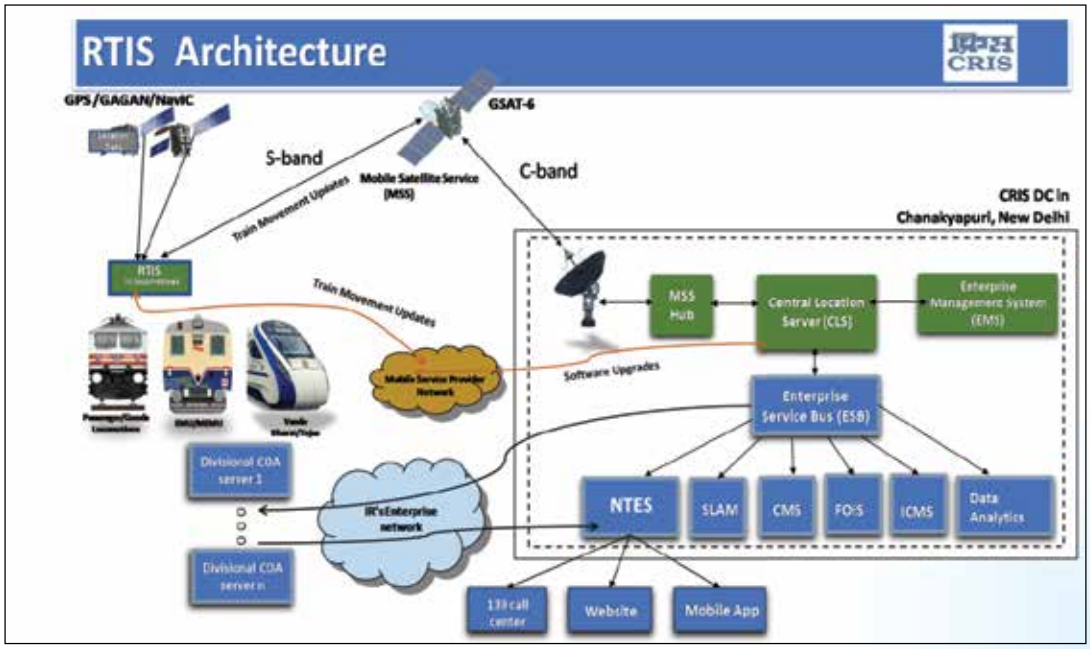
2.2.10 Real-time Train Information System (RTIS)

Real-time Train Information System (RTIS) automates acquisition of train movement data on Indian Railways (IR) and thus enables real-time tracking of trains & locomotives. RTIS has been implemented by Centre for Railway Information Systems (CRIS) in collaboration with SAC ISRO.

About 20 million train movement updates are processed by the system daily resulting in about 60% control chart plotting for coaching trains. For reliable data communication of moving trains to central location servers of CRIS, ISRO's S-band & C-band MSS have been adopted. This is unique narrow-band low bit-rate technology designed for data communication from moving assets without the need of directional antenna or satellite tracking. In addition to MSS, dual 4G/3G mobile data modems are also used in the device to complement MSS and facilitate over-the-air (OTA) software upgrades and device monitoring. All central side ICT infrastructure, MSS satcom hub, communication software stack, application software, etc. are hosted in CRIS.

About 10400 electric locos (including EMU/MEMU & Vande Bharat trainsets) have already been enabled with RTIS. In addition to this, RTIS has to be proliferated further to cover remaining locomotives & train sets.

Delhi Earth Station (DES), ISRO provides technical support for 24x7 round the clock operations of RTIS services. Proof of concept test of Rail MSS Terminal-Locomotive



RTIS Network

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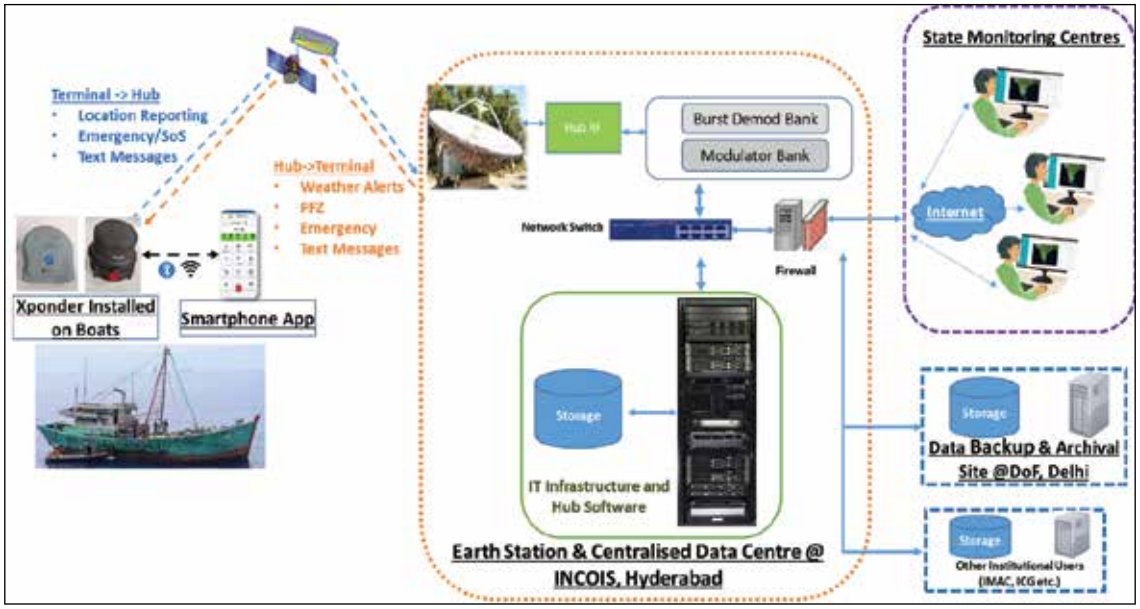
(RMT-L) in static simulated condition was conducted on 12th November 2025 at DES along with CRIS/RTIS.

2.2.11 Vessel Communication and Support System for Monitoring, Control and Surveillance (VCSS-MCS)

ISRO has developed SATCOM terminals for tracking of sub-20 meters fishing vessels/ boats which venture into deep sea for several days. The system provides for both safety of the fishermen as well as monitoring their movements. Department of Fisheries has undertaken rollout of this solution for one lakh fishing vessels through M/s NSIL.

By November 2025, more than 40,000 terminals have been deployed across the Indian Costal States and Union Territory and registered in Nabhmitra. Recent cyclone "Shakti" & "Montha" reports were transmitted in real time to all boat users where transponders are installed.



Fishing Vessel Tracking Network

2.2.12 South Asia Satellite

South Asia Satellite (SAS) provides satellite connectivity to Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal and Sri Lanka. It carries 12 Ku band transponders with coverage over the member nations. SATCOM network has been established using SAS transponders in Bhutan, Bangladesh, and Maldives for various applications such as television, radio, internet connectivity, disaster management, and for critical telecom links.

2.3 Navigation Systems

Navigation with Indian Constellation (NavIC) is India's independent regional navigation satellite system catering to a coverage area of India and 1500 km beyond the Indian mainland. ISRO has established the space and ground infrastructure. ISRO is making continuous efforts to enable civilian sectors like land transportation, aviation, maritime, mapping, surveying, geodesy, timing, telecommunications, etc., to utilize the services offered by NavIC. GPS Aided Geo Augmented Navigation (GAGAN) is a space-based augmentation system for civil aviation purposes in the Indian Flight Information Region (FIR). ISRO has established the space segment, while the ground segment is established by the Airports Authority of India (AAI).

Major developments in navigation systems during 2025 have been:

2.3.1 NavIC base layer constellation

NavIC base layer currently consists of four satellites (IRNSS-1B, 1F, 1I, and NVS-01) providing PNT service. NVS-02 was successfully launched on 29th January 2025 onboard LVM3-M5. However, the satellite could not achieve its intended final orbit. It is capable of providing limited PNT service. Performance of indigenous atomic clock in NVS-02 has been thoroughly evaluated and it is exceeding the specification.

2.3.2 NavIC ground segment

NavIC ground segment is fully functional. Activities have progressed for establishment of reference stations (known as IRIMS) in foreign locations to improve the measurement baseline. Interference and noise surveys have been completed at South Africa and France and further activities have been initiated.

2.3.3 Navigation message authentication

Navigation message authentication technique has been developed and tests have been carried out. Software libraries have been developed for operationalization in NavIC SPS. Interface control definitions have also been worked out.

2.3.4 GNSS digital baseband (GDB) ASIC

Indigenously designed all-in-view NavIC + GNSS digital baseband (GDB) ASIC was realised with 28 nm foundry node. The ASIC supports 100 tracking channels including NavIC & all GNSS open service signals. It has dual core processor and on-chip PLL for configurable processor frequency. It also incorporates multiple features like anti-jamming,

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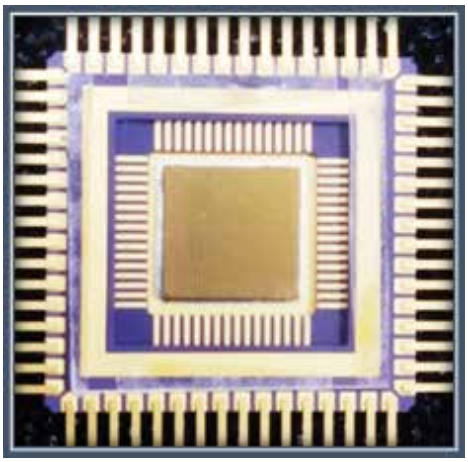
Navigation Systems

anti-spoofing, message authentication, pseudolite signal acquisition, and can be used for low power applications.



GDB ASIC

2.3.5 Efforts towards precise product generation

Post-processed NavIC products, needed for high accuracy applications involving NavIC is identified as a priority development. Under this effort, post-processed clock and orbit products were successfully used in remote sensing application on trial basis.

2.3.6 Time dissemination

Department of Legal Metrology, along with NPL and ISRO, is executing the project of dissemination of Indian Standard Time (IST) through five regional timescales and one disaster recovery centre. ISRO has carried out integration of the five regional timescales. Four timescales located in Ahmedabad, Bengaluru, Bhubaneshwar, and Faridabad have successfully completed site acceptance testing.

Time dissemination setup

2.3.7 GAGAN

GAGAN service is functional with three signals in space (PRN 127, PRN 128, PRN 132) from three GEO satellites viz. GSAT-8, GSAT-10 and GSAT-15 respectively. Validity of PRN 132 was successfully renewed in 2025. GAGAN has been certified for navigation performance level of Approach with Vertical Guidance (APV-1) over India and for Required Navigation Performance (RNP 0.1) within Indian FIR. GAGAN system certification has been further extended.

2.4 Space Science Exploration and Research

The Department of Space's (DOS) Space Science and Exploration program achieved significant programmatic and scientific milestones, firming India's growing influence in several discovery-class of scientific results, and robustly progressing future exploratory ambitions. Operational missions delivered critical, high-quality data: the Aditya-L1 solar observatory expanded its public data archive, releasing over 20 TB for global utilization. The X-ray Polarimeter Satellite, XPoSat, marked key achievements, successfully completing its first genuine Target of Opportunity (ToO) observation, which resulted in the detection of a thermonuclear burst followed by a superburst from a neutron star source. XPoSat ceremonially released its maiden data set (143 GB) and announced the Guest Observer opportunity for the national community in October 2025. Concurrently, the operational AstroSat mission continued its observations, and brought out significant results. Chandrayaan-2 Orbiter continues to study the Moon and advanced data products such as global elemental maps and polar mosaics are made available in ISSDC, which will be useful for global lunar exploration. Strategic groundwork for future missions also accelerated: the collaborative Chandrayaan-5/LUPEX mission formally advanced with the signing of its Phase-B Implementation Arrangement (IA) with JAXA, while the Venus Orbiter Mission (VOM) secured international cooperation in Venusian science. VOM utilized this momentum by organizing a dedicated national science meet in October 2025 and releasing an Announcement of Opportunity (AO) to strengthen community involvement. Preparations for the Chandrayaan-4 lunar sample return mission intensified, marked by the "National Meet on Chandrayaan-4 Science" in April 2025, a critical step toward defining requirements for domestic sample analysis facilities. Furthermore, DOS advanced long-term strategic planning by synthesizing outcomes from the DOS Chintan Shivir 2025 and initiating the concept formulation for specialized future missions, including India's first dedicated magnetospheric mission.

This chapter will briefly present the major achievements of DOS in the sector of Space Science & Exploration.

2.4.1 Updates on the Active Science Missions

a. Chandrayaan-3

Launched on July 14, 2023, the Chandrayaan-3 mission successfully demonstrated soft-landing and roving on the Moon's Southern high latitude by 23 August 2023. After separating from the lander, the Propulsion Module (PM) was kept in lunar orbit until October 2023 before being maneuvered into a high-altitude Earth-bound orbit via Trans-Earth Injection (TEI). This interplay of gravity fields has led the spacecraft to enter the Moon's Sphere of Influence (SOI) on November 04, 2025. On November 06, 2025 07:23

UT, the first lunar flyby event took place outside the Indian Deep Space Network (IDSN) visibility at a distance of 3740 km from the Moon's surface. The second flyby event was visible from the IDSN, the closest approach distance was 4537 km from the Moon's surface on November 11, 2025, 23:18 UT. CH3-PM exited the Moon's SOI on November 14, 2025.

Meanwhile, there have been several significant scientific results from the post-analysis of the Chandrayaan-3 datasets.

b. AstroSat

AstroSat, India's multi-wavelength space-based astronomical observatory, remains fully operational with all scientific payloads working satisfactorily. AstroSat data has led to over 532 refereed publications globally. The mission provides highest-resolution UV imaging and detected X-ray polarization from celestial objects. Data accessibility improved after the successful completion of testing and evaluation for porting the extensive AstroSat archives to the PRADAN portal. The mission continues to support research, contributing to 47 PhD theses and funding data utilization projects.

c. Chandrayaan-2

The Chandrayaan-2 orbiter continues its sustained scientific exploration from a 100 km lunar polar circular orbit. The mission continues to yield foundational data on lunar volatiles and composition, with 48 TB of data released to over 10,000 users. Observations on the effects of Coronal Mass Ejections from the Sun on the lunar exosphere is a significant result and first of its kind. Efforts are underway to publish a special issue on the orbiter's six-year achievements in a journal.

d. Aditya-L1

Aditya-L1, India's dedicated solar observatory, has released over 20 TB of scientific data for global utilization as of October 2025. The mission successfully serviced several Target of Opportunity (ToO) and calibration proposals. Community engagement remains robust: the 11th hands-on data training workshop was successfully held in October 2025. A joint ISRO-ESA Heliophysics Workshop is scheduled for January 2026, which will promote collaborative data analysis.

e. XPoSat

XPoSat reached a major milestone with the ceremonial release of 143 GB of maiden datasets to the scientific community in October 2025. The XSPECT payload achieved a key scientific outcome by detecting a thermonuclear Type-I X-ray burst immediately followed by a rare, long-duration superburst from the neutron star binary system 4U 1608-52.

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Space Science Exploration and Research

This was confirmed as the first genuine Target of Opportunity observation for XSPECT. The mission continues regular observation campaigns of astronomical sources like Sco-X1. Furthermore, the XPoSat Proposal Processing System (XPPS) was deployed on an internet platform, enabling national guest observers to submit XSPECT-based science proposals, following the National Science Meet held for data release and performance appraisal.

2.4.2 Updates on Newly Approved Space Science Missions

a. Chandrayaan-4

Chandrayaan-4, India's forthcoming Lunar Sample Return Mission, is designed to collect and return lunar samples from the polar region of the Moon to Earth for detailed laboratory analysis. The science team has reviewed potential landing sites, prioritizing them based on scientific potential using existing lunar datasets, including Chandrayaan-2. Preparations are in progress for firming up the plan for sample analysis and archival facilities.

b. Chandrayaan-5 / LuPEX

The Chandrayaan-5 / LUPEX mission, a joint venture between ISRO and JAXA targeting the in-situ study of lunar polar volatiles, secured Financial Sanction (FS) on March 10, 2025. The mission took a significant step forward when the Phase-B Implementation Arrangement (IA) detailing agency responsibilities was formally signed on August 29, 2025. Technical Interface Meetings (TIMs) were held in May and August 2025. The Science Working Group (SWG) has been constituted to maximize the science returns from the lander and rover payloads, and the Principal Scientist of the mission has also been identified. The Preliminary Design Review (PDR) of the mission has also been completed.

c. Venus Orbiter Mission

The objectives of the Venus Orbiter Mission (VOM) encompass studying the Venusian atmosphere, ionosphere, surface, subsurface, and its interaction with the Sun. International collaboration efforts have been formalized, with approval granted for MoUs related to key international payloads. The Science Working Group (SWG) has been constituted to maximize the science returns from the payloads, and the Principal Scientist of the mission has also been declared. The Preliminary Design Review (PDR) of the mission has also been completed.

2.4.3 Space Science Missions in Approval and Study Phases

The Mars Lander Mission (MLM), as the follow-on of India's Mars Orbiter Mission (MOM), has obtained the approval of the Space Commission, and is currently under approval by

the Cabinet. The mission is aimed as scientific studies of the Martian surface, near-surface environment, as well as Sun-Mars interactions.

The DISHA (Disturbed and Quiet Time Ionosphere-Thermosphere System at High Altitudes) mission is a proposed twin-satellite system designed to study the effects of solar forcing on the Earth's upper atmosphere. Its core objective is to characterize the ionosphere-thermosphere system by simultaneously measuring neutral and charged particle parameters. This includes understanding variability caused by lower atmospheric processes and solar storm-induced geomagnetic disturbances. DISHA-H (High inclination, > 85°) and DISHA-L (Low inclination, ~25°), both at ~ 400 km altitude, aim to decouple latitudinal and longitudinal variations for effective space weather forecasting. DISHA is currently in the process of obtaining internal clearances.

The ExoWorlds mission is a proposed space-based observatory, based on the transiting spectrometry technique from the Sun-Earth L2 point, intended for the study of the atmosphere of exoplanets. Its central goal is to conduct a comprehensive survey of the chemical composition and atmospheric processes of a large population of exoplanets, leading to a new understanding and classification of planetary systems. ExoWorlds is also currently in the process of obtaining internal clearances.

The Department of Space is also formulating concepts for astronomy missions like DAKSHA, PRATUSH, SEAMS, and INSIST. Furthermore, discussions are underway with the scientific community for India's participation in space-based deci-Hz Gravitational Wave (GW) missions. Continuous engagement is maintained with the scientific community for generating concept notes on missions targeting the Cosmic Dark Ages and Cosmic Dawn.

2.4.4 Major Scientific Results

a. First in-situ temperature measurements near southern polar region of the Moon by ChaSTE experiment onboard Chandrayaan-3 Vikram lander

Measurements from Chandra's Surface Thermophysical Experiment (ChaSTE) payload on Vikram Lander onboard Chandrayaan-3 the first-ever in-situ measurements of the temperature profile was made and thermophysical properties within the top 10 cm of the lunar surface at a high latitude south polar landing location. Publication: Nature: Communications Earth & Environment (https://doi.org/10.1038/s43247-025-02114-6).

(https://www.isro.gov.in/India_Bags_Credit_First-Ever_In-Situ_Measurement.html)

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b. Primitive mantle material revealed by Chandrayaan-3 APXS volatile measurements in the South Polar Region of the Moon

Concentrations of volatile elements measured at Shiv Shakti station near the South Polar Region were determined using PRL's Alpha Particle X-ray Spectrometer (APXS) onboard the Pragyan rover of the Chandrayaan-3 mission. This new finding makes the Chandrayaan-3 landing site a promising site to access primitive mantle samples, which is otherwise lacking in the existing lunar collections.

(https://www.isro.gov.in/ISRO_EN/Ch3_APXS_volatile_measurements.html)

Publication: Nature: Communications Earth & Environment

(https://doi.org/10.1038/s43247-025-02305-1)

Publication: Nature: Scientific Reports (https://doi.org/10.1038/s41598-025-21988-2)

c. Observation of substantially high and variable electron density in the near-Surface environment of the Moon, by the RAMBHA-LP experiment onboard Chandrayaan-3 lander

The Chandrayaan-3 mission used its RAMBHA-LP instrument to take measurements of the near-surface plasma environment at the Shiv Shakti point; the first-ever plasma measurements at lunar Southern high latitudes. It is observed that the electron density near the lunar surface varied between 380 to 600 electrons per cubic centimeter, the variations being controlled by two main factors: the solar wind (when the Moon is facing the Sun) and charged particles escaping from Earth's magnetic field (when the Moon is behind Earth, within the geomagnetic tail). The electrons were found to be energetic, with kinetic temperatures in the range of 3000-8000 K, indicating non-thermal processes. The study also highlighted the role of molecular ions, in addition to the elemental ions, in creating this plasma near the Moon.

Publication: Monthly Notices of the Royal Astronomical Society (https://doi.org/10.1093/mnras/staf1276)

d. Observation of the effects of solar Coronal Mass Ejection (CME) on the Moon's sunlit exosphere, by CHACE-2 onboard Chandrayaan-2

The Chandrayaan-2 lunar orbiter has made the first-ever observation of the effects of the Sun's Coronal Mass Ejection (CME) on the Moon, with one of its scientific instruments Chandra's Atmospheric Composition Explorer-2 (CHACE-2) onboard. Observations from

CHACE-2 showed an increase in the total pressure of the dayside lunar exosphere (very thin atmosphere) when the CME impacted the Moon. The total number density (number of neutral atoms or molecules present in an environment per unit volume) derived from these observations showed an increase by more than an order of magnitude. This increase is consistent with earlier theoretical models, which predicted such an effect, but CHACE-2 onboard Chandrayaan-2 has observed such an effect for the first time.

(https://www.isro.gov.in/Chandrayaan-2_Coronal_Mass_Ejections_Lunar_Exosphere.html)

Publication: Geophysical Research Letters (https://doi.org/10.1029/2025GL115737)

e. Decoding the rhythms of a Black Hole: A discovery with AstroSat

India's first dedicated multi-wavelength space observatory, AstroSat, has been continuously monitoring the enigmatic black hole GRS 1915+105 since its launch (September 2015) and provides invaluable insights into source's behaviour. Using two of its onboard instruments, namely Large Area X-ray Proportional Counter (LAXPC) and Soft X-ray Telescope (SXT), a group of Indian scientists from University of Haifa, IIT Guwahati, Indian Space Research Organization observed that the X-ray brightness from GRS 1915+105 fluctuates dramatically over time. It exhibits a unique pattern of alternating low-brightness ('dips') and high-brightness ('non-dips') phases, each lasting a few hundred seconds.

(https://www.isro.gov.in/Adiscovery_with_AstroSat.html)

Publication: Monthly Notices of Royal Astronomical Society (https://doi.org/10.1093/mnras/staf926)

f. Discovery of Dense Sub-Saturn planet using PARAS-2 Spectrograph at Mt Abu Telescope

Using the state-of-the-art PARAS-2 spectrograph attached to the 2.5-meter telescope at PRL's Mount Abu Observatory PRL scientists have discovered a new exoplanet (TOI-6038A b), a dense sub-Saturn size planet with a mass of 78.5 Earth mass and a radius of 6.41 Earth radius in a wide binary system. The planet orbits an F-type star every 5.83 days in a circular orbit. Publication: The Astronomical Journal (https://doi.org/10.3847/1538-3881/ada959).

(https://www.isro.gov.in/PRL_Scientists_Discovered_DenseS)ub-Saturn.html)

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g. Advanced Data Products for Deeper Understanding of the Lunar Polar Region

India's Chandrayaan-2 Orbiter, operational since 2019, has been mapping the Moon with its Dual Frequency Synthetic Aperture Radar (DFSAR). The DFSAR radar onboard Chandrayaan-2 is the first of its kind, using a special, high-resolution signal (L-band) to deeply study the lunar surface. Scientists from Space Applications Centre have used this data to create detailed maps of the Moon's North and South Poles, conveying crucial information, for the first time, on three key features: the potential presence of water ice, surface roughness, and the dielectric constant. This ready-to-use data is essential for planning future missions to the Moon's polar regions, which hold vital clues about the early Solar System.

The derived Polar Mosaic products (Level 3C) are released for the users and freely available in Indian Space Science Data Centre (ISSDC) PRADAN website of the Indian Space Science Data Centre (ISSDC):

(https://www.isro.gov.in/Lunar_Polar_Region.html)

https://pradan.issdc.gov.in/ch2/protected/browse.xhtml?id=sar

The products can be visualized in CH2 MapBrowse:

https://chmapbrowse.issdc.gov.in/MapBrowse/

2.4.5 Other Significant Scientific Accomplishments

Scientists observed the interstellar comet 3I/ATLAS currently on its way out of the inner Solar system after perihelion passage. Observations were carried out in imaging and spectroscopic modes with PRL's 1.2m telescope, situated at Mount Abu. The images show a near-circular coma. A spectrum was obtained, which shows prominent emission features commonly seen in Solar system comets - the CN, C2 and C3 bands. An Astronomer's Telegram on the observations was published (ATel #17502).

Scientists from the Space Physics Laboratory (SPL) has analyzed the radio occultation data from Chandrayaan-2 and the Mars Orbiter Mission, offering new insights into lunar and solar wind plasma environments. In solar and space weather studies, the particle and magnetic field payloads on Aditya-L1 (PAPA and MAG) captured key data on solar transients and turbulence, while extensive modeling and multi-point observations of the May 2024 geomagnetic storm provided one of the most comprehensive analyses from the

Sun to Earth's ionosphere. Ground-based radar and satellite studies over Thumba revealed strong electrodynamic coupling processes during this extreme event.

Research in ionosphere–magnetosphere physics highlighted new mechanisms for electron acceleration, equatorial geomagnetic variations, and atmospheric–ionospheric coupling during storms, earthquakes, and tropical cyclones. In atmospheric and climate research, SPL advanced understanding of monsoon convection, aerosol–radiation interactions, and volcanic impacts on climate, identifying phenomena like quasi-periodic oscillations and Hadley cell expansion effects on cloud dynamics. Algorithmic advances enabled enhanced satellite remote sensing of aerosols, clouds, and radiative effects, and improved radio occultation inversion for planetary ionospheres. SPL also developed an inverse modeling framework for regional CO_2 flux estimation and investigated atomic oxygen variability affecting satellite drag.

Scientists from the National Atmospheric Research Laboratory (NARL) achieved 99.86% accuracy in predicting Earth's equatorial plasma bubble (EPB) formation using ionosonde observations. Studies also documented an unusually strong equatorial ionization anomaly (EIA) persisting for over 12 hours during the May 2024 geomagnetic storm and developed a NavIC Total Electron Content (TEC) depletion detection algorithm for navigation applications.

2.4.6 Space Science Roadmap Formulation

The formulation of India's space science roadmap has been driven by the DOS Chintan Shivir 2025 held during July 16–18, 2025. The objectives of this effort were to formulate a revised roadmap covering milestones for the short-term (till 2035), mid-term (2035–2047), and long-term (until 2062), explicitly aligned with the Space Vision 2047. The final outcome report on 'Space science and Exploration' has been completed and has been presented to the Honourable Prime Minister during National Space Day 2025.

2.4.7 International Cooperation Activities

The department's international cooperation in space science and exploration has been marked by advancements in major joint missions and active participation in global forums. A key highlight was the progression of the Chandrayaan-5 / LUPEX lunar collaboration with JAXA, which saw the third face-to-face Technical Interface Meeting (TIM-3) conducted at ISRO Headquarters during May 13–14, 2025. Following this, the crucial Phase-B Implementation Arrangement (IA) detailing mutual responsibilities was formally signed on August 29, 2025. Further bilateral coordination occurred with TIM-4 held at URSC during August 19–20, 2025, and a joint science meet with JAXA on September 17, 2025.

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In international forums, DOS maintained a strong presence, notably at GLEX 2025. Furthermore, ISRO presented the status of approved space science missions at the COSPAR Panel on Planetary Protection meeting held in mid-April 2025.

For the Venus Orbiter Mission (VOM), ISRO secured formal approvals in April 2025 to advance international collaboration, including initiating the Implementation Arrangement/MoU with ROSCOSMOS for the VIRAL payload and formalizing an MoU with the Swedish Institute of Space Physics (IRI) for the VNA payload. Collaboration on heliophysics also solidified with the constitution of the Scientific Organising Committee for the joint ISRO-ESA Heliophysics Workshop in India, which received governmental approval in September 2025 for the event scheduled in January 2026. Other activities included discussions with the United States Geological Survey (USGS) regarding the automated dissemination of Chandrayaan-2 data and the formation of three joint task teams with the Italian Space Agency (ASI) focusing on lunar science topics. Throughout this period, ISRO actively contributed to the multilateral forums like International Space Exploration Coordination Group (ISECG) and International Mars Exploration Working Group (IMEWG).

ISRO-JAXA Technical Interface Meet in ISRO Headquarters

2.4.8 Community Engagement in Space Science

a. National Meets

National Meet on Venus Orbiter Mission

During October 29-30, 2025, ISRO organised a national science meet on India's first mission to Venus, viz. the Venus Orbiter Mission (VOM), in ISRO Headquarters, Bengaluru. It was attended by about 150 scientists, engineers, faculty members and Ph.D. students, comprising members from the ISRO/DOS, as well as national research and academic

institutes. More than 70 members, representing about 40 research / academic institutions of the country outside DOS, actively participated in the meeting.

The two-days long national science meet was organised with the objective of actively engaging the national science community, including academia and research institutes, towards maximizing the scientific potential of the mission. The meet aimed at strengthening the synergy between ISRO, national academia, and institutes, ensuring a collaborative approach to deep-space planetary exploration.

Venus Orbiter Mission national meet in ISRO Headquarters

XPoSat National Meet and Opening up the Scientific Data from the XPoSat Mission along with Announcement of Opportunity for National Guest Observer

On October 13, 2025, ISRO organised a National Meet on XPoSat mission and released the scientific data from the mission to the scientific community. The maiden datasets from XPoSat (amounting to about 143 GB), relevant tools, along with the guest observer opportunity to use the XPoSat for scientific observations by Indian X-ray Astronomy Community were released by Dr. V. Narayanan, Chairman, ISRO / Secretary, DOS, in ISRO Headquarters, Bengaluru, in the presence of a gathering of Astronomers, mission planners, academicians and students from different parts of the country. The data release event was followed by an appraisal meet on the performance of the XPoSat mission, and its scientific payloads. The meet, covering technical sessions on XSPECT and POLIX, was attended by about 175 members from Indian academia, research institutes, as well as from the ISRO/ DOS community. The participants included more than 50 members from the Indian

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academia, research institutes including faculties, researchers and students, representing around 15 universities/institutes/colleges across the country.

XPoSat National Science Meet in ISRO Headquarters

b. Building the Future Flag-bearers of the Space Science Programme

Announcements of Opportunity

Announcement of Opportunity (AO) for utilizing archival data of Planet Venus for scientific analysis

In order to promote, strengthen and to increase the scientific user community for the Venus Orbiter Mission, ISRO has invited researchers through the AO-call for promoting the analysis and modelling of archival data available for the planet Venus. Novel research proposals are invited under the following research areas of interest

- Venusian Morphology, topography and sub-surface studies
- Geological mapping, mineralogy and surface composition of Venus
- Venusian atmosphere structure, dynamics and composition
- Venusian Ionosphere and solar wind interaction
- Modelling of Venusian Atmospheres and Ionospheres

Announcement of Opportunity (AO) for utilizing Chandrayaan-3 Lander and Rover payloads data for scientific analysis

In order to enhance the science outcome of the Chandrayaan-3 mission, ISRO sought proposals from the national scientific community through an Announcement of Opportunity (AO), towards scientific analysis and utilisation of data from all experiments of Chandrayaan-3 lander and rover. The AO was open to all faculty and researchers from

recognized academia, research institutions, Universities, Colleges and government organizations of India.

Announcement of Opportunity for UG and PG Science & Technology students to participate in the student session of 23rd National Space Science Symposium (NSSS) 2026

Regional Outreach Programme (ROP) events in North-East India

The 23rd National Space Science Symposium (NSSS) will be held in NESAC, Umiam,

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Meghalaya during 23-27 February 2026. On July 3, 2025, Dr.V.Narayanan, Secretary, DOS / Chairman, ISRO made the announcement of the 23rd National Space Science Symposium, i.e. NSSS-2026, and launched the website of the symposium, through an online event from ISRO Headquarters. The National Space Science Symposium, a biennial event commenced in year 1978, has undergone evolution in its pattern and scope, in tune with the global trend of space exploration. NSSS, in its current form, is envisaged as a vehicle for progress in space science and technology, providing opportunity to Indian researchers working at various institutes and universities to present their scientific research, discuss on scientific problems of interest in the area of space sciences encompassing topics from all the domains of space science. The symposium comprises plenary sessions, public lectures, oral and poster presentations in technical parallel sessions, a dedicated student session and exhibition.

The student session of NSSS - 2026 would include a workshop, tailored for the UG/PG Science and Technology students, as well as presentations by students on novel ideas related to space science and technology. In addition to this, the symposium will enable the students to interact with scientists, attend plenary sessions, Interdisciplinary lectures, as well as the public lectures.

As a precursor to the NSSS-2026, a series of events have been organised jointly by ISRO and NESAC in all the states of the North-East India, under the Regional Outreach Programme (ROP) of NSSS-2026. Till February, 2026, there would be nine outreach events in collaboration with regional academic institutes. The ROP would cover around 1000 Under-Graduate and Post-Graduate students of STEM from the North-East India, some of them would be sponsored to attend the students' session of NSSS-2026.

User-Engagement Workshops

The AstroSat Support Cell (ASSC), which functions through a collaboration between ISRO and the Inter-University Centre for Astronomy and Astrophysics (IUCAA), has maintained its core functions of supporting the scientific community and facilitating data utilization since April 2025.

In collaboration with ASSC, IUCAA, a dedicated workshop titled "AstroSat and XPoSat data analysis" was held during June 2025 at Providence Women's College, Kozhikode, benefiting approximately 40 participants. This fulfilled a milestone planned during May 2025.

The Aditya-L1 Support Cell (AL1SC), a joint effort between ISRO and the Aryabhatta Research Institute of Observational Sciences (ARIES, Nainital), is established to act as a

community service center for guest observers, assisting in preparing science proposals, analyzing data, and developing specialized software. A key function of AL1SC is to conduct workshops at regular intervals to provide hands-on data training to students and researchers utilizing Aditya-L1 data.

Since April 2025, the AL1SC has actively conducted or planned the following in-person workshops:

- 10th Aditya-L1 Workshop (May 26 – June 4, 2025): This long-duration National Workshop on "Aditya-L1 Data Training" was successfully conducted at ARIES, Nainital. Approximately 25 students from diverse backgrounds (B.Tech/M.Sc/PhD) participated and received hands-on training on Aditya-L1 payloads.
- 11th Aditya-L1 Workshop (October 6–8, 2025): This in-person workshop, the 11th in the series, was successfully organized at Pondicherry University. Nearly 40 participants were provided hands-on data training for Aditya-L1 payloads. Participant selections for this event were completed by August 2025.
- 12th Aditya-L1 Workshop (Planned for IIT-Jammu): The Indian Institute of Technology (IIT) Jammu agreed to host an Aditya-L1 workshop. This workshop is planned to be conducted during December 22–24, 2025, and a website was launched to solicit applications from participants, and the theme was identified.

ISRO-START 2025 Programme

The ISRO-START 2025 programme was conducted with the theme "Future of India's Space Exploration". The lectures were delivered by eminent scientists from various institutes across the country, including ISRO/DOS centers. The ISRO-START programme, initiated in year 2023, primarily targets post-graduate and final-year undergraduate students of physical sciences and technology studying in Indian educational institutes, universities, and colleges. In 2025, 496 institutes served as nodal centers for the event.

During the concluding session of ISRO-START 2025, ISRO organized a major National Workshop on "Space Science Exploration and Career Opportunities for Students" on March 20, 2025, at IIRS, Dehradun. This event featured technical sessions on future Indian space exploration, career opportunities, and panel discussions for students, and was attended by 161 students and 43 faculty members.

The ISRO-START 2026 programme will be announced soon.

2.5 Space Transportation Systems

India's journey in launch vehicle development began in the 1960s with sounding rockets for atmospheric and meteorological studies. The first Indian-made sounding rocket, RH-75 (Rohini-75) took off in 1967 from the Thumba Equatorial Rocket Launching Station (TERLS) in Thiruvananthapuram which laid the groundwork for mastering rocket technology. India has achieved Atmanirbharta in space transportation systems through operationalization of the satellite launch vehicles viz. Polar Satellite Launch Vehicle (PSLV), Geosynchronous Satellite Launch Vehicle (GSLV), and Geosynchronous Satellite Launch Vehicle – Mark III (LVM3). The development of Small Satellite Launch Vehicle (SSLV), capable of launching small satellites of mass up to 500kg to Low-Earth Orbits has been completed. The new Space Policy introduced by the Government of India in 2023 wherein the operational space transportation systems will be realized by Indian industry through NSIL. In view of this, the realization of PSLV has already been commenced through industry and technology transfer of SSLV to Industry has been initiated by the Department. The POEM platform in PSLV has opened avenues for start-ups to demonstrate their various payloads under the ambit of the New Space Policy.

Self-reliance in space transportation system has been a key element in framing India's future space missions. This portfolio of launch vehicles has enabled India to undertake multi-orbit and multi-satellite missions for accessing near-earth orbits. Apart from launching satellites which find societal benefits, India is now having the expanded vision with Human Space Programme and further space explorations. A human rated space transportation system based on LVM3 configuration (HLVM3) has been qualified and is ready for undertaking the first un-manned Gaganyaan mission. Development of the Next Generation Launch Vehicle (NGLV) with reusable technology has been initiated to meet the expanded vision of Indian Space programme. Government of India approved the Establishment of the Third Launch Pad at Sriharikota for the Next Generation launch vehicles of ISRO, support as standby launch pad for the SLP, and also enhance the launch capacity for future Indian human spaceflight missions. The development of advanced propulsion technologies including LOX-Methane propulsion, Semi-cryogenic propulsion, Electric propulsion and Air-breathing propulsion have been taken up. Technologies for Vertical Take-off & Vertical Landing and Winged body orbital re-entry vehicles, are also being developed by ISRO with the support of industry and academia.

Major Events

2.5.1 Polar Satellite Launch Vehicle (PSLV)

Polar Satellite Launch Vehicle (PSLV) completed its 63rd launch during the period and continued to demonstrate its reliability and versatility through multi-satellite and multi-orbit missions.

a. PSLV-C61 vehicle lifted off with EOS-09 spacecraft on May 18, 2025 at 05:59Hrs from SDSC, Sriharikota. The performance of PSLV-C61 vehicle was normal till the 2nd stage and an anomaly was noticed during the functioning of 3rd stage solid motor & the mission could not be accomplished. A national level committee was constituted to investigate the anomaly in the performance observed & identify the root cause of the failure and suggest corrective measures to be implemented. The committee had exhaustive deliberations and has submitted the findings & recommendations. Based on the recommendations of the National Level Committee comprising of eminent experts from academia & industry, the third stage of PSLV i.e., HPS3 motor with modified design was realised and two static tests were successfully completed on October 06, 2025 and November 19, 2025 as in flight, from SDSC, SHAR. The overall performance of the motor and subsystems were as expected and closer to nominal performance.

First Static test of the modified HPS3 Motor conducted on October 6, 2025

Second Static test of the modified HPS3 Motor conducted on November 19, 2025

b. PSLV-C62/ EOS-N1 mission will launch the EOS-N1 spacecraft which is being realised by ISRO. The launch vehicle stacking activities for the mission has commenced and the mission is tentatively planned during fourth quarter of 2025-26.

c. PSLV-C63/ TDS-01 Mission will launch the Technology Demonstration Satellite (TDS-01) of ISRO for the demonstration of various technologies including Quantum Technology Demonstrator payload, Traveling Wave Tube Amplifier and high thrust Electrical Propulsion Systems. The mission is tentatively planned during fourth quarter of 2025-26.

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d. EOS-10 satellite of the Oceansat series & Indo-Mauritius Joint Satellite (IMJS-1) will be launched by the first PSLV realised by Indian Industry, undertaking end-to-end responsibility of stage realisation. The launch is tentatively scheduled during fourth quarter of 2025-26.

2.5.2 Geosynchronous Satellite Launch Vehicle (GSLV)

GSLV is a three-stage vehicle with solid, liquid, and cryogenic upper stage, designed to place a 2000 kg class of spacecraft into Geosynchronous Transfer Orbit (GTO).

a. GSLV-F16/ NISAR mission launched the NASA-ISRO Synthetic Aperture Radar Satellite, which is an advanced Earth Observation satellite jointly developed by NASA & ISRO. The mission was successfully accomplished on July 30, 2025 at 17:40 Hrs from the Second Launch Pad (SLP) at SDSC, Sriharikota. This was the first LEO mission of GSLV launching NISAR spacecraft to a Sun Synchronous Polar Orbit. NISAR is the first of its kind mission, jointly developed by ISRO and NASA for microwave imaging purpose globally. It carries an L-band and S-band Synthetic Aperture Radar (SAR), with capability to acquire fully polarimetric and interferometric data.

GSLV-F16/ NISAR Mission

b. GSLV F17/ EOS-05 Mission will launch the EOS-05 spacecraft which is a GEO-imaging satellite. Realisation of vehicle stages systems are being carried and the satellite is planned to be launched from SDSC SHAR during fourth quarter of 2025-26.

c. GSLV F18/ NVS-03 Mission will launch the third NVS satellite (NVS-03) in a series of 5 navigation satellites intended to replace/ augment the aging in-orbit NavIC constellation and is tentatively scheduled during fourth quarter of 2025-26.

2.5.3 Geosynchronous Satellite Launch Vehicle MKIII (LVM3)

LVM3 is a three-stage launch vehicle with two solid strap-on motors (S200), one liquid core stage (L110) and a cryogenic upper stage (C25).

a. LVM3-M5/ CMS-03 mission successfully launched the CMS-03 spacecraft on

November 02, 2025 from SDSC, Sriharikota. This was the 5th operational mission of LVM3 vehicle. CMS-03, weighing about 4410kg, is the heaviest communication satellite launched to Geosynchronous Transfer Orbit (GTO) from Indian soil. CMS-03 is a multi-band communication satellite that will provide services over a wide oceanic region including the Indian landmass.

b. LVM3-M6/ BlueBird Block-2 mission is a dedicated commercial launch service mission for an international customer i.e., M/s AST & Science, LLC, a US-based company, through a commercial agreement with NSIL. The mission is tentatively scheduled during second half of December 2025.

LVM3-M5/ CMS-03 Mission

2.5.4 Small Satellite Launch Vehicle (SSLV)

SSLV is an all-solid three-stage vehicle capable of launching 500kg class satellites into a 500km planar orbit.

a. NSIL has undertaken the realization of various sub-systems of SSLV vehicle through various industries towards realizing 15 vehicles to meet the immediate National demands. With respect to the improvements in the propulsion systems, new carbon composite motor cases for SS2 and SS3 motors were realised and successfully tested.

b. A technology transfer agreement was signed on September 10, 2025 between NewSpace India Limited, ISRO, IN-SPACe & Hindustan Aeronautics Limited (HAL) for the transfer of the Small Satellite Launch Vehicle (SSLV) technology at ISRO Headquarters, Bangalore. The successful commercialization of SSLV is expected to boost the Indian space ecosystem and meet the national and international demand for small satellite launch services.

2.5.5 Reusable Launch Vehicle (RLV)

The objective of the current RLV programme is to demonstrate critical technologies required for developing a winged body reentry vehicle similar to that of an aircraft.

a. The architecture for ORV propulsion systems and avionics have been finalized.

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b. Wind tunnel tests for ascent phase of GEV-ORV was carried out at NAL and flight loads were estimated. ORV mass properties were generated including the modified Landing Gear System (LGS) and Control Actuator System (CAS).

c. The material for Thermal Protection System has been finalized and thermal characterization test has been successfully carried out on C-SiC test specimen at Plasma Wind Tunnel facility.

d. Preliminary guidance & control design for ORV descent phase (De-boost to touchdown) completed with necessary 6D validations.

e. Major tests like joint level thermal test qualifying the nose cap wing leading joint, shock tunnel tests with varying heat load, wind tunnel tests with Mach Numbers ranging from 6 to 10 and development testing of 200N RCS thruster were completed.

f. Realisation of the hot structures such as wings, elevons, rudders and vertical tail with leading edges are in progress.

2.5.6 Test Vehicle (TV)

A vehicle developed as a low-cost test platform to carry out various experimental missions for in-flight functional testing like Crew Escape System (CES) for Gaganyaan, Vertical Take-off and Vertical Landing (VTVL) technology demonstration, space tourism, etc.

a. The second developmental flight of Test Vehicle TV-D2 with Crew Escape System, carrying simulated Gaganyaan Crew Module is planned during Q4 2025-26. Realization of the stage for TV-D2 has been completed and the mission is planned during Q4 2025-26.

2.5.7 Semi-Cryogenic Propulsion System

The Semicryogenic engine project envisages the design and development of a 2000kN semi-cryogenic engine leading to the development of a Semicryogenic Stage (SC120) for LVM3, that enhances the payload capability of LVM3.

a. Five short duration (17.8s) hot tests on the intermediate configuration of the 2000kN Semicryogenic engine i.e., (Power Head Test Article or PHTA) have been successfully completed during the period from March 2025 to July 2025 at the newly commissioned Semicryogenic

PHTA Test Article

Integrated Engine & Stage Test facility at the ISRO Propulsion Complex (IPRC), Mahendragiri wherein, the performance of all engine systems except the thrust chamber is being validated. During the tests, engine was successfully ignited and operated upto 60% of the steady state thrust levels, demonstrating stable and controlled performance throughout the firing. The tests proceeded as predicted and all the engine parameters were as expected. These tests validated the integrated performance of the critical subsystems such as the pre-burner, turbo pumps, start system and control components. Currently refurbishment of PHTA test article is being carried out and further tests up to 100% thrust level is planned to comprehensively validate the engine system. The realisation of the sub-systems for the first Integrated Engine i.e., IE-01 is in progress.

PHTA Test

b. The major hardware of the SC120 stage such as propellant tanks, structures and control components have been realised. Structural qualification tests of Isrosene tank and Inter Tank Structure (ITS) were completed successfully at structural test facility, IPRC. Structural acceptance test of Isrosene propellant tank earmarked for the realisation of Semicryogenic stage (SC120) for flight demonstration mission in LVM3 vehicle was also completed successfully. The LOX tank design was modified to accommodate stored gas pressurization system gas bottles inside the tank. Accordingly, the tank

Structural Acceptance Test of Isrosene propellant tank envisaged to be used in SC120 stage for Flight Demonstration

Trial Integration of SC120 stage

realisation was completed and delivered for stage integration. A validation of full stage integration procedure by trial integration of all SC120 stage sub-assemblies was completed.

2.5.8 Development of Critical Technologies for Hypersonic Air-breathing Vehicle with Airframe integrated system (HAVA):

Air-breathing propulsion technology would enable improvement in payload mass fraction of space transportation systems. HAVA flight envisages to demonstrate the accelerated flight of the vehicle under hypersonic conditions using Scramjet engines.

a. Experimental data obtained from the second experimental flight for the demonstration of Air Breathing Propulsion Technology which was successfully conducted during 2024, have been well studied and fine tuning of the engine performance has been done. The fine tuning of the engine was demonstrated through seven successful hot tests which were carried out at NAL, Bangalore for scramjet combustor including tests with flight configuration.

b. Being a highly complex technology, a series of similar experimental missions with Scramjet engines are planned to gather sufficient data towards fine tuning the performance of the engine.

c. With respect to the second mission i.e., DFS-02 mission, casting of both the booster and sustainer motor have been completed, and hardware fabrication completed for both engine modules & fuel feed systems. Fabrication, calibration & droplet characterization for fuel injection struts for DFS-02 mission completed. Currently assembly activities of the scramjet combustor are in progress and DFS-02 mission is tentatively planned during Q4 2025-26.

Supersonic combustion flame with GH2

Supersonic combustion flame with GH2 & Isrosene

Supersonic combustion flame with Isrosene alone

2.5.9 Sounding Rockets

Advanced Technology Vehicle Project conducts sounding rocket launches for the scientific exploration of the middle & upper atmosphere. It also provides a cost-effective platform for testing new technologies before introducing into launch vehicles.

a. A total of 8 RH-200 rockets were successfully launched from the start of the financial year till November 2025, from TERLS.

2.5.10 Next Generation Launch Vehicle (NGLV)

The development of partially reusable, human rated & commercially viable Next Generation Launch Vehicle (NGLV) with enhanced launch capability has been initiated.

a. NGLV vehicle is a three-stage vehicle with a maximum payload capability of 30tonnes to LEO. Two variants of the vehicle i.e., with and without solid strap-ons are planned to be developed. The first and second stages are based on a common LOX-Methane Engine (LME-1100) having a nominal thrust of 1100kN and the third stage is based on the existing CE20 Cryogenic Engine developed for LVM3. The first stage will be configured for recovery through vertical landing and reusability.
b. All specification documents for NGLV configuration have been released. Overall aero data, load distribution and preliminary structural dynamic data were generated. Overall stage configurations were finalized and configuration definition document was released. Preliminary 3D models have been generated for various sub-assemblies. Structure configuration and vehicle interface drawings completed for various stages
c. Overall mission requirements finalized and trajectory design completed. Aero and mission studies have been carried out for core alone configurations of NGLV. Overall number of wind tunnel tests required for the NGLV programme worked out. Design of the NGLV ascent force model for wind tunnel testing completed and realisation initiated. Wind tunnel 1:100 model has been designed for NGLV configuration.
d. Preliminary design of all the LOX-Methane engine subsystems completed. Expression of interest for production of LOX methane engines through industry released. Development & qualification test plan for the LME1100 engine were reviewed.
e. Human rated avionics configuration finalized for the vehicle. System concept reviews and PDR completed for 3 avionics systems. System concept review of avionics, electrical integration & vehicle checkout systems, LHRS and control actuators completed.
f. Mathematical model of EGC actuators, grid fin deployment control actuator, and servo design have been completed. Vehicle mass and inertia properties updated.

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g. Preliminary design review for all RF systems has been completed. Vehicle checkout system requirements document for TLP has been released.

h. Civil works pertaining to various facilities required for NGLV vehicle were finalized. Technical cell networking and software tools activation have been completed.

2.5.11 Development of key technologies for LOX-LCH4 Engine

Envisages the development of key technologies involving realisation and testing of sub-systems which will provide the way forward for the development of the flight LME1100 engine for NGLV.

a. Single element tests: Single Element Thrust Chamber Test Article interfaced with TCT Facility and flow trials (Methane flow trial and LOX chill down and flow trial) completed. Conducted single element thrust chamber short duration ignition trial to characterize injector element for LOX Methane engine. Demonstrated single element injector ignition and sustained combustion with Spark Torch Igniter. Subsequent, long duration test planned in TCT facility during December 2025. Spark torch igniter hardware (2nos.) were realised through Additive Manufacturing (AM) route. Water flow trials and ignition test have been conducted for spark torch igniter realized through AM route.

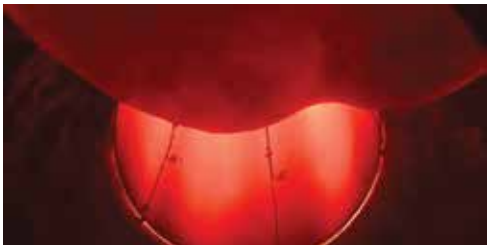
Hot Test of LOX-methane Single Element Thrust Chamber with Injector Head

b. Actual GG hardware realized and is getting ready for hot test at TCT facility which is planned during January 2026. Preliminary test sequence for LME-Gas Generator hot test generated. A subscale thrust chamber injector head has been configured to demonstrate multi element injector head realization process.

c. The turbo pump hardware is undergoing integration. The first LOX pump cold flow test is planned from Dec. 2025 onwards. Subsequently, Methane pump cold flow tests are planned from Feb. 2026.

2.5.12 Development of New Technologies in Propulsion Systems

a. ISRO successfully carried out the 1st long duration qualification hot test of the PS4 engine that powers the 4th stage of PSLV, with Carbon-Carbon Nozzle divergent for a full qualification duration of 665 seconds at IPRC. The performance of PS4 engine with Carbon-Carbon Nozzle divergent was normal. The induction of Carbon-Carbon Nozzle divergent in place of the currently columbium alloy in the PS4 engine will result in payload advantage of 19kg per PSLV mission and higher operating temperature in flight. PS4 engines with Carbon-Carbon Nozzle divergent will be very useful in missions which require payload advantage.



Qualification hot test of PS4 Engine with Carbon-Carbon Nozzle Divergent

Throttleable VIKAS engine hot tests

b. Four Hot tests of the Throttleable Vikas engine with the newly developed water control valve (electromechanical flow control valve), have been successfully conducted for an overall duration of 50 seconds at different chamber pressures. The performance of the engine, water control valve, control electronics, and facility ground systems were satisfactory up to 32.5% throttled condition. The tests validated the proper functioning of the water control valve at nominal and throttled conditions. Smooth engine start transient with proper shutdown characteristics of the engine were characterized during the tests. Development of throttleable Vikas engine is a key technology demonstrator for the development of Vertical Take-of and Vertical Landing technology (VTVL) for the future class of vehicles.

c. Two long duration hot tests of the PS4 engine with Stellite Nozzle divergent for a full qualification duration of 665 seconds each was successfully conducted at IPRC. The performance

PS4 Engine Stellite Nozzle Divergent Hot Test

of PS4 engine with Stellite divergent was normal. With this test, all the qualification tests for the Stellite Nozzle divergent have been completed and the hardware can be inducted in flight. The induction of Stellite nozzle divergent in place of the currently used columbium alloy ensures cost savings of the engine and capability to operate under higher operating temperatures.

Vikas Engine Restart Demonstration Test

d. Subsequent to the first restart demonstration test of ISRO's workhorse Vikas Engine which was successfully accomplished at the engine test facility at IPRC, Mahendragiri, on December 23, 2024, three more restart demonstration tests were carried out at the engine test facility at IPRC, Mahendragiri for an overall total duration of 279 seconds. Restart of Vikas engine is a key element in demonstrating the Vertical Take-off & Vertical Landing (VTVL) technology. All the engine parameters in the above tests were normal and as expected.

e. Ignition trial of the multi-element igniter for CE20 cryogenic engine was successfully carried out on February 7, 2025, which simulated the engine ignition in vacuum conditions. This test was carried out in the High Altitude Test Facility at ISRO Propulsion Complex, Mahendragiri, Tamil Nadu. Performance of a three element igniter that is required for engine restart capability was demonstrated successfully.

f. Development Hot test of 3.1kN throttleable engine, which is planned to be used as the Landing Engine for the LuPEx/ Chandrayaan-5 mission with varying chamber pressures was demonstrated successfully. The facility performance and the engine performance during these tests were normal.

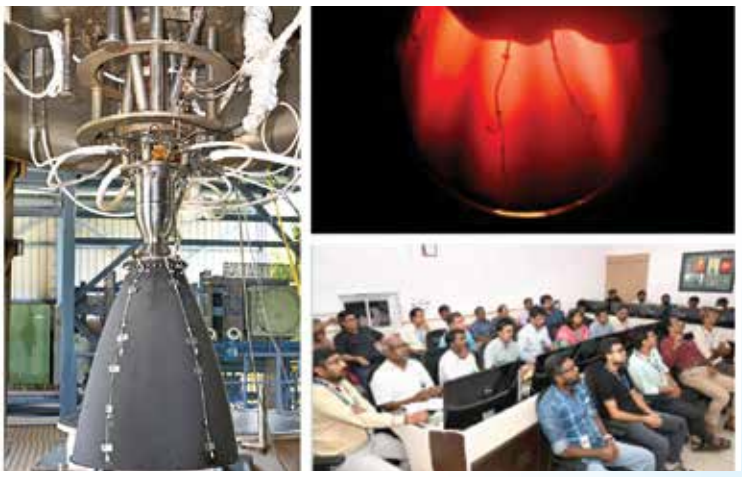
g. Two boot-strap mode re-start demonstration test of the CE20 Cryogenic engine was successfully conducted under vacuum conditions in the High-Altitude Test (HAT) facility at ISRO Propulsion Complex, Mahendragiri. A multi-element igniter was employed

in both the thrust chamber and gas generator to facilitate boot-strap mode ignition. In this tests, following the ignition of the thrust chamber, the gas generator was ignited under tank head conditions, and the turbo pumps were started without the use of the start-up system. Subsequently, boot-strap mode build-up and steady-state operation of the engine were successfully demonstrated. With this achievement, ISRO successfully demonstrated boot-strap mode starting of a gas-generator cycle cryogenic engine without any auxiliary start-up system, perhaps for the first time in the world. This is a significant milestone towards enhancing the restart capability and mission flexibility of future LVM3 flights.

Development hot test of 3.1kN Engine

Re-ignition characterisation hot test of CE20 engine in boot strap mode under tank head condition

h. Restart Demonstration hot test of PS4 engine that powers the 4th stage of PSLV, with carbon-carbon composite nozzle divergent, successfully conducted for a duration of 480 seconds (with first burn of 200s, an off time of 100s, a second burn of 40s, an off time of 100s, and a third burn of 40s) on November 25, 2025 at LUS-TF, IPRC.



Re-start demonstration hot test of PS4 engine with Carbon-Carbon Nozzle Divergent

2.6 Gaganyaan

Gaganyaan is a national programme to demonstrate the capability to launch human beings to low earth orbit on an Indian launch vehicle and bring them back safely to earth. The mission is broadly divided into three major phases, namely, ascent phase, orbital phase and descent phase.

In the ascent phase, the human rated launch vehicle carries the Orbital Module to a low earth orbit. The orbital phase starts with the injection of the Orbital Module by the launch vehicle into an elliptical orbit. This is further raised to a circular orbit using the engines present in the Orbital Module. The orbital phase ends with the beginning of the de-boost maneuvers carried out to initiate the return journey. The descent phase begins with the de-boost maneuvers which sets the course of the module towards the designated touch-down location. A series of activities will be carried out during the descent phase, which will finally end with a low-velocity splash down at a designated location in sea waters.

The Gaganyaan programme involves complex and multi-disciplinary activities with an emphasis on human-centric approach in designing, realizing and testing various subsystems.

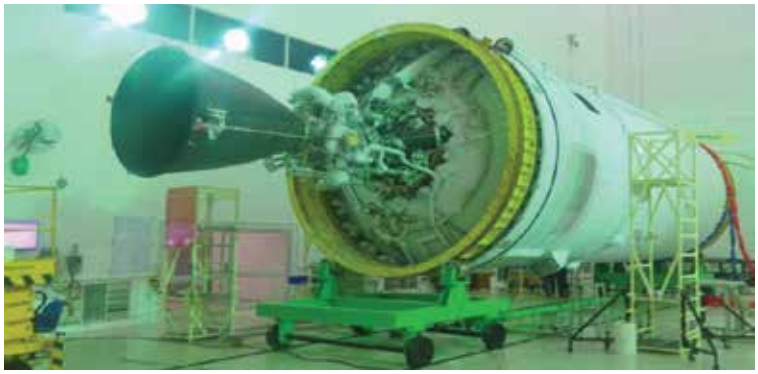
Various precursor missions are planned for demonstrating the Technology Preparedness Levels before carrying out the actual Human Space Flight mission. These demonstrator missions include Integrated Air Drop Test (IADT), Pad Abort Test (PAT) and Test Vehicle (TV) flights. As a precursor to crewed mission H1, three uncrewed missions G1, G2 and G3 are planned towards end-to-end testing of all systems involved. The first uncrewed mission G1 is configured as an experimental mission to enable early flight testing of various systems.

2.6.1 Gaganyaan First uncrewed Mission

a. Human Rated Launch Vehicle (HLVM3)

HLVM3 vehicle consists of three propulsion modules (HS200 strap-ons, L110 stage, C32 stage) and Crew Escape System (CES). Vehicle integration activities commenced last year. Further, stacking of both HS200 solid motors completed. L110 and C32 stages are ready and under preservation. Avionics flight packages for the Solid Strap-on Nose Cone realized and delivered for integration. Telemetry and Telecommand packages qualified and delivered. Navigation and Guidance Control and power checks completed. Instrumentation checks of inter-stages and equipment bay completed.

L110 stage



C32 stage

CES fore end stack

b. Crew Escape System (CES)

Crew Escape System (CES) comprises of five different types of quick-acting solid motors viz. High-Altitude Pitch Motor (HPM), Low Altitude Pitch Motor (LPM), CES Jettisoning Motor (CJM), High Altitude Escape Motors (HEM) and Low Altitude Escape Motor (LEM). Vibration testing of the HPM and LPM carried out. All CES motors and associated subsystems are ready. CES fore-end stacking has been completed up to the Crew Jettisoning Motor. Phase-1 checks and Flight Acceptance Test of Avionics Deck Assembly completed.

c. Orbital Module

Orbital Module (OM) comprises of Crew Module (CM) and Service Module (SM). CM is the habitable space with Earth like environment in space for the crew. It houses the crew interfaces, human centric products, life support system, avionics and deceleration systems. SM will be used for providing necessary support to CM while in orbit. It contains thermal system, propulsion system, power systems, avionics systems and deployment mechanisms. Another important element in the Orbital module is the Environmental Control & Life Support System (ECLSS) which is used to maintain a habitable environment inside Crew Module.

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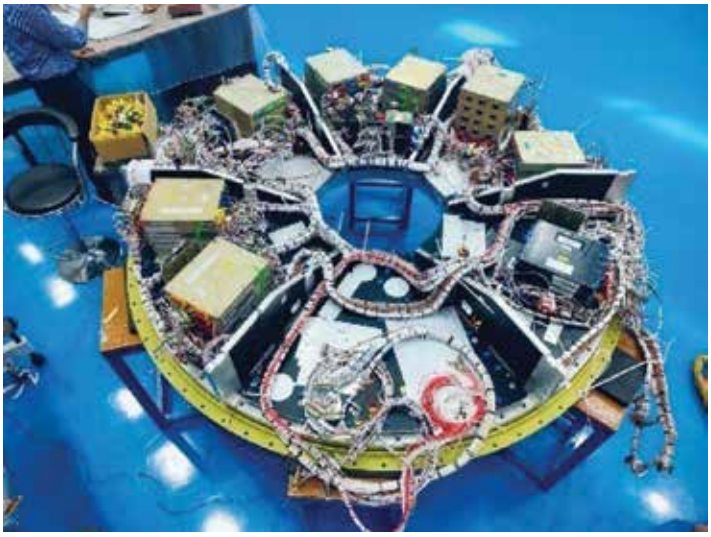
While last year saw realisation of systems for Orbital Module, this year activities are in progress towards assembly, integration and testing of systems in CM and SM for G1 mission as described in sections below.

Crew Module (CM)

Crew Module propulsion system and Crew Module Uprighting System integrated with the Crew Module. Instrumentation checks of the Crew Module Sequencer completed. Aft heat shield bonded with Thermal Protection System.

Crew Module Propulsion System

Vibration and Thermovac tests of Navigation, Guidance and Control packages, Mission Computer, Telemetry & Telecommand systems completed. Navigation and Guidance Control and Satellite Positioning System packages assembled in the Crew Module. Integrated checks of Gaganyaan Data Handling System, On-board Receiver and interface checks with Mission Computer completed. Harness realized for Crew Module decks. Instrumentation checks and package assembly in the bottom deck completed.



Crew Module Bottom Deck

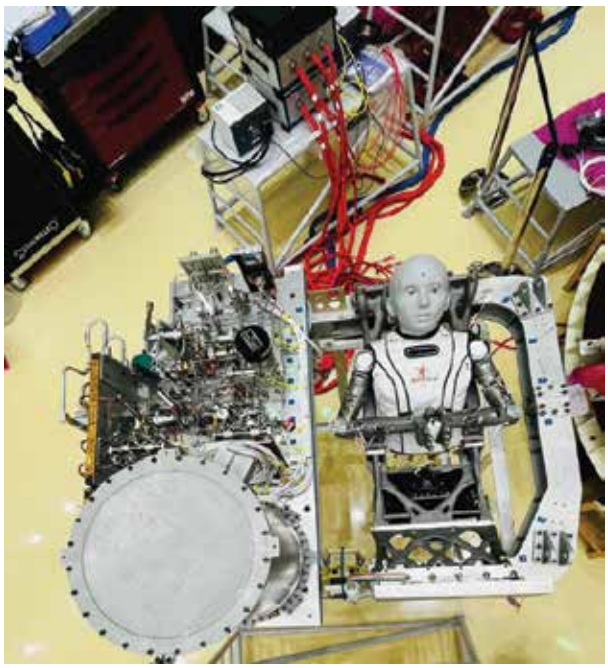
Structural and thermal qualification of the crew display console including mechanism completed. Crew cabin systems viz. crew display console, Audio Video Processing System, Visible Camera system, Location Transmitter, Event Monitoring Camera System, cabin

lights and Environment Monitoring System assembled in Crew Module and integrated testing successfully completed.

Floats for the Crew Module Uprighting System realized. Primary float inflation test and secondary float functional test completed. Packing of Apex Cover Separation parachute and pilot parachute completed.

Crew Module under Integration Activities

Interfaces for half humanoid on the crew seat pallet generated. Phase-1 checks and integrated checks of half humanoid with Audio Video Processing Unit, Gaganyaan Data Handling System, Gaganyaan Data Acquisition System, display console and Crew Module systems successfully completed.



Half-humanoid Assembly

Service Module (SM)

Simulator-level deployment tests of both solar arrays and Quadrifilar Helix antenna boom carried out. Software development of the Service Module On-board Computer completed, followed by vibration and environmental testing. Power packages, On-board Computer and instrumentation sensors mounted on SM and powered on.

Integration of the Service Module propulsion system completed. Thermal implementation of the Service Module Propulsion System and Reaction Control System completed.

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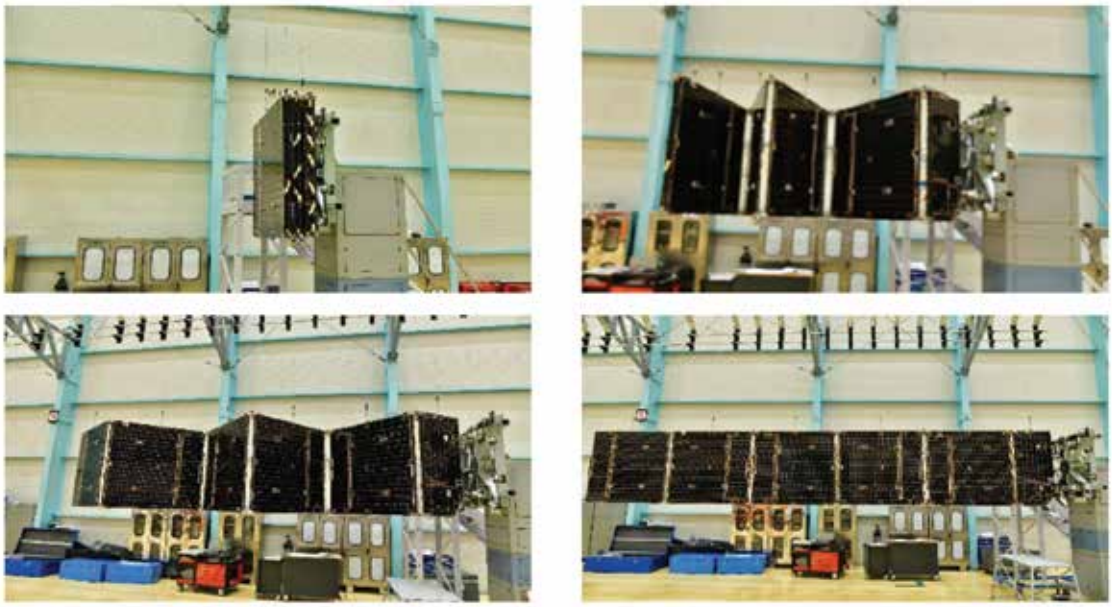
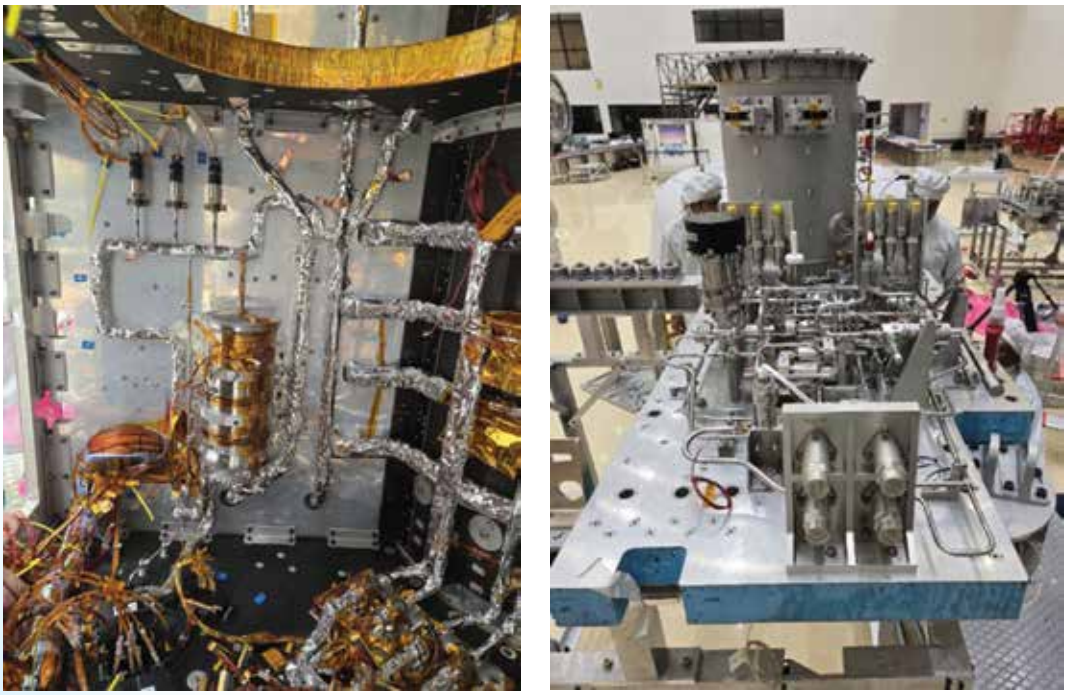
Gaganyaan



Solar Array Simulator level Deployment Test

Environmental Control and Life Support System (ECLSS)

Performance testing of the Thermal Control System heat exchanger completed. Liquid-liquid heat exchanger, pump module and compensator mounted on the Service Module followed by welding, leak testing, pressure hold, and thermal implementation.



ECLSS integration activities

Components of Thermal Control System viz. solenoid valve, fill and drain valve and flow proportioning valve were integrated. ECLSS controller and Data Acquisition System integrated in the Crew Module. Proof, Leak & Pressure hold checks of Cabin Pressure Control System and actuator checks with ECLSS controller completed.

d. Ground Network Systems

The Amazon Web Services (AWS) network has been operationalized and validated through support to the SPADEX mission. Network operations of communication systems were validated with the European Space Agency (ESA) ground station through a series of Radio Frequency Compatibility Tests (RFCT). End-to-end data flow checks carried out for audio and video transmission at the ESA ground station in Germany. The IDRSS-1 feeder stations established at ISTRAC, Bengaluru and SHAR. Network configuration completed and Test and Evaluation completed. Data, audio and video transmission and reception were demonstrated using the GSAT satellite. Terrestrial links established between the Indian Naval Station and SHAR as well as Gaganyaan Mission Control Centre (Bengaluru) and the Gaganyaan Control Facility (SHAR). The link between the Gaganyaan Mission Control Centre, Gaganyaan Control Facility and the Crew Module Recovery Centre at Delhi established and tested. A contract signed with the Swedish Space Corporation for ground station support for the G1 mission. The Deed of License for the Cocos (Keeling) Islands, Australia executed for the establishment of a ground station terminal.

e. Crew Training

Mission specific training carried out in Static Mock-up Simulator.

Gaganyatris training in Static Mock-up Simulator

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Updated version of Virtual Reality Training Simulator realised for crew training.

Gaganyatris training in Virtual Reality Training Simulator

Mission Control Training Room established for carrying out training of ground team.

Mission Control Training Room

Habitability trials with Static Mock-up Simulator for duration of 02Hrs, 06Hrs, 10Hrs and 18 Hrs completed to assess Crew reachability, onboard AV communication, emergency exit procedure, familiarization of display pages, Crew Module environment and off-nominal mission scenarios.

Habitability trials

2.6.2 Development/Ground Qualification Tests

The development/ground qualification tests carried out during the year include:

a. Structural Qualification and Acceptance Tests

Structural qualification tests for the Orbital Module Adaptor and Service Module Fairing completed. Structural testing of the Service Module, including static testing completed. Acoustic testing of the C32 inter-tank structure and vibration testing of the HS200 separation system completed.

b. Crew Escape System (CES) Qualification Tests

Static testing of the High-Altitude Escape Motor carried out. Vacuum ignition tests of the CES Jettisoning Motor and Low-Altitude Escape Motor completed. Structural qualification testing of Low-Altitude Escape Motor completed. Non-Destructive Testing of CES motors completed. High-altitude test for the High-Altitude Escape Motor carried out.

High Altitude Escape Motor static test

Vacuum ignition tests of the CES Jettisoning Motor

c. Thermal Protection System (TPS) Tests

Qualification testing of the Crew Module Thermal Protection System completed. Testing of the Flexible Thermal Protection System carried out.

d. Propulsion system tests

Two short duration hot tests were conducted for 30s and 100s to validate the test article configuration of Service Module Propulsion System followed by a full duration hot test for 350s to validate the integrated performance for off-nominal mission profile.

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Hot test of Service Module Propulsion System

e. Parachute and Recovery System Tests

As part of the Rail Track Rocket Sled test, clustered deployment of drogue parachutes at 90° and 140° angles of attack carried out. Rail Track Rocket Sled test of drogue parachutes under extreme conditions of dynamic pressures carried out. Integrated Main Parachute Airdrop Test (IMAT) conducted to demonstrate the delay in disreefing between the two main parachutes. Non-Destructive Testing of Apex Cover Separation system, drogue parachutes, and pilot parachutes completed.

RTRS Tests of Drogue Parachutes

Integrated Main Parachute Airdrop Test

f. Crew Module Uprighting and Float Systems

Functional tests for the primary and secondary floats of the Crew Module Uprighting System carried out.

g. Separation Systems and Pyros

Functional test of Crew Module Fairing Separation System

Functional testing with initiation delay between bolt cutters for the Crew Module Fairing Separation System completed. Pyro charging of the Service Module Fairing completed. Orbital Module Adaptor umbilical qualification carried out. System level functional development test of Crew Module – Service Module Connect Disconnect System carried out. Orbital Module–Launch Vehicle separation test carried out. Integrated Structural Qualification Tests of Orbital Module Adaptor (OMA) & Service Module Fairing (SMF) carried out. Dynamic separation tests of C32 Cryogenic Umbilical (LOX and LH2) in both primary mode (pyro based) and secondary mode (traction pull) completed.

Structural Qualification Tests of Orbital Module Adaptor

Integrated Structural Qualification Tests of Orbital Module Adaptor (OMA) & Service Module Fairing (SMF)

C32 Cryogenic Umbilical Dynamic Separation Tests

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Gaganyaan

h. Ground Support and Launch Pad Systems

Design of the white room for servicing the space suit before the mission at the Second Launch Pad completed. Trials of the zipline system at the launch pad carried out.

Zipline

2.6.3 Gaganyaan Test Missions

Test missions are used to qualify critical systems like deceleration system, crew esacpe system, crew module propulsion systems by simulating near flight conditions.

a. Integrated Air Drop Test -01

IADT-01 successfully accomplished on 24th Aug'25 at SHAR. This test successfully demonstrated the objective of end-to-end performance validation of the critical

Chinook helicopter carrying Crew Module

Deployment of parachutes

Crew Module touchdown in sea waters

parachute-based deceleration system of the Crew Module for Gaganyaan mission in one of the typical mission scenarios. This test is part of system level qualification of parachute-based deceleration system, in which a simulated CM, encompassing the deceleration system is dropped using a helicopter. The test simulated a possible abort scenario on the launch pad. Upon release of CM, the onboard avionics commanded for deceleration system initiation and there after parachutes deployed in predefined sequence.

b. Test Vehicle Mission-D2

TV-D2 will demonstrate In-flight Abort of CES at Mach number 1.9 corresponding to LEM-HEM transition condition, followed by CM separation (at Mach 1.6), re-orientation & damping through Reaction Control Systems, parachute deployment as in nominal re-entry mission leading to safe CM touchdown and recovery. The vehicle stage is ready.

TV-D2 vehicle stage

Electrical and mechanical integration activities of Crew Module completed. Environmental tests completed.

Vibration test of TV-D2 Crew Module

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Gaganyaan

2.6.4 National & International Collaboration activities for Gaganyaan Programme

a. Framework Memorandum of Understanding on Cooperation in Space Medicine' signed with Sree Chitra Tirunal Institute for Medical Sciences & Technology (SCTIMST), Department of Science & Technology (DST).

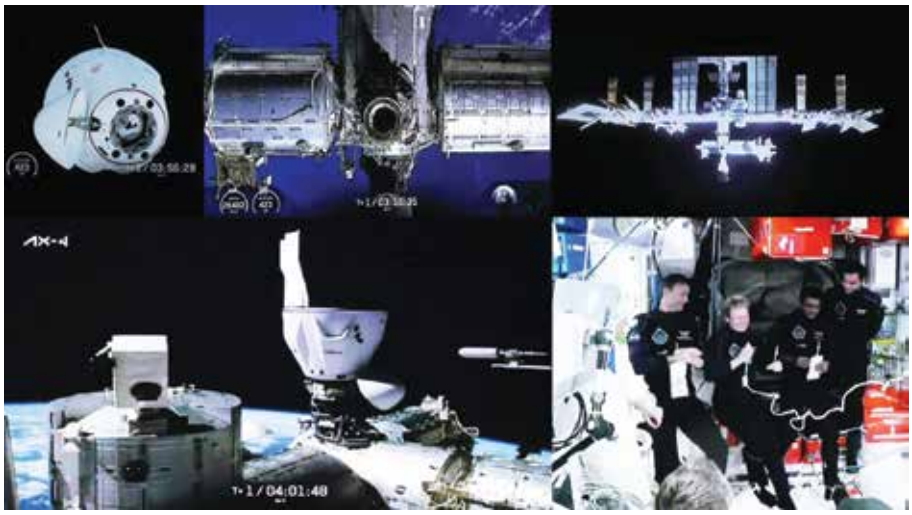
Framework MoU on cooperation in Space Medicine

This framework MoU between ISRO and SCTIMST will lead to cooperation in the niche field of Space Medicine which will benefit the national human space programme as well as spur innovations and developments in the fields of Human Physiological Studies, Behavioural Health Studies, Biomedical Support Systems, Radiation Biology & Medicine, Countermeasures for improving Human Health & Performance in Space Environment, Telemedicine and communication Protocols and Crew Medical Kit for Space Missions. The program will create opportunities for studies and experiments, especially in the field of Space Medicine.

b. Axiom-4 mission

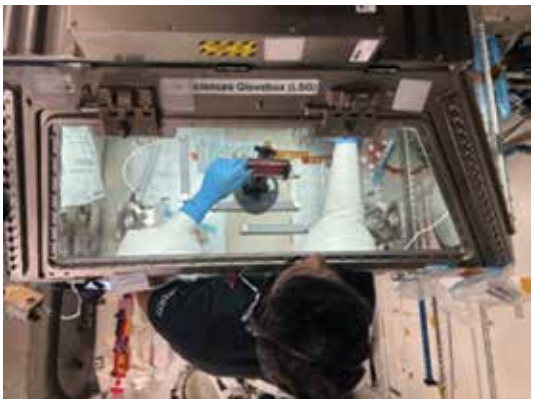
Launched by Falcon 9 rocket on June 25, 2025, aboard the SpaceX Dragon spacecraft, the mission was conducted in collaboration with NASA, Axiom Space, ESA, and other international partners. The launch vehicle and the Dragon spacecraft performed flawlessly, achieving all mission milestones—from stage separation to orbit insertion—well within expected parameters.

Gaganyatri Shubhanshu Shukla conducted a suite of seven microgravity experiments developed by Indian research institutions under the Human Space Flight Centre's (HSFC) coordination. These experiments explored muscle regeneration, algal growth, crop viability,



Dragon docking sequence to ISS

microbial survivability, cognitive performance in space, and the behaviour of cyanobacteria—each aimed at enhancing understanding of human spaceflight and microgravity science. All experiments were completed successfully, and samples have been returned for detailed post-flight analysis. Shubhanshu Shukla worked in close partnership with members of Axiom-04 Crew and Expedition 73, contributing to the daily rhythm of ISS operations and supporting joint science, maintenance, and outreach efforts.



Shubhanshu Shukla doing science experiment onboard ISS

Gaganyatri Shubhanshu Shukla coming out from Dragon after successful mission

He participated in integrated crew timelines, shared resources aboard the Harmony module, and coordinated multiple crossover activities, fostering international cooperation in space.

The mission completed on July 15, 2025 with undocking of Dragon from ISS, re-entry and splashdown in Pacific Ocean with nominal deorbit operations and vehicle performance.

2.7 Technical Facility / Infrastructure

The significance of establishing new facilities and enhancing infrastructure at various ISRO centers aligns with programmatic needs, long-term goals, Atmanirbhar Bharat, and reforms in the space sector.

This section provides a detailed overview of the facilities and infrastructure set up at different centers.

2.7.1 Vikram Sarabhai Space Centre (VSSC)

a. Supercomputing Facility

Supercomputer facility is designed to handle the most complex and demanding scientific research, computational analysis, and enterprise-grade data processing tasks. Benchmarked along with C-DAC consultancy resulted with 3.11 Peta-Flop @ 80% efficiency.

Supercomputing Facility

b. Ablative Testing vacuum chamber for TPS qualification for Gaganyaan

A dedicated Ablative Specimen Testing vacuum chamber with a PLC controller is installed & commissioned for Gaganyaan. It has a volume of 2.5m3 with a chemical dry vacuum pump with 700m3/hr capacity for testing the ablative and non-ablative TPS specimens.

Ablative Testing vacuum chamber

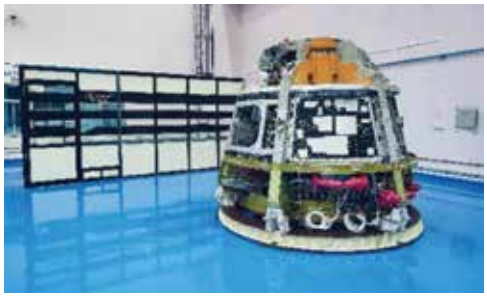
c. NGC Simulation test bed for G1

Test beds for HLVM3 OILS, HLVM3 S200 ALS, LVHM OILS and ECLSS OILS were realized. They are equipped with provisions for failure simulations as per the test conditions, assess the actuator performance and its interaction with vehicle dynamics under closed loop, validation of LVHM systems and associated software and validation of ECLSS Controller functionalities in the closed loop.

NGC Simulation test bed for G1

d. Crew Module Integration and Checkout Facility

RLV Bay at Dr. Brahm Prakash Complex is converted to Crew Module Integration and Checkout Facility (CMICF) to cater to the requirements of integration and checkout operations of Crew Module for Gaganyaan G1 mission with dedicated checkout system established for testing of sub-systems. The facility was utilized for G1 Crew module initial integration and testing.



Crew Module

e. Augmented VLCC Facility

The Virtual Launch Control Centre was augmented with additional rooms featuring new consoles, dedicated VIP gallery and active LED Video Wall. VLCC Console Software has been upgraded to RHEL 9.5 Operating System. The Augmented VLCC was operational for LVM3- M5 Launch.

Augmented VLCC

f. 1MW Pulse coded C Band Radar Transmitter

The 1MW Pulse Coded C-Band Radar transmitter was realized through Indian Industry. It is capable of generating an RF pulsed power of 1MW in C-Band frequencies of 5400 – 5900 MHz. The testing, installation and commissioning was completed. With this system, TERLS Range is fully equipped with two C-Band Radars having Coded Transmitters.

C-Band Radar Transmitter

g. Integrated Component Disbursal System

It is an automatic storage & retrieval machine for delivery of electronic components in the form of kits. It is customized with materials having anti-static properties, to handle ESD sensitive devices.

Machine has an inbuilt inventory management software with GUI for user interaction, operation & a linked database to display all the required details of a device against a user request for which the kit has to be delivered.

Machine for component disbursal

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Technical Facility / Infrastructure

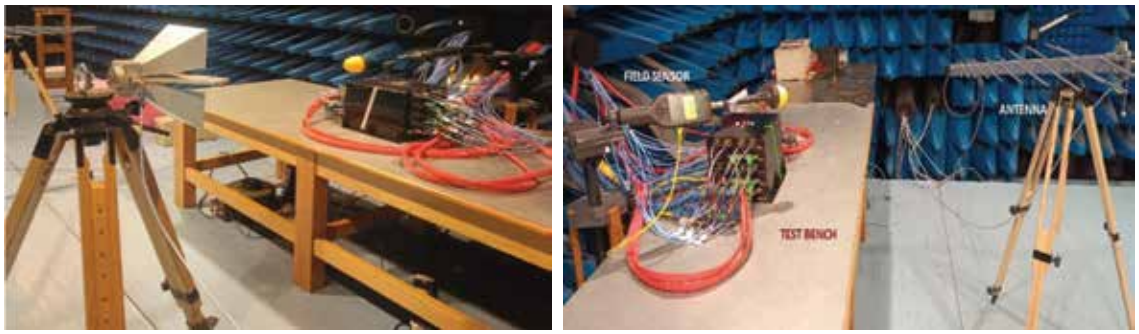
h. Programmable Hot Air Oven (6m x 6m x 11m)

Programmable Hot Air Oven with internal volume of 396 m3 is established for curing of large structural products such as composite payload fairings of LVM3 and GSLV, gridded PLAs of LVM3, and composite monolithic Motor Cases, Composite liner-less tankages etc. The new oven enables programmable curing of all filament wound and structural products under vacuum consolidation with controlled heating and cooling.

Hot Air Oven

i. Augmented EMI Facility with test setups for MIL STD 461G tests

EMI Facility was upgraded to latest MIL STD 461G for testing Gaganyaan packages as per the new standard. The facility is now capable of carrying out Conducted Susceptibility and Conducted Emission Tests as per MIL STD 461G.



Conducted Susceptibility and Conducted Emission Tests

j. Gaganyaan Checkout System (AVN)

Integrated Processors Test (IPT) test bed, Simulated Input Profile (SIP) system and S200/ L110/ C32 EMA checkout systems were realized. It facilitates failure simulations like Power, 1553 link, clock & input failures to test robustness of on-board error handling. Dedicated Checkout system developed for validation of S200, L110 & C32 Stage Controllers and ECLSS System.

Gaganyaan Checkout system

k. AP Process Facility – II at APEP, Aluva

AP Process Facility – II (APPF II) augments annual production capacity from present 1680 MT to 3000 MT, fully meeting current ISRO requirements. The facility produces ammonium perchlorate using sodium perchlorate and ammonium chloride.

Inauguration of APPF II

l. Space Museum and Knowledge Centre at Kowdiar, Trivandrum

State-of-the-art Knowledge Centre cum Space Museum at Kowdiar, Thiruvananthapuram to inculcate scientific spirit in the society, popularizing Space Science and Technology among general public and publicizing the Indian Space Programs & Developmental Activities is under construction.

Design concept of Knowledge Centre cum Space Museum

All Statutory clearances from various authorities of Govt. of Kerala are obtained including Building Construction Permit. Tender floated for building construction works and technical evaluation of the bids has been completed.

2.7.2 Satish Dhawan Space Centre (SDSC SHAR)

a. SSLV Launch Complex (SLC)

SDSC SHAR is responsible for realization of an exclusive SSLV Launch complex (SLC) at Madhavankurichi area, Tuticorin district, Tamil Nadu. Considering the significant increase in global demand for launch service of small satellite, ISRO has developed Small Satellite Launch Vehicle (SSLV) configured with a lift-off mass of 120t to place 500kg spacecraft in 500 km orbit. SSLV has been designed with unique features of quick turn-around time, least launch campaign of 72 hours and minimal launch infrastructure requirements. Existing launch pads at SDSC SHAR Viz., First Launch Pad (FLP) and Second Launch Pad (SLP) are lined up for meeting launch demands of PSLV, GSLV & LVM-3 launches, thus realization of exclusive launch pad for SSLV is essential.

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The SSLV Launch Complex is being established at Kulasekarapattinam, Tuticorin Dt., Tamil Nadu, in order to meet the growing launch demands of the country, primarily for SSLV launches and for the launch activities of Non-Governmental Enterprises (NGEs). Honourable Prime Minister had earlier laid the foundation stone for the SSLV Launch Complex on February 28, 2024 from Tuticorin.

SSLV Launch Pad Foundation Stone

On August 27, 2025, Dr. V. Narayanan, Chairman, ISRO / Secretary, Department of Space laid the foundation for the Launch Pad at the SSLV Launch Complex (SLC). Major Facilties and systems including the Mobile Launch Structure (MLS), bogies, platforms, doors, Jet Deflection Duct and vibration isolation systems which are mostly inhouse designed are being realized. Major range systems such as radars, telecommand, and telemetry are being developed in-house and being realised through industry partnerships, with support from other ISRO centres including VSSC, SAC, ISTRAC and IISU.

SSLV Launch Pad Construction

The SSLV Launch Complex at this site is targeted for completion by the end of 2026, enabling launches of SSLV as well as rockets from NGEs. The launch of RH560 rockets for upper atmospheric studies and demonstration of technologies is targeted in the first quarter of 2026.

b. Augmentation of SLP complex for Semi-cryo stage integration and servicing (ASLP)

To meet the immediate need of servicing the LVM3 variant with Semi-cryo stage (as part of payload capability enhancement), augmentation of Second launchpad is required. The configuration details are worked out for the augmentation.

STS road map envisages the induction of Semi-Cryo stage in place of L110 and C32 as Cryogenic upper stage in place of C25. To meet the servicing requirements of the newly

inducted stages, Augmentation of Second Launch Pad Project (ASLP) was sanctioned. The project scope involves the realization of new facilities and augmentation of existing facilities.


MLP & Semi-Cryo System

Major equipments viz., LOX tanks, cryogenic valves, Isrosene tanks, PLC based Automation system, Process flow components, remote valve enclosures are realised.

c. Gaganyaan Launch Complex & Recovery Systems (GLCRS)

Gaganyaan Launch Complex & Recovery Systems project is planned at SDSC SHAR towards enabling Human Space Missions from Second Launch Pad (SLP) and realization of associated Crew facilities. All existing ground systems are augmented to meet HLVM3-G1 mission. Major facilities viz., LTR-G, OMPF, GCF, CESB are completed.

For Pad Abort Test (PAT-02), Service tower modification works are completed. Load test, functional checks and Interface verification for Launch pedestal were carried out. Design & realization of lateral access platforms for updated CECS assembly requirements is in progress.

Zip line system & Landing tower with CESB: Erection and commissioning trials are completed. Crew Emergency Safety Building (CESB) building including zipline landing tower completed. Safety systems interfacing crew safe room are being finalized.



Zip line system & Landing tower

d. Third Launch Pad (TLP)

Department of Space has contemplated the Space Vision 2047, with a series of advanced

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Technical Facility / Infrastructure

missions like realisation of Bharatiya Antariksha Station, Landing on Moon, Interplanetary Missions, etc. In line with the Space Policy, more impetus was given for R&D initiatives in new Space Technologies & Applications and for expanding the Human understanding of Outer-space.

To achieve these goals, ISRO requires advanced launch vehicles capable of carrying payloads exceeding 30 tons to Low Earth Orbit (LEO) and 10 tons to Geostationary Transfer Orbit (GTO). Next Generation Launch Vehicle (NGLV) is one of the advanced launch vehicles configured to meet this mandate and to address the evolving demands of future Space Transportation System.

Preliminary Draft Configuration TLP

The scope of this project is to establish the Third Launch Pad (TLP) facilities at SDSC SHAR, Sriharikota for servicing and launching of NGLV-SOORYA & SOORYA-H, with a provision for future augmentation for LVM3 with SC120 servicing & launching requirements and to meet servicing requirements of Human Space Programme. The major infrastructure will be realized as part of the TLP are launch pad facilities, process, safety and instrumentation & control systems, Acoustic Suppression System, Air Separation Unit and associated Range, Air Conditioning and Electrical systems.

Geo Graphical Survey has been completed and test results obtained for further analysis. Preliminary Configuration of Launch Pad Systems worked-out based on the revised launch vehicle configurations. Impact of LMLV on TLP systems was worked out. Preliminary Configuration of Launch Pad Systems, Process and Safety systems worked-out based on the NGLV-R & LMLV on TLP.

2.7.3 UR RAO Satellite Centre

a. Facilities Commissioned

As part of Infrastructure augmentation activities, New CATF facility and Autoclave Facility were installed and commissioned. Autoclave Facility was inaugurated by Director, URSC on Oct 27, 2025.

Inauguration of Autoclave Facility

b. New proposals

New proposals like Electro Dynamic Shaker system for SRS testing, 4.5 Dia. Solar Panel Thermal Cycling Facility, Design, Fabrication, Supply, Installation and Commissioning of 4 nos. of 240KL liquid Nitrogen storage Dewars are under various stage of procurement.

2.7.4 Space Applications Centre

The facilities at SAC includes highly sophisticated payload integration laboratories, electronic & mechanical fabrication facilities, environmental test facility, image processing, and analysis facilities. Major technology facilities & infrastructure commissioned during this period are:

- Li-ion Battery Characterization Test Facility
- Cryogenic system for sub-mm wave Telescope
- Radiation set-up for Radar Navigation Sensor
- Visible & NIR detector characterization lab
- IR & X-ray detector development setup

2.7.5 ISRO Propulsion Complex

a. Cryogenic Turbo Pump Test Facility (CTPT)

The Cryogenic Turbo Pump Test Facility (CTPT) was successfully realized to meet the specialized requirements for acceptance testing of cryogenic turbo-pumps associated with CE20, CUS and future high-energy propulsion systems.

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The facility incorporates an integrated LOX/LH_2 feed system, high-speed data acquisition, advanced vibration monitoring, cryogenic safety interlocks and precision flow-control loops to enable accurate turbine and pump performance evaluation under operational conditions. With the commissioning of CTPT, IPRC has strengthened its capability to conduct independent qualification and flight acceptance tests of OBTP, FBTP and associated cryogenic rotating machinery, reducing dependency on external facilities and enhancing mission-readiness for GSLV and LVM3 programmes.

b. Centralised Demineralized Water Plant (CDMP)

The Centralised Demineralized Water Plant (CDMP) was established to supply high-purity DM water required for cryogenic test facilities, cooling systems, closed-loop circulation units and auxiliary infrastructure.

The plant incorporates multi-stage treatment, automated regeneration cycles, continuous conductivity monitoring and redundancy features to ensure uninterrupted supply of high-quality water essential for cryogenic chill-down, pump performance trials, thermal management and facility safety systems. The commissioning of CDMP enhances operational reliability, reduces manual intervention and standardizes water quality across all facilities, thereby improving consistency in cryogenic test results

c. New LAM Test Facility (NLTF)

The New LAM Test Facility (NLTF) was realized to support the qualification and acceptance testing of Liquid Apogee Motors (LAMs) for spacecraft propulsion. The facility includes precision vacuum feed systems, high-stability flow-control regulators, automated ignition sequencing, thrust measurement systems and upgraded thermal conditioning arrangements. Designed to handle long-duration burns and multiple restart cycles, NLTF strengthens IPRC's capability to process high-volume LAM hardware for INSAT, GSAT, NVS and interplanetary spacecraft. Its commissioning significantly enhances throughput for spacecraft propulsion testing and reduces congestion at legacy facilities.

d. Automated Continuous Cleaning Facility (ACCF)

Facility is designed for automated continuous cleaning of propellant tanks in closed loop. This will reduce cleaning cycle time, reduced manual handling of IPA and improved safety during spray cleaning operation. Fluid circuits comprising of IPA circulation system, filtration system and GN2 purging system with instrumentation and control system. The Facility is established and commissioning is expected to complete by Dec-2025.

e. Automated 3 axis tank rotation system for PS4 propellant tank cleaning

Facility is designed for automated cleaning of PS4 propellant tanks without manual rotation. Conventionally, the tank will be filled with cleaning agent (IPA) and rotated manually to simulate sloshing.

The facility is re-designed with automation of rotation using servo motor system. This will reduce cleaning cycle time, reduced manual handling of IPA and improved safety during cleaning operation. Facility is established and commissioned in July-2025.

f. Proof Pressure Testing Facility – II (PPTF-II)

The Proof Pressure Testing Facility–II (PPTF-II) was realized to meet the growing demand for testing of tanks, feedlines, regulators and structural subsystems of PSLV, GSLV, LVM3 and SC120/NGLV.

The new facility features high-pressure hydrostatic systems, digital load monitoring, safety-interlock architecture, remote-control panels and advanced pressure-cycling capabilities. Its commissioning has doubled IPRC's proof-pressure testing capacity and enabled parallel testing operations, thereby improving turnaround time for stage integration and qualification activities. PPTF-II plays a critical role in supporting large-volume subsystem processing for ongoing and future programmes.

STF Facility

g. LOX–Methane Injector & Ignition Test Facility (LM-Test Setup)

The LOX–Methane test setup was created to support technology demonstration for NGLV-class methalox propulsion systems. The facility includes dedicated LOX and gaseous-

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Technical Facility / Infrastructure

methane feed circuits, automated ignition systems, spark-torch sequencing, mass-flow metering, blowdown lines and integrated safety features for handling cryogenic oxidizers and flammable fuels.

The setup enabled successful execution of single-element thrust chamber ignition trials, cold-flow tests and igniter validation experiments. With this realization, IPRC has established foundational capability for future methane-based engine development.

h. SC120 Stage Servicing System (SIET – Stage Bay)

The SC120 stage servicing system was realized as part of the semi-cryogenic test facility augmentation to support assembly, integration and functional testing of SC120 stages. The system incorporates LOX and Isrosene feed circuits, pneumatic actuation assemblies, propellant-conditioning loops, valve actuation panels and control-room interfaces.

The facility enables smooth execution of subsystem assembly, leak checks, flow trials and stage-level readiness tests. This engineering realization marks a significant step towards full-scale SC120 stage developmental tests for the NGLV programme.

i. Automated Tank Cleaning & Machining Systems (Stage Integration Support)

To support increased PSLV/NGLV stage production, new automated machining, cleaning and insulation-processing systems were established during the year. These include automated rotating cleaning stations, high-pressure hydro flush systems, CNC-based insulation machining setups and enhanced ventilation & waste-handling units.

The new systems improve accuracy, reduce processing time and enhance safety during tank and feedline preparation, directly contributing to improved stage assembly throughput.

j. Realization of Integrated Cryogenic Engine and stage Test facility (ICET)

The facility is being commissioned wherein the commissioning activities with simulating fluid (Liquid Nitrogen) are underway and with actual propellants are planned in the forthcoming weeks. In addition, the commissioning activities of Service fluids systems viz. DM water & Liquid Nitrogen are completed and other sub-systems (Cooling water, Ejector, Cryogenic Helium) are underway.

The mammoth facility (42 m tall with twin bay configuration) possesses equipments like large cryogenic storage tanks (LH2 : 250 & 125 m^3; LOX : 80 & 50 m^3; LN2 : 110 & 35 m^3), High pressure cylinders (for GH2, GHe & GN2 : 101 nos. 40 MPa; 2 m^3), Vapourizers

(34 nos.), etc. The facility has novel features viz. Ether CAT based Hot standby PLCs, Digital measurement system with Foundation fieldbus architecture and process systems with improved features.

2.7.6 ISRO Telemetry Tracking and Command Network

a. 11m Antenna Installation at Biak under INMP-III project

ISRO Telemetry, Tracking and Command Network (ISTRAC) is responsible for providing telemetry tracking and command support for Launch vehicles and Low Earth Orbit (LEO)/ Interplanetary missions. ISTRAC has established a satellite control centre/ground station at Biak, Indonesia for health monitoring, control and mission operations of IRS satellites. ISTRAC has carried out dismantling of existing 10m Biak-1 antenna and Installation of new 11m S/X- band TTC antenna terminal, at Biak, Indonesia. The major elements in the antenna system are the Reflector system, Mount System and Feed System.

The complete installation and commissioning would be carried out in three phases:

Phase - I	Dismantling the existing antenna
Phase - II	Mechanical installation of new 11m Antenna
Phase - III	Servo, RF installation and T&E of overall system

The mechanical activities started from 03 May 2025 and completed on 30 June 2025.

Progress of activities for 11 m Antenna Installation at Biak

b. NETRA Project

A network of space object tracking radar and optical telescopes is being set up for dedicated tracking and monitoring of LEO and GEO space objects, including space debris, as part of NETRA (NEtwork for space object TRacking and Analysis) project.

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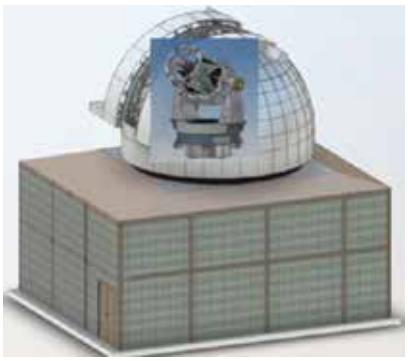
Technical Facility / Infrastructure

Chairman ISRO visiting allotted land for NETRA radar at Chandrapura

Drone-acquired image of radar site

For the radar, a 67-acre site has been identified at Chandrapur, Assam. Memorandum of Transfer was executed in Nov 2023 and final registration of the land has been completed on 7 Nov 2025.

Signing of MoU with BRO for civil work



Conceptual design of the NETRA optical telescope facility

By collaboration with Indian Institute of Astrophysics (IIA), NETRA telescope is being established at Hanle, Ladakh. The construction of the approach road to the site is completed and a MoU was signed with Border Road Organisation (BRO) on 1 May 2025 for

A panoramic view of the road constructed by BRO to the optical telescope site at Hanle

the construction of the observatory. The telescope's detailed design review was completed and the dome structure was shipped to SSA Control Centre on 24 Nov 2025.

2.7.7 Liquid Propulsion Systems Centre

The following are the major infrastructure projects inaugurated during the period:

a. Integrated Titanium Alloy Tankage Production Facility (ITPF, Tumakuru)

ISRO successfully commissioned & inaugurated Integrated Titanium alloy tank Production Facility (ITPF) on September 03, 2025 at the ISRO campus in Tumkur District, Karnataka for end to end manufacturing of lightweight Titanium alloy propellant tanks for spacecrafts and fourth stage of PSLV launch vehicle. This facility can potentially serve as a state-of-art national facility and also cater to the requirements of space start-ups.

Integrated Titanium Production Facility (ITPF) at Tumkur, Karnataka

b. Monopropellant Thruster Test facility (MTTF, Tumakuru)

ISRO also successfully commissioned & inaugurated the Monopropellant Thruster Test Facility (MTTF) at the ISRO campus in Tumkur District, Karnataka, for carrying out the testing of attitude control thruster in satellites. This state of the art facility established

Monopropellant Thruster Test Facility (MTTF) at Tumkur, Karnataka

will replace the existing aging facility and will also cater to the requirements of space start-ups.

c. Other infrastructure projects inaugurated:

- Gaganyaan Umbilical Integration and Test Facility (GUIT)
- Cryogenic Level Sensor Calibration Facility at LPSC (B)

2.7.8 National Atmospheric Research Laboratory

NARL has initiated Hyderabad Camp Observatory (HCO) as part of its expansion plan with the financial support of Atmospheric Science Programme office. The main objective of HCO is to understand the impact of urbanization on atmospheric boundary layer, clouds and precipitation. Hyderabad is chosen as the test bed for the project. This observatory is designed as a multi-institutional program with active participation from national institutes and universities. As many of these processes need to be studied in a cohesive way, a suite of instrumentation for measuring relevant parameters has been installed at 4 core observatories and 21 supporting stations. With recent installations, the HCO is now fully operational. The data obtained from HCO are forming the basis for several interesting studies on Urban Heat Island (UHI), spatiotemporal variability of pollution and sources (both natural and anthropogenic), cloud vertical structure to microphysical processes in rainfall.

(left panel) Locations of core observatories (red circle) and 25 automatic weather stations (blue circles) and TSDPS weather stations (black circles). (right panel) Recent installations of micrometeorological tower and other sensors.

2.8 Technology Development

2.8.1 In-house R&D activities

Indian Space Research Organisation (ISRO) has been at the forefront of space technology and exploration since its inception. Over the years, leveraging its key resources, the organisation has made several strides in space technologies, making India a major player in the global space arena.

India stands today at a defining juncture where science, technology, and strategic vision are converging to shape the nation's trajectory for the next three decades. As India aspires to become a Viksit Bharat by 2047, space science and technology will play a catalytic role across governance, economy, environment, security, and global leadership. From the early days of the Nike-Apache sounding rocket at Thumba in 1963 to the Chandrayaan-3 lunar landing, Aditya-L1 solar mission, XPoSat, and the upcoming Gaganyaan human spaceflight programme, the Indian space ecosystem has transformed into a world-class scientific enterprise supported by around 20,000 employees, 450 industries, and over 130 academic institutions. In the decades ahead, these foundations will expand into an integrated, innovation-driven architecture capable of defining India's long-term scientific destiny.

ISRO is currently pursuing around 2000 Research and Developmental activities, which are focussing key areas such as Stage Recovery & Reuse, Reusable Launch Vehicle (landing Experiments & Orbital Re-entry Vehicle), Semi-cryo engine & stage, LOX-Methane Engine, Air breathing/ Hybrid Propulsion based Rockets, Advanced Materials & Manufacturing, Advanced Inertial systems, Low Cost Spacecrafts, Inter-linking of satellite networks, On-Orbit Servicing, Docking, Space Robotics, Lunar sample return, Quantum Communication, Electric Propulsion, Advanced Scientific Payloads, Space Based Surveillance, Atomic Clock, Travelling Wave Tube Amplifiers for communication payloads, Technologies for sustained Human space missions viz. Regenerative Life support systems, Rendezvous & Docking, Inflatable habitats, Human factor & Engineering studies, Space situational awareness, etc.

The Government of India has outline India's Space Vision 2047, which targets establishing Bharatiya Antariksh Station (BAS) by 2035 and landing an Indian on Moon by 2040. In line to the Space Vision 2047, ISRO has initiated & pursuing technology developments for the approved projects.

ISRO has already initiated futuristic and disruptive technologies such as Quantum Radar, In-Situ Resource Utilization (ISRU), Flexible satellite payloads, Magnetic & functional materials, Inter-planetary space exploration, Space Tourism, Low-temperature energy

systems, Intelligent satellite, Self-destructing satellite, Space bio-mimetic AI powered applications for urban planning & agriculture, Cyber security etc.

2.8.2 Developmental activities through academia and industry

In order to utilize the technological potential of academia and industry for complimenting R&D activities of ISRO, which are more/ direct relevance to ongoing & immediate future missions, ISRO has initiated & pursuing following key collaborative developmental activities.

a. Mission Focussed Research Projects

Towards execution of 'Mission Focussed Research Projects of ISRO through IISc, 5 Joint Project Implementation Plan (JPIP) agreements have been signed between ISRO Centres, IISc and FSID/ IISc.

b. Centre of Excellence for R&D in Fluid & Thermal Sciences

To enhance Research efforts in the area of Fluid & Thermal Sciences with involvement of academia, a 'Centre of Excellence (CoE) – Research in Fluid & Thermal Sciences' established by ISRO in IIT Madras. Chairman, ISRO / Secretary, DoS inaugurated 'Centre of Excellence (CoE) for Research in Fluid and Thermal Sciences' at IIT-Madras on March 17, 2025. The centre is named as S Ramakrishnan Centre of Excellence, in honour of renowned space scientist (late) Dr. S Ramakrishnan, Former Director, LPSC and VSSC, ISRO.

Inauguration of CoE in IIT Madras

The established Centre of Excellence (CoE) will be highly useful for solving related thermal problems regarding the design, analysis and testing of various fluid-thermal components of ISRO and CoE can work as an extended arm of ISRO in the area of Thermo-Fluids Research.

c. Spin-off technologies from ISRO to other sectors

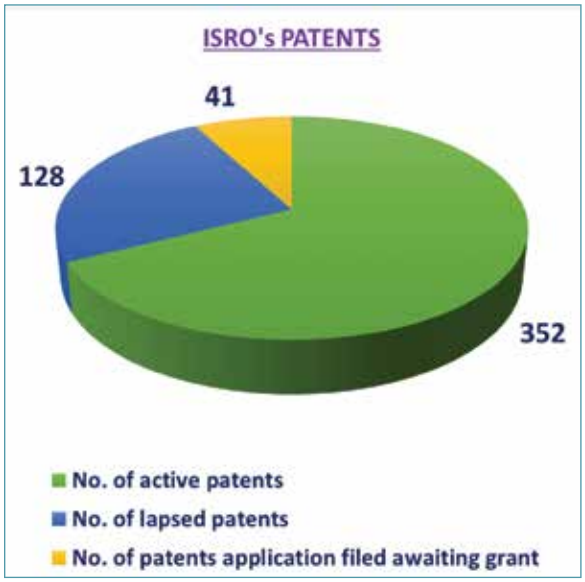
Participation in BMGE-2025

ISRO along with IN-SPACe participated in Bharat Mobility Global Expo (BMGE)- 2025 held at Yashobhoomi, New Delhi from January 18 – 21, 2025. ISRO exhibited 40+ space technologies including imaging sensors, pressure sensors, gyroscopes, insulation coatings etc., with potential applications in the automotive sector. VSSC, LPSC, URSC and IISU teams from ISRO presented the features and probable areas of application of these technologies in automotive industry at a special session.

2.9 Capacity Building

2.9.1 Intellectual Property Rights

ISRO has 352 active patents, 100 nos. of copyrights, and 13 nos. of trademarks. During the reporting period around 30 patent applications and 8 copyright applications are filed, 28 fresh patents were granted and active patents were renewed. Presently, 41 nos. of patent applications are under various stages of examination and 33 nos. are undergoing drafting by the patent attorneys before their eventual filing at the patent office.



2.9.2 Industry Interface

a. GLEX 2025

The Global Space Exploration Conference (GLEX) 2025 was held between May 7-9 in New Delhi and it marked a milestone in international collaboration. It was co-hosted by ISRO and the Astronautical Society of India (ASI) under the International Astronautical Federation (IAF). The high-profile summit, themed "Reaching New Worlds: A Space Exploration Renaissance," drew leaders, astronauts, and scientists from over 35 countries, reinforcing India's central role in international space diplomacy and innovation. GLEX 2025 featured more than 240 interactive presentations across 10 technical sessions and 15 thematic areas, showcasing global advances in space exploration.

GLEX 2025

b. National Meet 2025 (NM 2.0) and National Space Day Celebrations 2025

On August 22, 2025, ISRO conducted the National Meet 2.0 (NM 2.0) at the Bharat Mandapam in New Delhi, coinciding with the celebrations of the 2nd National Space Day. NM 2.0 was held with theme "Leveraging Space Technology and Applications for Viksit Bharat 2047," and served as a pivotal platform to unite stakeholders viz. ministries,

state governments, industries, startups, academia and space enthusiasts. The NM 2.0 highlighted the role of space in national development, followed by the inauguration of an exhibition that showcased innovations from startups, research institutions and industry.

National Meet 2.0

The 2nd National Space Day (NSpD 2025) was celebrated with grandeur and pride on 23rd August 2025 at Bharat Mandapam, New Delhi, with the theme "Aryabhatta to Gaganyaan: Ancient Wisdom to Infinite Possibilities". The NSpD 2025 celebrations culminated months of zonal events held across the country. ISRO Centres and Units organized nearly 100 outreach activities across 28 States and 8 Union Territories, directly reaching an estimated 1.5 lakh students and 15,000 teachers. In addition to physical participation, the celebrations attracted a remarkable1.25 lakh digital audience who joined online through livestreaming and social media platforms. The winners of ISRO Robotics Challenge and Bhartiya Antariksh Hackathon competitions were honoured during the inaugural session.

National Space Day (NSpD) 2025

c. DoS Chintan Shivir – 2025

As per the directive of Honorable Prime Minister, Shri Narendra Modi, with the objective of carrying forward the strategies, action plans, milestones etc., for achieving the goals envisioned in Space Vision 2047 as well as to evolve space vision beyond 2047, the Department of Space (DoS) has organized a three-day workshop, "Chintan Shivir 2025," from July 16th to 18th, 2025.

Chintin Shivir 2025

2.9 Capacity Building

The three-day work shop was conducted with the theme "Implementing Space Vision 2047 and Looking Beyond", aligning with the objective of the workshop.

Gathering at Chintin Shivir 2025

The workshop brought together experts of ISRO, NSIL, IN-SPACe, DoS and other autonomous establishments of DoS to chart a comprehensive roadmap for DoS by revisiting the Space Vision 2047 and to evolve space vision beyond 2047. The experts' discussions focused around 11 pivotal domains including space transportation, space infrastructure, space applications, human space exploration, enabling Indian space industries and space business. A total of about 350 officials of DoS participated in the Chintan Shivir 2025.

The three-day event comprised of sessions covering all the verticals impacting Space Technology Roadmap for Vision 2047. The entire session was broadly classified under 11 major verticals, viz.

(i) Space Transportation
(ii) Space Infrastructure
(iii) Space Applications
(iv) Strategic Space & Space Security (including SSA)
(v) Space Science & Exploration
(vi) Human Space Exploration & Habitation
(vii) Quality Reliability and Safety
(viii) Capacity Building, Academia Interface & International Collaboration
(ix) Space Business & Diversification Plans
(x) Enabling Indian Space Industry Ecosystem
(xi) Organizational Policies & Procedures

d. International Astronautical Congress (IAC) 2025

International Astronautical Congress (IAC) 2025

The 76th International Astronautical Congress (IAC 2025), hosted in Sydney from September 29 to October 3, highlighted India's role in global space endeavors. ISRO and IN-SPACe established the India Space Pavilion, which highlighted six decades of India's space odyssey, tracing milestones from pioneering missions like Chandrayaan and Aditya L1 to ambitious future projects such as Gaganyaan and the proposed Bharatiya Antariksh Station. Together, these exhibits reflected India's continuous pursuit of innovation and excellence in space technology.

As part of Indian Space Pavilion, 18 Indian Space industries / Startups have showcased their products & achievements. 5 of them have established independent exhibition pavilion as part of IAC-2025.

e. CII International Space Conference 2025

CII International Space Conference 2025

The Confederation of Indian Industry (CII), in collaboration with ISRO, IN-SPACe and NSIL successfully hosted the International Conference on Space 2025 with the theme "Harnessing Space for Global Progress: Innovation, Policy, and Growth", on September 8–9, 2025 at Bengaluru, India. This conference brought together 650+ delegates, government leaders, industry stalwarts & global experts.

The Conference had sessions with engaging discussions on bridging gaps in achieving India's space vision, the private sector's role in accelerating the NewSpace economy, and strategies for self-reliance through indigenous capabilities. The conference served as a dynamic platform to showcase ISRO's pivotal contributions to India's space advancements,

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alongside the instrumental roles of IN-SPACe and NSIL in nurturing a thriving ecosystem for startups, academia, and industry.

f. CSIR-ISRO Space Meet 2025

CSIR-ISRO Space Meet 2025

On November 17, 2025, the Council of Scientific and Industrial Research (CSIR) in partnership with ISRO hosted a brainstorming session on Strategic R&D in Bengaluru. The meeting brought together over 50 eminent scientists, engineers, and policymakers to forge synergies between terrestrial innovation and space exploration. Dr. V Narayanan, Secretary, DoS/ Chairman ISRO delivered keynote address at the occassion.

g. Bengaluru Tech Summit (BTS) 2025

Bengaluru Tech Summit (BTS) 2025

The 28th edition of the Bengaluru Tech Summit (BTS), was held at Bangalore International Exhibition Centre (BIEC), from November 18-20, 2025. ISRO established a space pavilion by showcasing the exhibits such as scaled models of the LVM3, Chandrayaan-3, NISAR satellite, alongside posters depicting achievements of Indian space programme. Over 50,000 attendees, including startups and global delegates, visited the stall.

h. Aero India 2025

ISRO set up a dedicated pavilion at the Aero India 2025 event, held at Yelahanka Air Force Station Bengaluru from February 10 to 14, 2025. The pavilion showcased models of ISRO's launch vehicles along with representations of newly approved projects, including Chandrayaan-4 and the Next Generation Launch Vehicle (NGLV). During the event,

Sri Rajnath Singh, the Hon'ble Minister of Defence, visited the ISRO stall and Chairman, ISRO / Secretary, DOS briefed him about ISRO activities.

2.9.3 Student Outreach Programmes

a. Yuva Vigyani Karyakram (YUVIKA-2025)

YUVIKA 2025, the Young Scientist Programme organized by ISRO, is a two-week residential science camp held from May 19 to May 30, 2025 across seven major ISRO centres for selected Class 9 students from all over India. The initiative aims to nurture scientific curiosity and provide hands-on exposure to space science, technology, engineering, and mathematics (STEM), featuring interactive lectures, practical workshops, lab visits, sky-gazing, drone demonstrations, and model rocket launches. Students have been selected based on academic performance, extracurricular, etc., covering all 28 States and 08 UTs. The programme is fully sponsored with no registration fee, ensuring equal opportunity for all eligible participants. 1320 students have been trained till date through YUVIKA programme.

Students at YUVIKA 2025

b. Bharatiya Antariksh Hackathon (BAH-2025)

As part of National Space Day celebration, a national level Bharatiya Antariksh Hackathon was organized. It was launched by Secretary, DOS/Chairman ISRO on June 18th, 2025. BAH 2025 invited students pursuing undergraduate, postgraduate, and Ph.D. programs to tackle 14 carefully curated problem statements spanning across critical domains such as Geospatial Technology, Space Science, Image Processing, and AI/ML. In response to BAH 2025, over 61000 students registered for the hackathon and a total of 8744 teams, each comprising 3–4 members, submitted innovative solutions to the given

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Capacity Building

problem statements. Following a rigorous evaluation process, the top 30 teams were selected to compete in the grand finale, showcasing the brightest talent from across the nation.

Bharatiya Antariksh Hackathon 2025

The grand finale of BAH 2025 was conducted at the NRSC, Hyderabad on August 7-8, 2025, spanning an intense 30-hour period. Top 3 teams were selected by an expert jury panel based on innovation solutions to the given problem statement. Winners were invited to NSpD-2025 Celebrations at New Delhi on 23rd August 2025 and were awarded by Hon'ble MoS for Space.

Grand finale of BAH 2025

c. North East Students' Programme for Awareness, Reach and Knowledge on Space (NE-SPARKS) program

The North East Students' Programme for Awareness, Reach, and Knowledge on Space (NE-SPARKS) is a pioneering initiative aimed at igniting curiosity and fostering awareness about space science and technology among students from the North Eastern Region (NER) of India. This program seeks to bridge geographical and informational gaps by providing students with an immersive experience of India's

Water Rocket demonstration at NE-SPARKS

advancements in space research and exploration through visits to ISRO Centres in Bengaluru.

The program is being executed in eight batches with a minimum one-month interval starting from April-2025 to December-2025. Till date, around 700 students in 7 batches have been provided the opportunity to witness cutting-edge technologies, interact with eminent scientists and engineers through a carefully designed guided tour. Students gained insights into ISRO's mission to explore the unknown, enabling them to envision a future in Science, Technology, Engineering, and Mathematics (STEM).

1st batch of NE-SPARKS- 2025

Students had the opportunity to visit the Satellite Control Centre (SCC), Mission Operations Complex (MOX), and the Indian Deep Space Network (IDSN) at Byalalu, gaining first hand insight into satellite operations and deep space communications. They also visited UR Rao Satellite Centre (URSC), exploring spacecraft integration facilities and the URSC exhibition area. They had also visited the Jawaharlal Nehru Planetarium with an engaging lecture and planetarium show on Gaganyaan.

d. CANSAT and Model Rocketry Event

500 students in 67 teams from Pan India participated in the CANSAT and Model Rocketry event organized by IN-SPACe and ISRO in Kushinagar, UP during October 27-31, 2025. The event facilitated mentorship to students from experts in space science & technology and also provided exposure to simulated space missions to the students.

CANSAT and Model Rocketry Event

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e. Visit of MyGov's National Space Day Quiz 2025 winners to SDSC SHAR

As part of the National Space Day 2025 celebrations, MyGOV successfully organized an online national-level quiz competition that attracted enthusiastic participants from across the country. The winners of this prestigious quiz 72 bright students were given an exclusive opportunity to visit the Spaceport of India at Sriharikota on 11 Nov, 2025.

MyGov's National Space Day Quiz 2025 winners at SDSC SHAR

During this memorable visit, the students toured key facilities including the First Launch Pad, Second Launch Pad, Mission Control Centre, launch base infrastructures, etc., They also engaged in an insightful interaction session with senior scientists, gaining firsthand knowledge and inspiration about India's space missions and technological advancements & accomplishments.

f. Space Tutor

ISRO has conceived a 'ISRO registered Space Tutor' framework to enable and encourage space science communicators throughout the country (NGOs/education agencies) that are promoting and propagating STEM education and hands-on activities related to Space science. Space tutor programme was formally launched on 5th August, 2022 and till date 252 NGOs/Institutions have been approved as "ISRO's Registered Space Tutor".

More than 400 events have been conducted across India, reflecting a robust outreach program. 22 states participated, demonstrating widespread geographical engagement in space education. More than 1 lakh individuals engaged, highlighting the massive scale and public interest in space science initiatives.

2.9.4 Human Resource Development

a. ISRO Technical Training Programme (ITTP)

ISRO is conducting ISRO Technical Training Programme in collaboration of Ministry of Skill Development & Entrepreneurship (MSDE), Government of India. The programme is intended to impart skill development training to the technical staff of ISRO at various technical facilities of National Skill Trainings Institutes (NSTIs) across the country under MSDE.

Based on the MoU, ISRO has signed agreement with nine NSTIs viz. NSTI - Bengaluru, NSTI - Chennai, NSTI - Mumbai, NSTI - Trivandrum, NSTI - Ramanthapur, Hyderabad, NSTI- Vidyanagar, Hyderabad, NSTI - Jodhpur, NSTI - Calicut and NSTI - Dehradun.

ITTP Programme at NSTI

A total of 30 ITTP programmes have been planned in FY 2025-26 in these NSTIs with aim of upskilling / re-skilling of 600 technical staff, out of which 15 programmes have already been completed with training of approximately 300 staff. By the end of FY 2025-26, total nos. of 129 ITTPs will be completed by achieving the goal to upskill / reskill Technicians / Technical assistants and Technical Officers.

b. Drivers Training Programme (DTP)

ISRO and Institute of Driving & Traffic Research (IDTR), Wazirabad, Delhi has entered an MoU to reskill / upskill transport staff of ISRO. This year, a total of five programmes which includes two programmes for Light Vehicles Drivers (LVDs), two programmes for Heavy Vehicles Drivers (HVDs) and one programme for Fork Lift operators (FLO) are planned. Four programmes have been completed till date providing upskilling / reskilling training for 40 Drivers.

DTP programme at IDTR

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c. Rashtriya Karmayogi Janseva Programme

In line with the Hon'ble Prime Minister's vision of fostering the Karmayogi mindset and Seva Bhaav (intent to serve) among Central Government Employees, the Capacity Building Commission launched the Rashtriya Karmayogi – Large –Scale Jan Seva Programme on 12th Sept. 2024. The program is a large-scale behavioural intervention for Central Government employees. Along with instilling a spirit of service, the program aims to instill a sense of satisfaction by providing them with a deeper purpose in life.

The first phase of programme was successfully conducted at DoS Secretariat / ISRO Headquarters from March 24 to March 26, 2025 and around 100 officials were trained in the programme successfully. 10 nos. of Lead Trainers from ISRO have been trained by the Capacity Building Commission in New Delhi who have trained further 160 nos. of Master trainers across ISRO centres. In second phase of the programme, more than 10,000 employees of ISRO/DoS have been trained in 1-day Rashtriya Karmayogi – Large –Scale Jan Seva Programme by the Lead Trainers and Master trainers across the centres. The programme involved collaborative learning with use of IGOT Karmayogi app installed on individual mobile phones.

d. Center for Space Science and Technology Education in Asia and the Pacific (CSSTEAP)

In line with the Hon'ble Prime Minister's vision of fostering the Karmayogi mindset and Center for Space Science and Technology Education in Asia and the Pacific (CSSTEAP), a Regional Center of the United Nations Office of Outer Space Affairs, established on November 1, 1995, is hosted by India through Department of Space at IIRS Campus, Dehradun. An international Governing Board (GB), consisting of members from 18 signatory countries from Asia-Pacific region and three observers, (UN-OOSA; ITC, The Netherlands and UNESCAP), administers CSSTEAP. The GB determines the policy of the Centre, approves its long-term plans and approves its annual programmes and the budgets. The 30th Meeting of CSSTEAP-GB was held on December 30, 2025 at ISRO HQ, Bengaluru.

Dr. V. Narayanan, Chairman, ISRO/ Secretary, DoS took over as Chairman of CSSTEAP-GB and subsequently chaired the meeting. The Delegates from Eight member countries (Bangladesh, Indonesia, Kryrgz Republic, Mongolia, Nepal, Republic of Korea, Sri Lanka, Thailand) and two Observer organizations (UNOOSA, Vienna and UNESCAP, Thailand) attended the meeting through in-person and via virtual. Directors of NRSC, PRL,

SPL & IIRS, Scientific Secretary, ISRO and other ISRO/DoS officials also participated in the meeting as special invitees. The GB congratulated CSSTEAP on completing 30 years of its establishment and ensured continued support to CSSTEAP's initiatives on education and capacity building in the Asia and the Pacific region.

30th meeting of CSSTEAP Governing Board was Chaired by Secretary, DoS on December 30, 2025

2.9.5 RESPOND

a. Introduction

One of the key initiatives of the Capacity Building and Public Outreach (CBPO) office at ISRO Headquarters is fostering an Academic Interface. This initiative focuses on establishing knowledge, incubation and research centres across the nation while promoting collaborative research with academic institutions, laboratories, and other research entities. Recognizing the need to strengthen ties with institutions nationwide, ISRO has implemented various capacity-building measures to enhance academia's engagement in space-related activities.

These initiatives include R&D Projects under RESPOND, Space Technology Cells (STCs), Regional Academic Centres for Space (RAC-S), the Satish Dhawan Centre for Space Science (SDCSS) at the Central University of Jammu, a Centre of Excellence (CoE) at IISc, ISRO Chairs, and collaboration with the Centre for Nano Science and Engineering (CeNSE) at IISc.

b. Sponsored Research (RESPOND)

The RESPOND (Sponsored Research) program, launched in the 1970s, encourages academic participation in space-related research. Through this program, faculty from academic institutes and research centres undertake projects relevant to the Indian Space Programme, with ISRO providing both financial and technical support. RESPOND aims to

strengthen academic research foundations, develop skilled human resources and enhance research facilities in institutions.

The program focuses on fostering studies aligned with upcoming space activities, contributing directly to ISRO's various missions. RESPOND also supports national and international conferences on space science and related fields, organized by universities, institutions, and other organizations.

c. Space Technology Cells (STCs)

ISRO has established nine Space Technology Cells (STCs) at leading institutions to advance research in space technology and applications at IITs: Bombay, Kanpur, Kharagpur, Madras, Guwahati, Roorkee, and Delhi, IISc Bengaluru and Savitribai Phule Pune University (SPPU), Pune (Joint Research Programme).

d. Regional Academic Centres for Space (RAC-S)

Six Regional Academic Centres for Space (RAC-S) have been established nationwide by ISRO with the dual objectives of promoting space technology activities among students and conducting advanced research in areas relevant to the technological and programmatic needs of the Indian Space Programme in the future. Regional Academic Centres for Space have been established in the following six institutes representing six geographic regions of the country:

- Western Region: MNIT Jaipur
- North-Eastern Region: Gauhati University, Guwahati
- Northern Region: NIT Kurukshetra
- Southern Region: NITK Surathkal
- Central Region: IIT(BHU) Varanasi
- Eastern Region: NIT Patna.

RAC-S facilitates advanced research, capacity building, and awareness creation at the institutional level.

e. Collaboration with CeNSE, IISc

ISRO has partnered with the Centre for Nano Science and Engineering (CeNSE) at IISc to address its requirements in nanotechnology and nanoscience. This collaboration involves R&D, training, capacity building, and access to state-of-the-art nanofabrication and characterization facilities for R&D activities.

f. Centre of Excellence (CoE) at IISc

A Centre of Excellence on Advanced Mechanics of Materials has been established at IISc to pursue advanced research in materials science, focusing on non-classical continuum mechanics, geometric and data-driven models, and their applications in space technology.

g. Satish Dhawan Centre for Space Science (SDCSS)

The Satish Dhawan Centre for Space Science, a joint initiative by ISRO and the Central University of Jammu, addresses regional needs in geospatial applications, disaster management, and space-based technologies for regional development. Its primary focus is on R&D in space science and technology.

h. Activities

During the period, RESPOND supported 80 New Projects, 86 ongoing projects, R & D activities of nine Space Technology Cells and six Regional Academic Centre for Space. During the year, 9 sponsored projects have been successfully completed. Scientific publications have been emerged out of these projects apart from fulfilling the objectives.

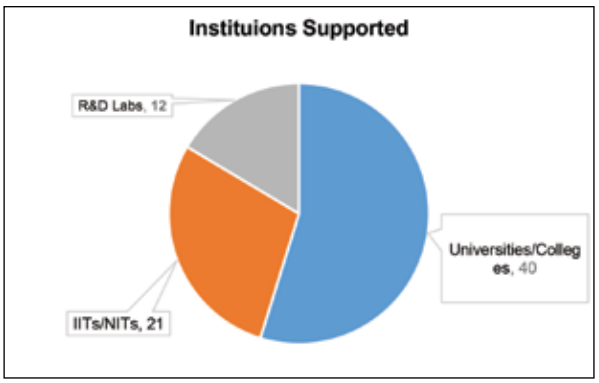


Figure 1

During the year, 40 Universities/ Colleges, 21 IITs /NITs and 12 Research Institutes/ Laboratories were involved in R & D projects (Figure-1). Further, during the year, large number of projects have been supported in the area of Space Technology (49) followed by Space Applications (19) and Space Science (12) (Figure-2).

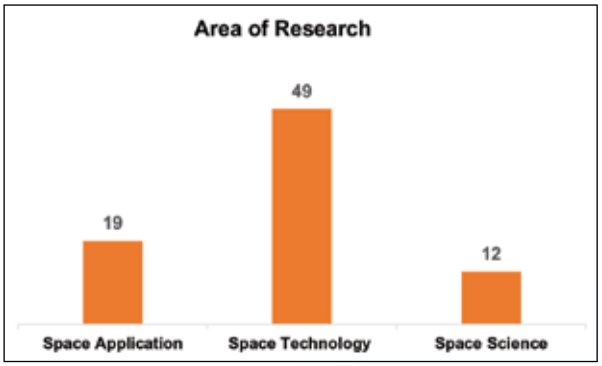


Figure 2

i. Space Technology Cells

Having recognized the imperative need to generate basic knowledge through advanced academic research ISRO has set up nine Space Technology Cells (STC) at premier institutions like Indian Institute of Technology (IITs) - Bombay, Kanpur, Kharagpur, Madras,

2.9

Capacity Building

Guwahati, Roorkee and Delhi; Indian Institute of Science (IISc), Bengaluru and Joint Research Programme with Savitribai Phule Pune University (SPPU, Pune) to carry out research activities in the areas of space technology and applications.

During the period, 75 new projects and 116 ongoing projects pertaining to eight Space Technology Cells have been supported under STC Programme. Under STCs, 50 projects have been successfully completed during the year.

Details are given in the table below:

S. No.	Name of the STC/JRP	No. of Projects		
		New	Ongoing	Completed
1.	IISc Bengaluru	17	13	24
2.	IIT Bombay	11	5	10
3.	IIT Kanpur	14	16	1
4.	IIT Kharagpur	10	18	9
5.	IIT Madras	9	1	3
6.	IIT Roorkee	11	19	2
7.	SPPU, Pune	5	3	2
8.	IIT Delhi	12	13	4
9	IIT Guwahati	7	6	1
	Total	**96**	**94**	**56**

j. Projects at Regional Academic Centre for Space (RAC-S)

Under Regional Academic Centre for Space programme a total of 151 New projects, 112 ongoing were supported. 11 completed projects during this year.

Overall Status of the RAC-S as on Dec 2025

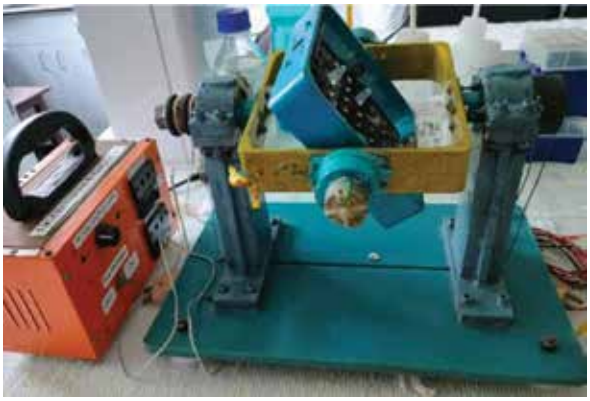
S.No.	Name of the RAC-S	New Projects	Ongoing Projects	Completed Projects
1.	MNIT, Jaipur	41	13	28
2.	NIT Kurukshetra	26	6	20
3.	Gauhati University	26	1	25

4.	NITK Surathkal	23	21	2
5.	IIT (BHU)	33	3	30
6.	NIT Patna	18	1	17
	Total	**151**	**39**	**112**

The projects are reviewed by domain experts in ISRO and later by Joint Policy and Management Committees (JPMC) consisting of experts from ISRO and the academia.

k. Highlights of some of the completed Projects under Sponsored Research

Development of therapeutic strategies to mitigate oxidative stress and cytoskeletal damage in astronauts for the Gaganyaan space mission



Under this project, PI has successfully investigated cytoskeletal dynamics in extracellular conditions under simulated microgravity. Nano cocktail solution was developed as a therapeutic strategy against microgravity induced bone loss. ZNAC solution was developed as a therapeutic strategy against microgravity induced vascular dysfunction due to altered shear and normal forces on endothelial cells due to microgravity.

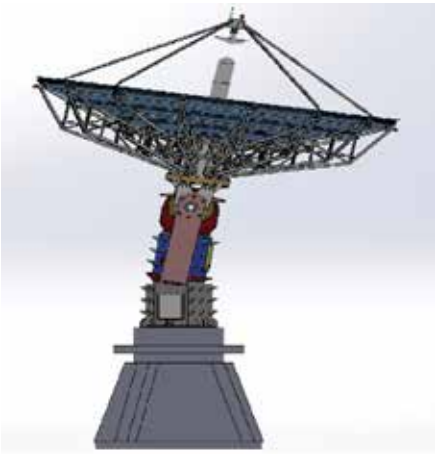
Experimental Simulation of Lightning and Development of Lightning Detection Antenna for Future Planetary Missions.

Under this project, the experimental simulation of Venusian lightning was carried out. The experiment helps understand the source strength of Venusian lightning occurring in the Venusian clouds between 47 to 65 km altitudes. This project addressed the detection of the electromagnetic waves generated by lightning through instrumentation in the emulated Venusian atmosphere under varied pressure and gas mixtures.

2.9

Capacity Building

Design, Modeling and Analysis of Tilt Mechanism for 7.5 m diameter Antenna for its Stability during the Track mode of Satellite.

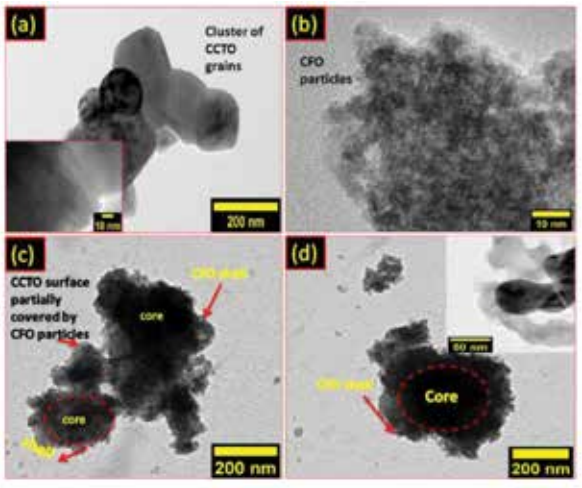


Under this project, design, modeling and analysis of the tilt Mechanism for a 7.5 m diameter antenna ensuring its stability during satellite tracking was established. The complete system including counterweights was analyzed for weight matching and validated. The analysis also concluded that hexagonal housing is the most suitable for antenna structure. The project also helped in determining the forces and torques affecting antenna stability during satellite tracking.

Metal oxide -MOF-Graphene based flexible asymmetric supercapacitors for space applications

The project aimed at the fabrication of robust flexible asymmetric supercapacitors exhibiting high energy and power densities, light weight, wide range of operation voltages. The PI has successfully developed a range of materials and electrode combinations and electrolytes and a new super capacitor device consisting of Ni-MOF electrodes.

Development of Novel CoFe2O4/CaCu3Ti4O12/Polymer Composites for EMI attenuation.



This study successfully demonstrated the synthesis, characterization, and optimization of various CCTO/CFO-based composites for advanced electronic and shielding applications. The fabrication of CCTO/CFO core-shell structures via the co-precipitation method resulted in significant improvements in dielectric and thermal properties, primarily due

to enhanced grain boundary effects and the introduction of Ti ions, which imparted ferroelectric and magnetic properties.

The high dielectric constant and electrical resistance at low frequencies highlight their potential for use in high-capacitance energy storage devices. Overall, the results of this study highlight the significance of structural, compositional, and processing modifications in enhancing the dielectric, electrical, and EMI shielding properties of CCTO/CFO-based composites. These findings provide valuable insights for the development of next-generation high-performance capacitors, energy storage devices, and electromagnetic shielding materials.

Icesat-2 Based Ground Photons Retrieval In Urban Areas By Using Deep Learning Algorithm.

This project envisages to develop a robust algorithm for noise filtering and identification of ground hitting photons in urban areas using machine learning and to estimate the building heights using ATL03/ICESAT-2 data and also to extract the building footprints from very high-resolution satellite data using deep learning model.

Channel Coding for satellite communication

This project envisages to develop and algorithm for the design of PCM in low density parity check code for efficient data transmission in satellite communication. RTL Code written for the LDPC Encoder/Decoder as ECC part of FPGA based transmitter/receiver design for satellite communication. This algorithm was developed and it will be used for communication in NavIC and Gaganyaan Project.

I. Workshops and Interaction meets

ISRO ACADEMIA CONNECT WORKSHOP

ISRO in collaboration with National Institute of Technology (NIT), Kurukshetra conducted one-day ISRO Academia Connect workshop at Regional Academic Centre for Space (RAC-S) at NIT Kurukshetra for Northern region of our Country on April 08, 2025. The aim of ISRO Academia Connect was to create awareness about Regional Academic Centre for Space (RAC-S) and also to highlight the advanced R&D requirements.

ISRO Academia Connect workshop for Northern region at NIT Kurukshetra

2.9

Capacity Building

Senior Scientists from all across ISRO / DoS Centres have delivered the presentation on various potential research areas in Space Science and Technology domain, where academia and ISRO can collaborate. Programme was attended by more than 150 academicians and researchers from 50 Engineering Colleges / Universities. The programme is also expected to disseminate the information about current developments and future prospects of Space Science and Technology to 80,000 students from northern region.

ISRO-STC Confluence

ISRO-STC Confluence 2025 at IIT Kharagpur

The Indian Space Research Organisation (ISRO), in association with the Indian Institute of Technology (IIT) Kharagpur, organised a second edition of ISRO–STC Confluence on July 1st & 2nd, 2025 at IIT Kharagpur. It is a comprehensive document of compilation of select research projects from the nine STCs established by ISRO in premier academic institutions across the country. These projects have demonstrated significant technological relevance and have contributed directly to various ISRO missions in domains including spacecraft systems, propulsion, sensors, materials, and AI applications.

Around 150 faculty members from ISRO's STCs have participated in the confluence, along with around 50 senior ISRO scientists and deliberated on various research opportunities & challenges in ISRO's current & future missions. Chairman ISRO emphasized the critical role of academia–ISRO collaboration in achieving self-reliance in high-end space technologies. He commended the contributions of the nine STC partner institutions and encouraged deeper scientific engagement in alignment with ISRO's future missions.

2.9.6 Space Technology Incubation Centres

Space Technology Incubation Centres (STICs) have been setup with aim to attract and nurture the young academia with innovative ideas / research aptitude for carrying out research, motivating and encouraging them to initiate the startups and business in the field of space technology & applications and developing the Academia–Industry ecosystem for Space Technology.

At present, six S-TIC are functioning one each at six regions of country viz. at NIT Agartala (North-Eastern zone), NIT Jalandhar (North zone), NIT Tiruchirappalli (South zone), MANIT Bhopal (Central zone), VNIT Nagpur (Western zone) and NIT Rourkela (Eastern zone).

7 Product / Prototype Development Projects varying from TRL-4 to TRL-8 have been completed at these S-TICs in FY 2025-26 and 22 projects are in progress.

Flexible Heat Pipe developed by STIC at NIT Tiruchirappalli under mentorship of SAC, Ahmedabad

a. Inauguration of STIC Facility at NIT, Rourkela by Secretary, DOS / Chairman, ISRO

On 19th March 2025, Dr V Narayanan, Secretary DOS / Chairman ISRO inaugurated the STIC research facility at the National Institute of Technology, Rourkela. The event was graced by the presence of the Sri M Ganesh Pillai, Scientific Secretary, ISRO, Prof. Umamaheshwara Rao, Director, NIT Rourkela, and Prof. Sunil Kumar Sarangi, Former Director, NIT Rourkela and faculties & students.

Inauguration of STIC Facility at NIT, Rourkela

During his inaugural address, the Chairman ISRO / Secretary DOS, highlighted the significant contributions of academic institutions specifically NIT Rourkela to the Indian Space Programme and also emphasized the need for development of innovative space technologies for future missions of ISRO.

b. ISRO Academia Connect Workshop & Inauguration of STIC Facility for Central Region and Release of "Research Areas in Space – 2025" at MANIT, Bhopal

ISRO has organised one-day Academia Connect workshop for Central region (Madhya Pradesh, Uttar Pradesh and Chhattisgarh) at Maulana Azad National Institute of Technology (MANIT), Bhopal on May 22, 2025. Dr. V. Narayanan, Secretary, DOS / Chairman, ISRO inaugurated the workshop in the presence of Dr. K. K. Shukla, Director, MANIT, Bhopal and Shri M. Ganesh Pillai, Scientific Secretary, ISRO.

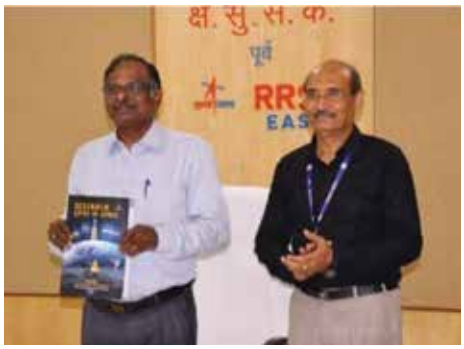
2.9

Capacity Building

ISRO Academia Connect workshop for Central region

Senior Scientists from all across ISRO / DoS Centres delivered talks on various potential research areas in Space Science and Technology domain, where academia and ISRO can collaborate. Programme was attended by more than 200 academicians and researchers from 70 Engineering Colleges / Universities across Madhya Pradesh, Uttar Pradesh and Chhattisgarh.

Dr. V. Narayanan, Secretary, DOS / Chairman, ISRO has inaugurated the STIC facility and also released "Research Areas in Space - 2025" document, which is compilation of Research Areas of Department of Space open for academic collaboration. This document contains 87 Research Areas and it will be used as a reference document for preparation of proposals by academia for collaborations with ISRO.



Release of "Research Areas in Space – 2025

Department of Space also established Space Technology Incubation Centre (STIC) facility, for Central region at MANIT Bhopal. The STIC at MANIT Bhopal will act as a nodal Centre to attract and nurture the students with innovative ideas for carrying out research in Space Technology for central region covering Madhya Pradesh, Uttar Pradesh and Chhattisgarh.

commemorative plaque at MANIT Bhopal during Inauguration of STIC Facility for Central Region

2.10 Quality Management, Occupational Health & Safety

Assuring the Quality, Reliability and Safety of all the developmental and operational ISRO's missions during the year reflected strong technological progress and maturity across the launch vehicle, satellite and human spaceflight domains. The GSLV-F15 launch on 29 January 2025 marked ISRO's **100th launch from SDSC, Sriharikota**. The **NASA-ISRO NISAR** mission, launched on 30 July 2025 onboard **GSLV-F16**, is an advanced Earth-observation satellite with capability for high-precision, all-weather mapping of land, ice, and ecosystems. Towards strengthening strategic communication capability, **CMS-03 (GSAT-7R)** was successfully launched on 02 November 2025 aboard **LVM3-M5**, becoming the **heaviest communication satellite** placed in GTO from Indian soil. The LVM3-M6 Mission placed the BlueBird Block-2 satellite, into the Low Earth Orbit as the heaviest payload to be launched by LVM3 launch vehicle. Meanwhile, the PSLV C61 launch on 18 May 2025 encountered a failure in its third stage, offering important lessons for future reliability enhancement.

The above achievements highlight ISRO's commitment to advancing India's space-capabilities across launch vehicle, spacecraft, space applications and human spaceflight domains while progressively strengthening its quality assurance, reliability engineering, and safety governance frameworks. This foundation not only supports current mission needs but also paves the way for more ambitious future projects including human-rated and deep-space missions. The Directorate of Safety, Reliability and Quality (DSRQ) at ISRO headquarters continued to closely co-ordinate with various quality teams ensuring greater synergy of activities across internal and external work centres of ISRO.

2.10.1 Integrated approach to Quality and Safety

Over the last few decades, DOS/ISRO has firmly established home-grown systems and mechanisms in the areas of quality and safety. Risk management is the common goal of both Quality and Safety disciplines through risk identification, assessment and mitigation of potential hazards making the disciplines of quality and safety closely interconnected. ISRO's recent efforts with the **Integrated Air Drop Test** of Gaganyaan serves as a key demonstration of this philosophy.

The IADT campaign brought together multidisciplinary teams across design, quality, safety, and mission-operations to jointly validate critical systems such as drogue and main parachutes, pyrotechnic firing logic, structural integrity and recovery operations. Through configuration control, rigorous ground-qualification, real-time risk assessment,

and unified failure-response procedures, the IADT mission illustrated how synchronized Quality and Safety practices ensure mission readiness for human-rated systems. Test matrix and SOPs were generated to perform the **crew module recovery operations**. The trials offer insights for optimizing margins and recovery procedures, strengthening the safety and survivability of the crew during return. Response time of crew module up-righting system and recovery mechanism is also being assessed to ensure the safe recovery of crew module in the minimum stipulated time.

This integrated oversight framework forms the backbone of the Gaganyaan programme, enabling reliable performance, predictable safety margins, and consistent adherence to human-rating standards.

2.10.2 Quality & Reliability Highlights

a. Integrated Product Assurance Board

The Integrated Product Assurance Board (IPAB) functions as an independent, apex-level mechanism to review the end-to-end quality, and reliability readiness of ISRO missions. IPAB conducts structured reviews covering spacecraft, launch vehicle, range, tracking, and payload elements, with emphasis on various engineering aspects, reliability analyses, non-conformances, and safety considerations. The Board also reviews closure of observations from earlier review fora and assesses applicability of lessons learned for future missions. Through its integrated and inter-centre review approach, IPAB held 14 sittings during the year to review various technical and area specific topics, providing objective inputs to management, strengthening mission readiness, and reinforcing organizational assurance ahead of critical mission milestones.

b. Quality Assurance of Spacecraft Missions

For CMS-03 spacecraft, the heaviest communication satellite launched to GTO from Indian soil, ISRO implemented rigorous QA protocols including exhaustive RF subsystem validation, thermal-vacuum cycling, structural dynamic testing, payload-level redundancy verification, and stringent workmanship audits to ensure mission readiness for strategic maritime and defence communication. Similarly, the NISAR Mission underwent highly specialized quality and precision-engineering processes such as dual-frequency SAR calibration, tight contamination-control management, high-fidelity electromagnetic compatibility testing, and meticulous alignment checks to meet global scientific data

accuracy requirements. For the operational spacecraft, the on-orbit performance was closely monitored and the observations were thoroughly addressed. Configuration control boards set up for keeping track of all the changes enhanced reliability of operational missions.

c. Workshop on Lessons Learned in Human Spaceflight

As humanity ventures deeper into outer space, each mission offers vital lessons shaped by successes, setbacks, and innovation. To embed these insights into its Gaganyaan human spaceflight program, a Workshop on "Lessons Learned in Human Spaceflight Missions" was organized during May 1–3, 2025 at ISRO HQ. Over 160 Scientists/Engineers participated in the Workshop with 17 domain experts sharing Indian/global lessons learnt from failures and near misses to strengthen crew safety, mission design and robust operations. The Proceedings of the Workshop comprising of more than 86 lessons were released by Dr V Narayanan, Chairman, ISRO/Secretary, DOS. The event reinforced ISRO's commitment to safety, sustainability, and excellence in advancing India's journey beyond Earth.

Release of Proceedings during the Lessons Learned Workshop

d. Improvement in quality and reliability of space systems

In light of the observations in GSLV-F15/NVS-02 and PSLV-C61/EOS-09 missions, ISRO's quality teams met on 26th May 2025 to discuss improvements in quality and reliability. The review meeting was guided by Scientific Secretary, ISRO. A detailed report comprising of recommendations pertaining to design, realization, quality assurance, documentation, review mechanism, project management and vendor management was brought out. Systemic improvements highlighted in the report are being implemented in a phased manner.

e. Harmonization of Quality Systems for Gaganyaan

Two dedicated sessions of IPAB were held on 10th and 12th September 2025 to review the Quality Systems for Gaganyaan. QA agencies of various centres presented their existing

2.10

Quality Management, Occupational Health & Safety

quality systems and processes, with elaborate information on all domains including mechanical systems, materials, electronic systems, chemical systems and software. Detailed discussions were conducted on the existing mechanisms for design reviews, quality control, change management, as well as Non-conformance and Failure Analysis. Based on the inputs received, uniform quality system guidelines are being generated for Gaganyaan.

2.10.3 Knowledge Management

a. Technical Standards

During the year, ISRO strengthened its technical standardization framework to ensure safe, reliable, and consistent realization of space systems. New and revised **ISRO Technical Standards (ITecS)** were developed through a structured, consensus-driven process involving experts from ISRO Centres and Units. Emphasis was placed on harmonization, improved version control, and effective lifecycle management to enable uniform interpretation and implementation across projects. These initiatives enhanced institutional assurance, reduced variability, and supported emerging technologies and increased industry participation.

In parallel, ISRO actively contributed to national and international standardization through participation in **Bureau of Indian Standards (BIS) and ISO committees**, providing technical inputs to the formulation and revision of 66 space-related standards aligned with global best practices. ISRO also supported strategic space standardization initiatives by contributing domain expertise toward evolving space system standards, strengthening interoperability and national capability.

b. Lessons Learned Platform – Path Sampada

To institutionalize organizational learning, ISRO continued to strengthen Path-Sampada, its centralized digital platform for capturing and disseminating lessons learned from missions and projects. During the year, the platform was enhanced through structured migration of

Path Sampada – 3.0 Platform

legacy repositories, establishment of centre-level focal points, and improved mechanisms for validation and reuse of lessons. Awareness and training initiatives were undertaken to broaden participation across ISRO Centres and Units. Path-Sampada 3.0, with more than 1700 lessons, functions as a key enabler, supporting risk reduction, prevention of recurrence of failures, and improved readiness for complex missions, including future human spaceflight programme.

2.10.4 Chintan Shivir 2025 (Breakout Session on Safety, Reliability and Quality)

The Chintan Shivir Programme conducted by the Department of Space (DoS) in July 2025 primarily focused on several crucial areas of space technology and applications. A dedicated Breakout session on Quality, Reliability and Safety was organised. A thorough assessment of the current state of the domain including existing mechanisms as well as the additional processes inducted for the Gaganyaan manned space missions was made. Subsequently, a comprehensive analysis was conducted on the gap areas and solutions were proposed to bridge the same. Several goals were identified in the process. Some of the goals identified are integrating Total Quality Management with Product Lifecycle Management to unify quality and safety practices as a short-term goal, development of digital-twin for launch vehicles and spacecraft as mid-term goal and autonomous space vehicle operation & crew health management long-term goal.

Chintan Shivir report

2.10.5 Occupational Health and Safety Highlights

The Indian space programme continued to be free from any major safety-related incidents during the year. The saga of launches started with the launch campaign of GSLV F15/NVS-02 Mission, followed by PSLV C61/EOS mission, GSLV-F16/NISAR mission, LVM3 M5/CMS-03 mission and LVM3 M6/BlueBird Block 2 Mission. All the missions were accomplished

2.10

Quality Management, Occupational Health & Safety

without any safety related non-conformance or anomalies. Similar to previous launches, well established safety procedures, safety standards and emergency preparedness plan were implemented to prevent any unforeseen incidence. Safety surveillance was available round the clock during the launch campaign activities. Activities involving production and transportation of solid propellants, earth storable liquid propellants, cryogenic propellants, rocket motors & pyrotechnic materials etc; and assembly & integration of rocket stages and satellites and high-pressure gas servicing at launch pad were carried out under the full-time participation of safety team.

The most significant achievement from safety perspective was the Developmental hot test of 200N engine for RLV-ORV (Orbital Re-entry Vehicle) at IPRC for a cumulative duration of 515 sec, Ignition of CE20 Engine in boot strap mode for characterisation of re-ignition in high altitude simulated condition at IPRC and 100 bar hot test at Sea Level test facility at LPSC and HPS3 Motor static tests. All these tests were carried out with strict safety protocols.

Safety surveillance was ensured during fabrication, integration, thermovac test, vibration tests and pressure hold test of satellites. Safety review of radiation sources for various spacecraft was also completed without any waivers.

a. Safety Mechanism

Board of Occupational Health & Safety (BOHS) is the nodal body to oversee implementation of ISRO/DOS Occupational Health, Safety & Environmental Policy in ISRO Centres/Units. Centre Safety Committee (CSC) at various ISRO/DOS Centres/Units reviews and clears locations for construction and commissioning of new facilities and new processes. The Safety teams provide surveillance and necessary clearances for potentially hazardous operations. In order to authorise the explosives-related activities and to ensure safety during manufacture, storage, transport & disposal of explosives a multi-tier mechanism has been evolved. As part of this mechanism, an Apex Committee oversees the activities and implementation of safety protocols and guidelines during the above operations. Inter-Centre Audit Committees have been constituted by the Apex Committee for verification of implementation of safety guidelines and protocols. Timely Audits were completed by the respective teams during the year.

b. Security of space assets and capabilities

Security of all the space assets in-orbit and the ground assets and capabilities is given utmost importance by DOS and is regarded as an element of National security. A high-level committee is working towards identification of the various threats to space assets and their various mitigation strategies. Key technologies and critical infrastructure to be developed for further enhancing the security of space assets and capabilities are being taken up in a fast-track mode. This activity is carried out in close coordination with various domain experts of ISRO, and auditing of the activities has been initiated for continual improvement.

DSRQ, ISRO HQ acts as the nodal office for the implementation of Crisis Management Plan of DOS. The systems and processes in place at DOS for the management of all possible crisis scenarios are found to be in order, and key steps for further enhancement have been identified.

c. Promotion of Safety culture and practices

Safety promotional activities have been continued through the celebration of National safety day, Fire service day, World environment day and other events by issuing posters and conducting safety seminars. Glimpses of some of the safety events at ISRO Centres and ISRO HQ are provided below.

State Level Mock exercise on Cyclone & Cyclone Induced Disasters at VSSC, Trivandrum

2.10

Quality Management, Occupational Health & Safety

Firefighting training at ISRO HQ, Bangalore

Basic Life Support Training

Workshop at ISRO HQ on "Understanding Safety: The Key to Successful Missions"

2.11 International Cooperation

The Indian Space Research Organisation (ISRO) continues to strengthen its cooperation with space agencies of partner nations and multilateral organisations through joint activities of mutual interest. These include collaboration in space technology applications, sharing of expertise, and organisation and participation in international events. The scope of international cooperation has expanded significantly in line with ISRO's enhanced capabilities, recent achievements, and approvals granted by the Government of India for flagship programmes and the space vision 2047. Additionally, the emergence of a vibrant space ecosystem in India, driven by ongoing reforms in the Indian space sector, has created new opportunities for expanding international space cooperation.

To date, ISRO/DOS and India have signed space cooperation documents with space agencies of 62 countries—namely Afghanistan, Algeria, Argentina, Armenia, Australia, Bahrain, Bangladesh, Bhutan, Bolivia, Brazil, Brunei Darussalam, Bulgaria, Canada, Chile, China, Colombia, Egypt, Finland, France, Germany, Hungary, Indonesia, Israel, Italy, Japan, Kazakhstan, Kuwait, Luxembourg, Maldives, Mauritius, Mexico, Mongolia, Morocco, Myanmar, Nepal, Nigeria, Norway, Peru, Philippines, Portugal, Republic of Korea, Russia, SaoTome & Principe, Saudi Arabia, Singapore, South Africa, Spain, Sri Lanka, Sultanate of Oman, Sweden, Syria, Tajikistan, Thailand, The Netherlands, Tunisia, Ukraine, United Arab Emirates, United Kingdom, United States of America, Uzbekistan, Venezuela, and Viet Nam. In addition, cooperative documents have been signed with five multinational bodies: the European Centre for Medium -Range Weather Forecasts (ECMWF), European Commission (EC), European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), European Space Agency (ESA), and the South Asian Association for Regional Cooperation (SAARC).

During this period, ISRO/ India signed several significant cooperative documents, including:

(1) India – Saudi Arabia MoU for space cooperation, (2) ISRO – NASA Implementing Arrangement (IA) for cooperation on the International Space Station, (3) ISRO – ESA Joint statement of intent on human space exploration cooperation, (4) ISRO - Philippine Space Agency Statement of intent on space cooperation, (5) ISTRAC - Department of Infrastructure, Transport, Regional Development, Communications and the Arts, Australia license agreement for placing temporary tracking terminal at Cocos (Keeling) islands, (6) ISRO – JAXA IA for Joint Lunar Polar Exploration Mission, (7) India – Mauritius agreement for ground station operation, (8) ISRO – Space Physics Laboratory, Sweden, agreement for payload onboard ISRO's Venus Mission; and (9) ISRO - Korea Aerospace Administration (KASA), Republic of Korea, agreement for space cooperation.

2.11 International Cooperation

Other major international cooperation activities during this period are highlighted below.

The successful launch of the ISRO–NASA Synthetic Aperture Radar (NISAR) Satellite mission onboard GSLV on July 30, 2025 marked a major milestone in ISRO–NASA cooperation. The event for release of S-band images from the NISAR satellite and to celebrate successful completion of 100 days in orbit was attended by officials from NASA/JPL.

As part of the training programme for Indian Gaganyaatris (Astronauts), ISRO, in collaboration with NASA, undertook a mission to the International Space Station. Group Captain Shubhanshu Shukla became the first Indian to travel to the ISS on June 25, 2025 as part of the Axiom-4 Mission. During his 18-day stay on the ISS, he conducted seven microgravity experiments. A high-level delegation led by the Chairman, ISRO/Secretary, DOS visited the United States in connection with this mission and held discussions with NASA and other U.S. Space companies on potential cooperation opportunities under the Gaganyaan programme. ISRO officials also visited NASA's Hyper Velocity Impact (HVI) Testing facility and participated in the first phase of HVI testing of Gaganyaan's Micro-Meteoroid and Orbital Debris (MMOD) shield samples.

Discussions with Australia on support for Gaganyaan crew recovery operations are being held regularly, apart from signing the licence agreement for establishing a temporary tracking terminal at the Cocos (Keeling) Islands. The third edition of the India–Japan Space Dialogue was held in April 2025 to review bilateral space cooperation. ISRO and JAXA have concluded the IA for the joint LUPEX mission, and technical discussions are progressing. As part of this collaboration, JAXA LUPEX teams visited Bengaluru on three occasions for in-person technical discussions. Officials from JAXA's Tanegashima Space Center also visited SDSC SHAR to discuss launch operations procedures with ISRO officials.

The VIRAL instrument from the Space Research Institute, affiliated with the Russian Academy of Sciences, has been selected as an international partner payload for inclusion in ISRO's Venus Orbiter Mission, and technical discussions are ongoing. ISRO officials visited Moscow for technical discussions with Roscosmos on the delivery of semi-cryogenic engines; the draft contract is currently under the approval process.

The realisation of the TRISHNA satellite is progressing well, with the completion of the Preliminary Design Review (PDR) for the bus elements and the VNIR and SWIR payloads. ISRO officials also participated in the international science workshop on TRISHNA held in France.

ISRO has installed a NavIC timing receiver at the Italian National Institute of Metrological Research (INRIM).

The India–Mauritius Joint Satellite programme is progressing well, with a possible launch targeted for the first quarter of 2026. The ISRO–Mauritius Research and Innovation Council (MRIC) Joint Working Group held two meetings to review the activities. An ISRO delegation visited Mauritius, conducted technical sessions, and participated in outreach activities.

Discussions with Bhutan on capacity building initiatives are continuing, including visits by faculty and students from Bhutan's College of Science and Technology to IIST, and student visits to URSC and ISTRAC. Further, discussions have been initiated with: (i) the German Space Agency on human spaceflight and microgravity research; (ii) the Saudi Space Agency on capacity building and satellite navigation; (iii) the Algerian Space Agency on remote sensing applications; (iv) Guyana on earth observation data applications; and (v) the UAE Space Agency on earth observation, satellite navigation, and disaster management.

ISRO and ESA completed the calibration activities of NavIC receivers at ESA's ESTEC facility for broadcasting the NavIC–Galileo Time Offset through NavIC signals, which will enhance user accuracy under limited satellite visibility conditions. The inaugural India–EU Space Dialogue was held in Brussels and reviewed cooperation opportunities in earth observation, secure communications, navigation, and space industry engagement.

ISRO is working towards the realisation of the G20 Satellite for Environment and Climate Studies as an international cooperative project. Instrument proposals were received from the space agencies of Australia, France, the United Kingdom, Mexico, South Africa, and Italy. The Satellite Apex Committee met on October 29, 2025, reviewed the feasibility study results, and agreed to accommodate all proposed payloads.

Several prominent international dignitaries visited ISRO during the year, including the Foreign Minister of Germany; Deputy Minister of Economic Affairs from Bavaria, Germany; Vice Minister for Foreign Affairs of Lithuania; Ambassadors/High Commissioners of Finland, France, Belgium, Australia, and Italy; the EU Space Envoy; the U.S. Consul General; the Governor of South Australia; the Vice-Chair of Japan's Cabinet Committee on National Space Policy; the Director General of NASRDA, Nigeria; the Head of the Digital Transformation and Telecommunications Agency of Mexico; the Executive Director of the Office of Space Technology and Industry, Singapore; the President of AEB; the President and COO of SpaceX; media delegations from West Asia and North Africa; Egyptian youth; and Young Political Leaders from Sri Lanka.

2.11

International Cooperation

ISRO delegations also participated in major international space events, including the 2025 BRICS Heads of Space Agency meeting, the 40th Space Symposium (USA), the 2025 IEEE Position, Location and Navigation Symposium (USA), the 53rd Intersputnik Board Session, the 64th session of the UNCOPUOS Legal Subcommittee, the 53rd CGMS Plenary, the 68th session of UNCOPUOS, the 6th G20 Space Economy Leaders Meeting, the 76th International Astronautical Congress, the 50th anniversary celebrations of ESA, the 19th meeting of the International Committee on GNSS, the Artemis Accords Workshop, and the Artemis Principals meeting.

ISRO, jointly with International Astronautical Federation (IAF) and Astronautical Society of India (ASI), organised GLEX-2025 in New Delhi from May 7–9, 2025. The event featured 40 technical sessions and two interactive presentation sessions, with participation from over 1,800 dignitaries across the space ecosystem, including Astronauts, Space Agency leaders, industry representatives, and students. Several bilateral meetings were also held on the sidelines.

The 55th CEOS Working Group on Calibration and Validation (WGCV-55) Plenary meeting was hosted by NRSC in Hyderabad from July 8–11. More than 40 officials, including 11 participants from eight countries, attended the working group sessions.

In the field of capacity building, ISRO continues to share its facilities, and expertise in the application of space science and technology by conducting short-term and long-term courses through the Indian Institute of Remote Sensing (IIRS) and the United Nations (UN) affiliated Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP) at Dehradun. As of now, there are more than 3700 beneficiaries from more than 125 countries.

2.12 Space Commerce

2.12.1 Background

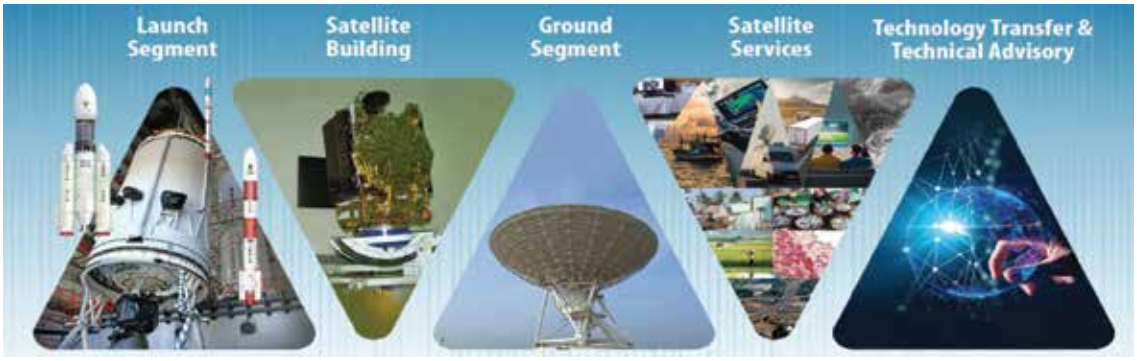
NewSpace India Limited (NSIL) was incorporated in March 2019 as a Central Public Sector Enterprise (CPSE) under the Department of Space, Government of India. It was established with the vision to drive the growth of the Indian industry in space-related activities and to provide products and services derived from the Indian Space Programme to global customers.

As part of the Government of India's Space Reforms initiative launched in June 2020 to unlock India's potential in the space sector, NSIL was mandated to undertake end-to-end commercial space activities related to satellites and launch vehicles on a demand-driven model. Since then, NSIL has achieved significant commercial success, expanding its business portfolio and consistently increasing its revenues.

As of 31st March 2025, NSIL has completed Six years of its Commercial Space operations, marked by substantial market presence and revenue generation establishing itself as a key player in global space commerce

Business Verticals

To cater to the business needs and the enhanced mandate of NSIL as approved by the Cabinet, it has created six business verticals as indicated below:



2.12.2 Business Operations

NSIL has made significant progress across all its major business operations in line with its enhanced mandate. The major highlights of business accomplishments during the period from 1st April 2025 till date are as follows:

a. Owning and Operating Satellites on Demand Driven Model

2nd Demand Driven Mission of NSIL [GSAT-N2]:

- NSIL successfully undertook its 2nd Demand Driven Communication Satellite

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Space Commerce

Mission GSAT-N2 during November 2024. GSAT-N2 weighing 4700 kg is a Ka-Ka band High Throughput Satellite has 48 Gbps of throughput capacity, for meeting the Broadband service needs of Indian mainland and neighbouring islands. The satellite was successfully launched during Nov 2024 from Florida, USA. GSAT-N2 has successfully completed In-orbit Testing and commissioning operations.

- Entire funding for this mission has been borne by NSIL.

3rd Demand Driven Mission of NSIL [GSAT-N3]:

- NSIL is set to undertake its 3rd Demand Driven Communication Satellite Mission, GSAT-N3, a S-band communication satellite, designed to meet the communication service requirements of Indian Government Users.
- Entire funding for this mission would be borne by NSIL.
- GSAT-N3 satellite weighing 4500 kg is proposed to be launched during Q4 of 2026.

b. Building Launch Vehicle through Indian Industry

Polar Satellite Launch Vehicle (PSLV):

- NSIL has entered into a contract with M/s HAL [the lead partner of M/s HAL and L&T consortium] for End-to-End production of 5 nos of PSLV-XL.
- 1st Indian Industry produced PSLV-N1 is scheduled for launch during Q1 of 2026.

Small Satellite Launch Vehicle (SSLV):

- To meet the demand driven launch requirements, NSIL is realising 15 SSLVs through ISRO identified Indian industry vendors.
- These 15 SSLVs are proposed to be launched during FY 2026-27 and FY 2027-28.

c. Launch Services

Polar Satellite Launch Vehicle (PSLV):

- NSIL successfully undertook its 5th Dedicated Commercial mission of PSLV by launching Proba-3 Satellite of European Space Agency from Sriharikota, during December 2024. As on date, NSIL has successfully launched 61 International and 2 Indian customer satellites on-board PSLV.
- NSIL currently holds Two signed Dedicated PSLV Launch Services Agreement (LSA) with international customers and Two signed Dedicated PSLV LSA with Indian Customers besides ~20 Co-passenger Satellites and discussions are underway with several potential customers.

Launch Vehicle Mark 3 (LVM3):

- NSIL currently holds one signed Dedicated LVM3 LSA for launching an international customer satellite during Q4 of 2025 and preparation are underway to ensure successful launch of the customer satellite as planned.
- NSIL is in discussion with potential International customers for launch of Dedicated LVM3 missions during 2026-2028.

Small Satellite Launch Vehicle (SSLV):

- NSIL has signed a Dedicated SSLV LSA with a satellite customer from Australia. NSIL has successfully launched one US Customer satellite onboard SSLV-D2 and one Indian Customer Satellite onboard SSLV-D3 as a co-passenger.
- NSIL is in discussion with International customer for launch of Two Dedicated SSLV missions during 2026. NSIL is in discussion with potential Indian and International customers for launch of Dedicated SSLV mission/ Ride-share mission during 2026-2028.

d. Satellite Building

- NSIL would be building and launching one satellite for customer where payload would be provided by customer whereas satellite bus and satellite integration and testing would be the responsibilities of NSIL/ISRO. Satellite launch is envisaged on-board PSLV during Q4 of 2025. On similar approach, NSIL would be building and launching 3 more satellites on-board PSLV during Q1 of 2027.
- NSIL has signed a contract with Indian Customer for building and launching heavier Communication Satellite. NSIL is in advanced discussion with Indian Customers for building and launching Three communication satellites.
- As part of user requirement, NSIL would be building and launching several Earth observation satellites on-board ISRO's launch vehicles in the coming years. Opportunities have been given to several Indian Industry partners for building these satellites as well.

e. Space based Services

- NSIL has been leasing Satellite capacity for meeting different application needs viz., DTH, VSAT, TV, DSNG, IFMC from its fleet of 15 in-orbit communication satellites. In addition, NSIL has been leasing capacity from foreign satellites to meet the demands of Indian users for DTH and VSAT applications. NSIL has entered into nearly 150+ agreements for the same.

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Space Commerce

- NSIL has been disseminating Earth Observation Imagery from Indian Remote Sensing Satellites as well as provisioning EO imagery from foreign satellites to meet the demands of the Indian user requirements.
- **Services towards monitoring of Marine Fishing Vessels:**

  NSIL has been identified as the implementing agency by Department of Fisheries for "National Rollout plan for Installation of Vessel communication and support system in Marine fishing vessels for Monitoring, control and surveillance (MCS)" under "Pradhan Mantri Matsya Sampada Yojana (PMMSY) Scheme". As part of this, NSIL is working with Indian Industry partners for Supply, Installation, Operation and management of 100,000 indigenous MSS terminals ("Xponders") on-board the fishing vessels including creation/development of ground infrastructure and monitoring centres. Nearly 65,000 MSS Terminals have already been delivered and 45,000 MSS Terminals have been installed across coastal states. As required by user, about 40000 Batteries have been supplied for installing on Motorized Boats along with MSS Terminals. One Gateway system, as part of this project is also being established at Hyderabad.

f. Telemetry Tracking Support (Mission Support Services)

- During the year, NSIL has provide Mission Support TTC services for two Indian Startup for their LEO missions and three Lunar / Deep Space missions. Emergency mode TTC support has been provided to an International Customer during May/ June 2025.
- Till date, NSIL has provided 12 Launch Vehicle Tracking Supports; 8 Telemetry, Tracking and Command (TTC) support; and 5 Deep Space Mission Supports to Indian and International Customers. These mission support services are being rendered through ISRO Ground stations.

g. Establishment of Ground Segment

NSIL is working with several Indian Companies for establishment of Ground Stations to cater to various programme needs. In addition to turn-key contracts with Indian companies for establishing Hub / Gateway stations, it is also considering engaging with Indian Companies for manufacturing VSAT terminals in large numbers for meeting Government user needs in the future.

h. Technology Transfer

Till date, NSIL has signed 100 Technology Transfer Agreements with Indian Industry for transferring ISRO developed Technologies. During the year, about 24 Agreements have been signed. One of the important highlights is the transfer of Small Satellite Launch Vehicle (SSLV) Technology to M/s HAL.

2.12.3 Corporate Social Responsibility & Sustainable Development (CSR & SD)

a. NSIL has taken up CSR&SD activities in the areas of Healthcare, Education, Sanitation, Social Justice and Empowerment, Skill Development, Sustainable Development and Disaster Management Support.

b. For FY 2024-25, an amount of ₹ 12,72,23,012 was identified for CSR&SD activities. Company has successfully undertaken 31 Projects in association with various NGOs/ Agencies as per the company's CSR&SD policy.

c. For FY 2025-26, an amount of ₹ 18,76,99,324 has been identified for CSR&SD activities.

2.12.4 NSIL Financials

a. As on Date, NSIL Authorised capital is ₹ 7500 Cr and Paid-up capital is ₹ 5607.60 Cr.

b. NSIL's total revenue during FY 2024-25: ₹ 2,761.56 Cr and the Profit after Tax: ₹ 822.20 Cr.

2.13 IN-SPACe

During 2025–26, IN-SPACe continued to play a pivotal role in driving India's Space-sector reforms. Across authorisation, promotion, technical enablement, international outreach, and ecosystem development, IN-SPACe has undertaken a wide range of initiatives to support NGEs, foster innovation, enhance industrial capabilities, and catalyse demand for indigenous space-based products and services. The following are a consolidated overview of the key activities, achievements and emerging outcomes across all IN-SPACe Directorates during the year:

2.13.1 Program Management and Authorization (PMA) Activities

The Programme Management & Authorization Directorate (PMAD) of IN-SPACe continued to serve as the single-window interface for regulatory authorization, facilitation, and programme oversight of Non-Government Entities in the space sector. Their activities are detailed below:

a. Authorisations and Regulatory Facilitation

- IN-SPACe has issued 112 authorizations till date, out of which 81 authorizations are for space activities by Non-Government Entities. During this year, 40 authorizations have been issued.
- PMA has received 690 applications, including 179 applications in the current year. A total of 486 applications have been closed.
- PMA has also signed 12 MoUs during the year, taking the cumulative number of MoUs to 72.

IN-SPACe signing MoU with different stakeholders

b. Data Dissemination and Regulatory Support

- IN-SPACe has issued 96 registration certificates to 38 data disseminators for dissemination of primary data of over 780 satellites across 22 constellations, of which 55 certificates were issued during the current year.
- IN-SPACe has issued 49 Advisory notes to NGEs to enable submission of ITU filings to ITU-R through WPC Wing of DoT and seeking SCOMET license from DGFT, out of which 20 were issued during this year.

c. SATCOM Joint Working Group

- IN-SPACe has constituted a Joint Working Group (JWG) with senior level members drawn from MI&B, DoT, WPC, DoS, and IN-SPACe, to develop a comprehensive demand generation strategy for SATCOM market and strengthening the SATCOM ecosystem in the country.

2.13.2 Promotion Directorate (PD) Activities

IN-SPACe's Promotion Directorate focused on nurturing a robust and inclusive space ecosystem by enabling industry outreach, start-up acceleration, skill development, academic engagement, and international collaboration. Their activities are detailed below:

a. Industry Outreach & Seed Fund Scheme

- To accelerate promising space-tech start-ups, IN-SPACe has launched a Seed Fund Scheme providing grants up to ₹1.0 crore to early-stage Indian space start-ups. Five focused opportunities have been announced for Use of Space Technology in areas such as Agriculture, Disaster Management, Urban Development, Marine sector, and Full Mission Virtualization for Smart Computing and Control. Multiple start-ups are progressing through milestone-based implementation.
- To create demand and build capacity, IN-SPACe has announced use cases in five domains, as pilot demonstration opportunities for NGEs, directly aligned with user requirements.

b. Space Economy Estimation and Ecosystem Development

- A Joint Working Group (JWG) on Space Economy Estimation has been constituted with representatives from IN-SPACe, Ministry of Statistics and Program Implementation (MOSPI), ISRO, DST, DoT and space associations to develop a comprehensive methodology for measuring the contribution of the space sector to national GDP.

2.13

IN-SPACe

- As part of ecosystem building, Expressions of Interest were invited from NGEs for development of technologies through start-ups and academia, receiving over 220 proposals.

c. IN-SPACe PIE Programme and Entrepreneurial Support

- The IN-SPACe Pre-Incubation Entrepreneurship (PIE) Programme was launched on 06th June 2024. A total of 105 applications were received for the IDEATE phase, out of which 10 innovators were shortlisted for progression to the INNOVATE phase.

d. Skill and Academia Outreach

- IN-SPACe has designed & conducted 11 short-term skill development courses on various topics covering the broad spectrum of space technology and applications. Total 13 courses have been completed, and the 14th course is underway. As on date, through these courses a total of 733 individuals has been certified.
- Under the IN-SPACe Skill Development Initiatives, IN-SPACe has been recognised as an awarding and assessing body by NCVET. Eight development courses/qualifications have been submitted and approved under the National Skill Qualifications Framework (NSQF).
- IN-SPACe has conceptualized, designed and executed the "IN-SPACe Model Rocketry/ CANSAT India Student Competition" for the first time in the country. The final was conducted from 26–30 October 2025 at Tamkuhiraj, Kushinagar, Uttar Pradesh, with participation of about 600 students (including over 120 girls) from around 68 teams nationwide.

IN-SPACe Model Rocketry/CANSAT India Student Competition at Kushinagar, Uttar Pradesh

- Two Space Student Immersion Programmes were conducted at the IN-SPACe Technical Centre, benefiting 68 students from three institutions.
- IN-SPACe has designed a unique scheme for establishing state-of-the-art 'Antariksh Anveshan Kendra' (Space Labs) at Indian academic institutions.
- A National Committee for Adoption of Space Tech Education in India has been formed by Chairman IN-SPACe. 14 institutions /universities have adopted space-tech modules/courses in their curriculum.

e. International Outreach & Engagements

- IN-SPACe has been actively engaging NGEs with global counterparts, through "Space Day".
  - Seven (07) Space Days have been conducted with Italy, Australia, Japan, Luxembourg, Singapore, Sweden, and the Netherlands.
  - IN-SPACe has connected with over 45 countries, and Indian private companies have entered into over 100 MoUs/business agreements with foreign entities.
  - Recent Space Days include
    - India – Singapore Space Day on 31st July 2024
    - India – Sweden Space Day on 25th September 2024
    - India – Netherlands Space Day on 08th April 2025
- IN-SPACe, participated in the 13th India–UAE High Level Task Force for Investment (HLTFI) (17th–18th September 2025). Also, engaged with UAE Space Agency and Mohammed Bin Rashid Space Centre to enhance bilateral space cooperation.

13th India - UAE HLTFI Delegation led by HCIM

2.13 IN-SPACe

- Under the India–Italy Strategic Action Plan (2025–2029), an Italian aerospace delegation of 13 companies visited Hyderabad, Bengaluru and New Delhi (22–26 September 2025).

Interaction of the Italian Delegation led by Ambassador of Italy to India, with Chairman IN-SPACe

- IN-SPACe led an Industry Delegation consisting of around 60 members across 23 NGEs to the 76th International Astronautical Congress (IAC 2025) in Sydney (29 September–3 October 2025), setting up an India Space Pavilion and enabling 28 bilateral engagements.

IN-SPACe delegation at IAC 2025, Sydney

- Other key international engagements include:
  - Participated in the 3rd India – Japan Space Dialogue, (March 31st – April 1st, 2025, Tokyo)
  - Representation of Indian NGEs at GSTC 2025, Singapore (26–27 February 2025)
  - Participation of 5 NGEs at Kenya Space Expo and Conference (KSEC 2024) in June 2024,
  - Representation at first India–EU Space Dialogue in Brussels, Belgium on 13th Nov. 2025.

f. Domestic Events, Conferences and Webinars:

- IN-SPACe facilitated 13 NGEs to showcase their capabilities during GLEX 2025.
- 30 Space Startups showcased their capabilities during Startup Maha Kumbh 2025.
- IN-SPACe organized webinars on:
  - "Empowering India's Space Sector through Semiconductor Excellence" with SAC and SCL
  - "Empowering Indian Space Industries through Quality Certification" with QCI
- Facilitated the 2nd National Space Day and National Meet 2.0 (NSpD-2025).
  - 24 NGEs demonstrate their products and solutions through presentation and exhibits
  - Interaction between Secretary, DoS & Chairman, IN-SPACe and 12 selected NGEs

g. MoU's Signed by Promotion Directorate:

- Promotion Directorate has signed 5 MoUs during the year.
- International MoUs Signed with:
  - Ministry of Posts, Telecommunication and Information Technology (MoPTIT), Govt of Bangladesh on Jointly building a Small Satellite for use by MoPTIT, during the state visit of Bangladesh PM to India

MoU between IN-SPACe and OSTIn

2.13

IN-SPACe

- IN-SPACe signed an MoU with Economic Development Board, Office for Space Technology & Industry, Singapore, on promoting the Space Sector during the state visit of Singapore PM to India on Sep 4, 2025.

2.13.3 Technical Directorate (TD) Activities

IN-SPACe Technical Directorate focused on enabling & facilitating the technical support, infrastructural support, technology transfer, Public–Private Partnership projects, creation of common technical facilities, access to national test infrastructure, and facilitation of private launch vehicle development. Their activities are detailed below:

a. Transfer of Technology (ToT)

SSLV

- Following an competitive bidding process, Hindustan Aeronautics Limited (HAL) was selected.
- The ToT between HAL, ISRO, NSIL, and IN SPACe was signed on 10th Sep 2025
- Training programme on SSLV technology was conducted for HAL at VSSC/ISRO.

Signing ToT between HAL, ISRO, NSIL, and IN SPACe

Training program on SSLV technology for HAL at VSSC, ISRO

Other Technologies

- IN-SPACe along with NSIL has signed 24 Technology Transfer Agreements (TTA) in which major technologies are LTCC, ISRO Laser Gyro and Ceramic Servo Accelerometer.

Technology Transfer Agreement signed with NGEs

Summary of Technology Transfers (As on Nov 2025)	Number
Applications received (Since 2023)	180
ToT agreement approved and signed (since 2023)	71
ToT Agreement approved and signed during Jan – Nov 2025	24

b. Establishment of Earth Observation (EO) System under PPP

- Following a competitive bidding process, A consortium led by PixxelSpace India, with SatSure, Piersight and Dhruva Space as partners, emerged as the winner

2.13

IN-SPACe

- A Special Purpose Vehicle (SPV) "AlliedOrbits Pvt. Ltd." has been registered with MCA.
- Concession agreement has been finalised.

EO-PPP Bid allotment by IN SPACe to Pixel and its consortium partner

c. Space Manufacturing Clusters (SMCs) and Common Technical Facilities (CTFs)

- IN-SPACe sought interest from all State Governments for establishing Space Manufacturing Clusters (SMCs) and Common Technical Facilities (CTFs). 10 States have shown interest, wherein framework MoU has been signed with 3 states: Gujarat, Tamil Nadu and Karnataka.
- Gujarat & Tamil Nadu have identified 100-acre & 250-acre land parcels respectively. Gujarat has also submitted the Detailed Project Reports (DPR) for establishment of thematic CTFs.
- Selection Committee chaired by Secretary, DoS will evaluate the proposals.

d. Satellite Bus as a Service (SBaaS)

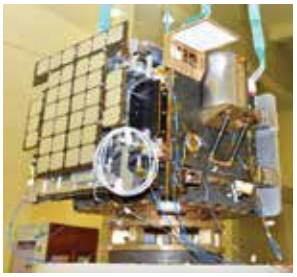
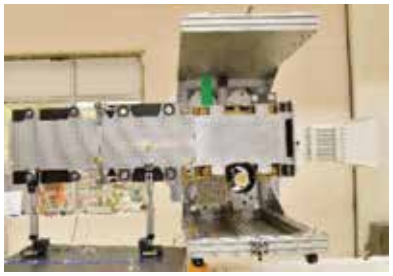
- An Announcement of Opportunity (AO) for development of Satellite Bus which could be used for Satellite Bus as a Service (SBaaS) was released on 26th April 2025.
- Expert committee reviewed the 15 proposal received from NGEs. Wherein, Four NGEs have been selected. Selected companies will receive a grant support of ₹5 crore each, for development of small satellite bus.

e. Technology Adoption Fund (TAF)

- The TAF scheme was launched in Feb 2025 with an outlay of ₹500 Cr. to take early-stage space technologies from lab-scale (TRL 3/4) to commercial scale (TRL 7/8 & above). The scheme offers 60% funding of total project cost for start-ups/MSMEs and 40% for larger industries, with a cap of ₹25 crore per project. 30 proposals are under evaluation.

f. Technical Support

- **Technical Facilitation at ISRO**
  - 49 NGEs have been facilitated for over 235 tasks for testing using various ISRO facilities.
  - Vibration testing CG-MI measurement of Drishti Satellite developed by M/s GalaxEye at URSC, ISRO
  - Outgassing Test and Radiometric calibration in thermo-Vacuum carried out for M/s SatLeo at SAC, ISRO

Vibration and CG-MI measurement at URSC for Drishti Satellite

Radiometric calibration in TVAC for SATLEO in SAC

- **Facilitation of Private Launch Vehicle Missions**
- Skyroot Aerospace – Vikram 1 Orbital Mission
  - IN-SPACe facilitated for solid propellant casting of Stage-1 motor of Vikram -1 at SDSC with ISRO support; a static test of one motor was successfully completed in August 2025.

Static Test of Stage-1 Motor of Vikram-1

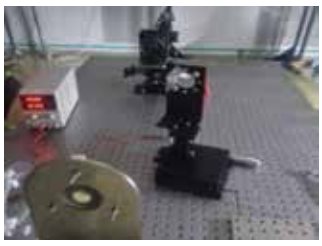
2.13 IN-SPACe

- IN-SPACe facilitated following major activities at various ISRO Centres:
  - Environmental and High-altitude test of igniter and retro motors
  - RF Compatibility testing for Telemetry and telecommand
  - RF compatibility testing for C-band Transponder
- IN-SPACe has conducted six Mission Readiness & Launch Clearance (MR&LC) and Technical Review Committee (TRC) meetings to review readiness for the Vikram-1.
- Vikram-1 Orbital Mission is slated for launch by Q1 2026

- Agnikul Cosmos – Orbital Launch Infrastructure
  - Discussions for environmental clearance & establishing a dedicated launch pad at SDSC & RF support for launch & first-stage landing operations with ISTRAC is in progress.
  - Review of the turbopump configuration and performance has been initiated.

- IN-SPACe Technical Centre
  - IN-SPACe Technical Centre, established for exclusive utilization by the NGEs, has enabled 35 NGEs in accomplishing a total of 403 tasks over 79,000 hours of facility utilization since 2022.
  - The facility has been augmented with 1.5m Dia Thermo-vacuum Chamber, TTCP modem, GNSS Simulator to cater to the evolving needs of NGEs.

Ion-Thruster testing in TVac Chamber of ORBITSPACE



IR-Camera Testing in Cleanroom of SATLEO

System-level Simulation in Design Lab by M/s PEIRSIGHT

- Indian Space Standards/Guidelines
  - In coordination with Bureau of Indian Standards (BIS), IN-SPACe has deliberated, recommended, & enabled the publication of 66 Indian Standards related to Safety and Quality Management, Spacecraft systems and operations, & Space debris & contamination control.

- IN-SPACe delegation participated in ISO/TC20/SC14 Plenary Meeting at Japan in May 2025. The effort is being made to conduct the next plenary session 2026 in India.

ISO/TC20/SC14 Plenary Meeting at Japan in May 2025

- IN-SPACe has prepared the comprehensive draft of the Safety and Security Guidelines for Space Activity, refined through detailed modifications based on ISRO's feedback.
- Extensive stakeholder consultations were also conducted with key industry associations to incorporate inputs on launch operations, orbital debris, and cybersecurity, ensuring robust, industry-aligned standards.

- Use-Case Identification
  - In line with the requirements of the user ministries and departments (viz. Ministry of Power, Ministry of Agriculture and Farmers welfare, NDMA), the respective Joint Working Groups (JWGs) identified specific priority use cases for POC demonstration by NGEi(s).
  - The NGEi(s) were invited to submit proposals against these use cases under the seed fund scheme. The following were the announced opportunities (AOs) including one from SAC, ISRO:
    - Pest & disease forewarning & early detection of biotic stress for major crops of India
    - Monitoring & EWS for GLOFs with Hazard and Risk Assessment in the Indian Himalaya
    - Reservoir Rim Slope Stability Monitoring

- Decision Support System (DSS) for Power sector installations & Right Of Way (ROW)
- SAR Applications using NISAR data

2.13.4 Strategy & Planning Wing Activities

The Strategy & Planning Wing (S&PW) through their targeted initiatives such as Space Applications Adoption Workshops, Investor Awareness campaigns, Structured Industry Interactions focused on strengthening the long-term programme planning towards achieving the decadal vision objectives for Indian Space Economy. Their activities include:

a. Space Applications Adoptions Workshop (SAAW): Customer Awareness Campaign

- To accelerate adoption of space-based solutions in government and industry, IN-SPACe launched the "Space Applications Adoption Workshops (SAAW)"
- 10 workshops have been conducted across thematic and regional domains, like Agriculture & Food Processing, Defence & National Security, Disaster Mitigation, Multiple business themes, North-Eastern Region, Assam, Kerala, Karnataka and Tamil Nadu.
- The workshops have addressed more than 1700 In-person and 730 online participants, representing over 220+ government departments and agencies & engaged 65+ NGEs.

Glimpse of Karnataka SAAW

b. Inve$t Space (Investor Awareness Campaign)

- To mobilize and channel private investments in the space sector, IN-SPACe has launched the Investor Awareness Workshops in campaign mode
- Started in October 2024, IN-SPACe has organized Six 'Inve$t Space' workshops in partnership with the Confederation of Indian Industry (CII), IIMA Ventures, TiE - Delhi NCR, ITI Capital, Inflexor VC & IVCA.
- The campaign has engaged over 1100 In-person and 120 online participants. More than 52 investment institutions (investors, venture capitalists, family offices, and asset management firms) and 35+ NGEs have participated across five editions, fostering dialogue, visibility, and investments.

c. IN-SPACe Industry Connect

- IN-SPACe has institutionalized the "IN-SPACe Industry Connect" as a structured engagement mechanism with NGEs and space ecosystem stakeholders, conducted virtually (quarterly) & in-person (yearly), to deepen stakeholder dialogue & strengthen the Indian Space Ecosystem.
- IN-SPACe conducted One In-Person 'IN-SPACe Industry Connect' (June 2025) & 3 Virtual IN-SPACe Industry Connect' this year.
- Across these interactions, around 300 In-person and 500 online participants were engaged in discussions & brainstorming on policy, regulatory facilitation, technology needs and collaborative opportunities, thereby strengthening ecosystem-wide coordination.

IN-SPACe Industry Connect – 7th at Ahmedabad (June 2025)

d. SPACe on GeM (Government e-Market Place)

- IN-SPACe signed an MoU with the Government e-Marketplace (GeM) to establish a dedicated "Space-enabled Products and Services" category on the GeM portal.

e. Antariksh Venture Capital Fund (1000 Cr VC Fund)

- To catalyze private investment and address the early-growth funding gap in India's space sector, the Government has approved a 1000 Cr VC Fund.
- The 1000 Cr VC fund will be managed by a Special Purpose Vehicle (SPV), the Antariksh Venture Capital Fund (AVCF) as a close ended fund registered with the Securities and Exchange Board of India (SEBI) as a Category II AIF.

2.14 India's Space Vision 2047

Government of India has announced the Space Vision 2047, which targets establishing Bharatiya Antariksh Station (BAS) by 2035 and landing of an Indian on Moon by 2040. Towards this, Government has approved five important projects: Gaganyaan follow-on missions and establishment of BAS 1st module by 2028, Development of Next Generation Satellite Launch Vehicle (NGLV) by 2032, Chandrayaan-4 by 2027, to develop and demonstrate the technologies to come back to Earth after successfully landing on the Moon and also collect moon samples, Venus Orbiter Mission (VOM) by 2028, to study the Venusian surface and subsurface, atmospheric processes and influence of Sun on Venusian Atmosphere and establishment of Third Launch Pad (TLP) at Spaceport of India, Sriharikota.

ISRO has formulated a roadmap for space science exploration missions, integrating multiple domains of developments, towards achieving the goal of Space Vision 2047. These efforts focus on technological advancements, international partnerships, increasing the participation of private players and advancing space exploration missions.

The major milestones of the achieving Space Vision 2047 are Launch of 1st module of Bharatiya Antariksh Station (BAS) by 2028, Establishment of full BAS by 2035 and Indian Moon landing by 2040.

CHAPTER

03

Resource Management

3.1 Budget at a Glance

The approved Budget Estimates (BE) of the Department for the financial year 2025-26 is ₹13,416.20 Crore. The Revised Estimate (RE) 2025-26 is ₹12,448.60 Crore. The Budget Estimates approved for the FY 2026-27 is ₹13,705.63 Crore.

(₹ in Crore)

Sl. No.	Particulars	BE 2025-26	RE 2025-26	BE 2026-27
1	Establishment Expenditure	398.85	387.04	396.32
2	Space Technology	10,230.21	9,601.99	10,397.06
3	Space Applications	1,706.79	1,596.26	1,725.06
4	Space Science	371.00	184.57	569.76
5	INSAT Satellite Systems	207.00	205.80	130.93
6	Other Central Sector Expenditure	502.35	472.94	486.50
	Total	**13,416.20**	**12,448.60**	**13,705.63**

3.2 Human Resources

3.2.1 Manpower Profile

The total approved sanctioned strength of the Department as on 01.12.2025 is 20269 out of which 19178 is sanctioned strength of ISRO & DoS. The sanctioned strength of Autonomous bodies, INSPACe & Public Sector Enterprises (PSEs) is 1091. Within ISRO, Scientific and Technical personnel constitute approximately 75% of the total workforce, while administrative personnel account for about 25%.

3.2.2 Recruitment and Talent Acquisition

To effectively realise organisational goals, the Department places paramount importance on competency requirements, adopting stringent recruitment processes to induct high-quality personnel. Recruitment norms are periodically fine-tuned to ensure the continuous development of human resources in alignment with evolving programmatic requirements.

The Centralised recruitments and Centre-specific recruitment processes are being continued with revised recruitment norms in place. ISRO/DoS has been absorbing meritorious graduates from the Indian Institute of Space Science and Technology (IIST) upon successful completion of the B.Tech/Dual Degree programmes, subject to meeting the prescribed benchmarks. The fourteenth batch of students admitted to the Dual Degree programme in September 2020 and the fifteenth batch admitted to the B.Tech programme in September 2021 at IIST graduated in June 2025, and a total of 78 eligible students have been inducted into DoS/ISRO.

ISRO has established the "Live Register" scheme, under which Ph.D. holders in specialized areas of engineering, technology, and science relevant to the Indian Space Programme may submit their dossiers to ISRO. The candidature is reviewed by the concerned Centres based on organizational requirements and suitability.

During the year 2025, centralised recruitment actions for filling up of about 1,050 posts in both Scientific & Technical and Administrative categories are at an advanced stage. Further, a plan of action has been formulated for filling up the vacancies arising during 2026.

3.2.3 Training and Development

Training and Development activities are undertaken through both centralised and decentralised mechanisms. The Centralised Induction Training Programme for newly recruited Scientists/Engineers, introduced in 2002, continues to be implemented.

3.2

Human Resources

The programme is designed to familiarize newly inducted Scientists/Engineers with ISRO systems, by providing comprehensive exposure to its programmes, achievements, rules, regulations, systems, and processes. During 2025, a total of 520 newly recruited Scientists/ Engineers underwent induction training.

In addition, on an average, about 600 personnel were imparted training through various programmes, including ISRO's Structured Training Programmes, centralised training programmes on specialised themes, training on Public Procurement conducted by AJNIFM and other major external executive training programmes conducted by institutions such as ISU, NIAS, i2P2M, ASCI, CII, etc. Further, based on Training Needs Analysis (TNA), Centres/ Units conduct area-specific and function-specific training programmes.

Other programmes such as Refresher courses for knowledge enhancement for technicians, technical assistants and technical support staff, Special training programmes for Administrative staff covering rules, procedures, systems and covering latest changes in the system and General training programme to improve soft skills, computer skills, management & leadership aptitude, etc. are conducted as part of cadre training requirement. These training programmes are implemented both through centralised and de-centralised training programmes.

3.2.4 Upskilling and Capacity Building

In compliance with the New Education Policy (NEP) and to address upskilling requirements, ISRO provides multiple avenues for academic and professional development. Under the Sponsored Education initiative, meritorious scientists and engineers are supported to pursue higher studies, including M.E./M.Tech. and Ph.D., at premier institutions such as IISc, select IITs, and IIST. This scheme has been further expanded to include Master's degrees through online programmes offered by institutes of national importance. Additionally, an Internship Scheme has been implemented within DoS/ISRO for external participants, aligned with the NEP, to instill scientific temperament and provide exposure to the Indian Space Programme for young minds.

3.2.5 Employee Welfare

Comprehensive welfare measures including housing, medical care, canteen facilities, and schooling for children are extended to employees under approved institutional schemes. To ensure financial security, life insurance coverage against workplace accidents is provided at a relatively low premium through internal trusts, specifically via the VISWAS and SAFE schemes, which offer assistance to families during exigencies.

3.2.6 eAPAR

For performance appraisal of the employees, eAPAR system is successfully implemented across ISRO from this assessment year 2025 onwards. Thereby conventional paper based APAR writing and subsequent assessment process are replaced with the advanced e-system. Pilot implementation was done last year with 2000 employees, and this year we have reached the level of full-fledged implementation. SPARROW software developed by NIC was customized for developing and implementing eAPAR for ISRO/ DoS.

3.2.7 Cadre Review

Cadre review in respect of DOS and ISRO had been approved by the Government on 28.08.2025 and 28.11.2025 respectively. 31 Project posts in respect of DOS and 435 project posts in respect of ISRO have been regularised, enabling to accommodate the existing incumbents in the project posts and further assuring future career opportunities for employees. Around 460 posts were created at higher grades to ensure promotion of eligible employees. In addition, to function as full-fledged Administrative Ministry and to fulfil its parliamentary accountabilities etc., a Permanent Deputation Reserve of 33 posts in Group-A and 37 posts in Group-B have been created. The Revised Cadre Strength of Administrative Staff in ISRO and DOS has become 3546 and 182 respectively.

Information as on October 31, 2025

Sl. No.	Details	Group-A		Group-B		Group-C	
		Sci/ Tech Staff	Admn Staff	Sci/ Tech Staff	Admn Staff	Sci/ Tech Staff	Admn Staff
A.	**GENERAL:** Total Number of Employees						
	(i) Male Employees	7161	260	2080	777	872	745
	(ii) Female Employees	1631	162	136	657	47	109
B.	**SCHEDULED CASTES/SCHEDULED TRIBES :**						
	(i) Number of Scheduled Caste Employees	606	66	401	214	170	183
	(ii) Number of Scheduled Tribe Employees	163	31	133	77	58	36

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Human Resources

C.	**PERSONS WITH BENCHMARK DISABILITIES (PWBD):**						
	(i) Number of persons with Benchmark Disabilities existing						
	1. Blindness and low vision	8	4	5	9	3	9
	2. Deaf and hard of hearing	18	5	21	7	12	1
	3. Locomotor Disability including cerebral palsy, Leprosy Cured, Dwarfism, Acid Attack Victims and Muscular Dystrophy	136	21	74	27	15	4
	4. Autism, intellectual disability, Specific Learning Disability and Mental Illness	0	0	0	0	0	0
	5. Multiple Disability from amongst persons under clauses (a) to (d) including deaf-blindness in the posts identified for each disabilities	0	0	0	0	0	0
	(ii) Number of Persons with Benchmark Disabilities appointed during the year						
	1. Blindness and low vision	1	0	2	0	1	1
	2. Deaf and hard of hearing	1	0	0	0	3	0
	3. Locomotor Disability including cerebral palsy, Leprosy Cured, Dwarfism, Acid Attack Victims and Muscular Dystrophy	1	0	1	0	5	0
	4. Autism, intellectual disability, Specific Learning Disability and Mental Illness	1	0	0	0	0	0
	5. Multiple Disability from amongst persons under clauses (a) to (d) including deaf-blindness in the posts identified for each disabilities	0	0	0	0	0	0

Sl. No.	Details	Group-A		Group-B		Group-C	
D.	**EX-SERVICEMEN:**						
	(i) Number of Ex-servicemen existing	15	9	38	57	59	136
	(ii) Number of Ex-servicemen appointed during the year	1	0	0	0	10	9
E.	**OTHER BACKWARD CLASSES:**						
	(i) Number of OBCs existing	2455	108	1279	572	532	409
	(ii) Number of OBCs appointed during the year	78	0	33	4	77	71
F.	**ECONOMICALLY WEAKER SECTION (EWSs)**						
	(i) Number of EWSs existing	18	0	27	2	53	8
	(ii) Number of EWSs appointed during the period 01.11.2024 to 31.10.2025	9	1	6	0	21	4
G.	**MINORITIES**	995	41	278	206	102	130
H.	**APPRENTICES TRAINING**						
	(i) Number of Apprentices trained during the year	1872					
	(ii) Number of successful apprentices out of (i) above	1212					
	(iii) Number of apprentices appointed as regular employees during the year against apprentice quota, if any.	0					
I.	Number of personnel staff attached to Hon'ble Minister of State (Space)	3					

3.2

Human Resources

STATUS OF SCHEDULED CASTE/SCHEDULED TRIBE PERSONNEL IN DOS/ISRO

Sl No	Centre/Unit	Total Strength of Employees 2025-26	Strength of SC Employees 2025-26	Strength of ST Employees 2025-26
1	VSSC	4577	355	27
2	SAC	1861	131	117
3	URSC	1339	260	97
4	SDSC-SHAR	2125	336	111
5	LPSC	1294	130	21
6	NRSC	770	95	35
7	MCF	301	37	14
8	ISTRAC	419	50	16
9	DOS/ ISRO HQ	200	54	21
10	ADRIN	138	9	3
11	IIRS	103	7	3
12	PRL	287	13	8
13	NARL	71	8	0
14	NESAC	53	1	8
15	IIST	96	3	0
16	HSFC	246	17	7
17	IPRC	674	130	8
18	NSIL	26	1	0
19	ANTRIX	13	0	0
20	IN-Space	44	3	2
	TOTAL	**14637**	**1640**	**498**

STATUS OF PERSONS WITH DISABILITIES IN DOS/ISRO

Sl No	Centre/ Unit	Total Strength of Employees 2025-26	Strength of Persons with Disabilities	Classification of Employees with Disabilites				
				Blindness & Low vision	Deaf and hard of hearing	Locomotor Disability including cerebral palsy, Leprosy Cured, Dwarfism, Acid Attack Victims and Muscular Dystrophy	Autism, Intellectual disability, Specific Learning Disability and Mental Illness	Multiple Disability from amongst persons under clauses (a) to (d) including deaf-blindness in the posts identified for each disabilities
1	VSSC	4577	124	18	27	78	1	0
2	SAC	1861	39	2	6	31	0	0
3	URSC	1339	64	12	14	38	0	0
4	SDSC-SHAR	2125	60	5	8	47	0	0
5	LPSC	1294	22	1	3	18	0	0
6	NRSC	770	19	2	5	12	0	0
7	MCF	301	6	0	0	6	0	0
8	ISTRAC	419	12	1	0	11	0	0
9	DOS/ ISRO HQ	200	8	1	0	7	0	0
10	ADRIN	138	5	0	0	5	0	0
11	IIRS	103	4	0	0	4	0	0
12	PRL	287	6	0	1	5	0	0
13	NARL	71	1	0	0	1	0	0
14	NESAC	53	1	0	0	1	0	0
15	IIST	96	2	0	0	2	0	0
16	HSFC	246	5	1	2	2	0	0
17	IPRC	674	16	0	2	14	0	0
18	NSIL	26	1	0	0	1	0	0
19	ANTRIX	13	1	0	0	1	0	0
20	IN-Space	44	0	0	0	0	0	0
	TOTAL	**14637**	**396**	**43**	**68**	**284**	**1**	**0**

3.2

Human Resources

STATUS OF REPRESENTATION OF EX-SERVICEMEN IN DOS/ISRO

Sl No	Centre/Unit	Total Number of Employees in Group - C 2025-26	Total Number of Ex-Servicemen in Group - C 2025-26
1	VSSC	547	102
2	SAC	173	6
3	URSC	94	24
4	SDSC-SHAR	354	15
5	LPSC	188	29
6	NRSC	120	14
7	MCF	50	1
8	ISTRAC	47	4
9	DOS/ ISRO HQ	17	2
10	ADRIN	12	0
11	IIRS	6	0
12	PRL	21	0
13	NARL	9	0
14	NESAC	3	0
15	IIST	0	0
16	HSFC	24	0
17	IPRC	108	17
18	NSIL	0	0
19	ANTRIX	0	0
20	IN-Space	0	0
	TOTAL	**1773**	**214**

WOMEN EMPLOYEES IN DOS/ISRO

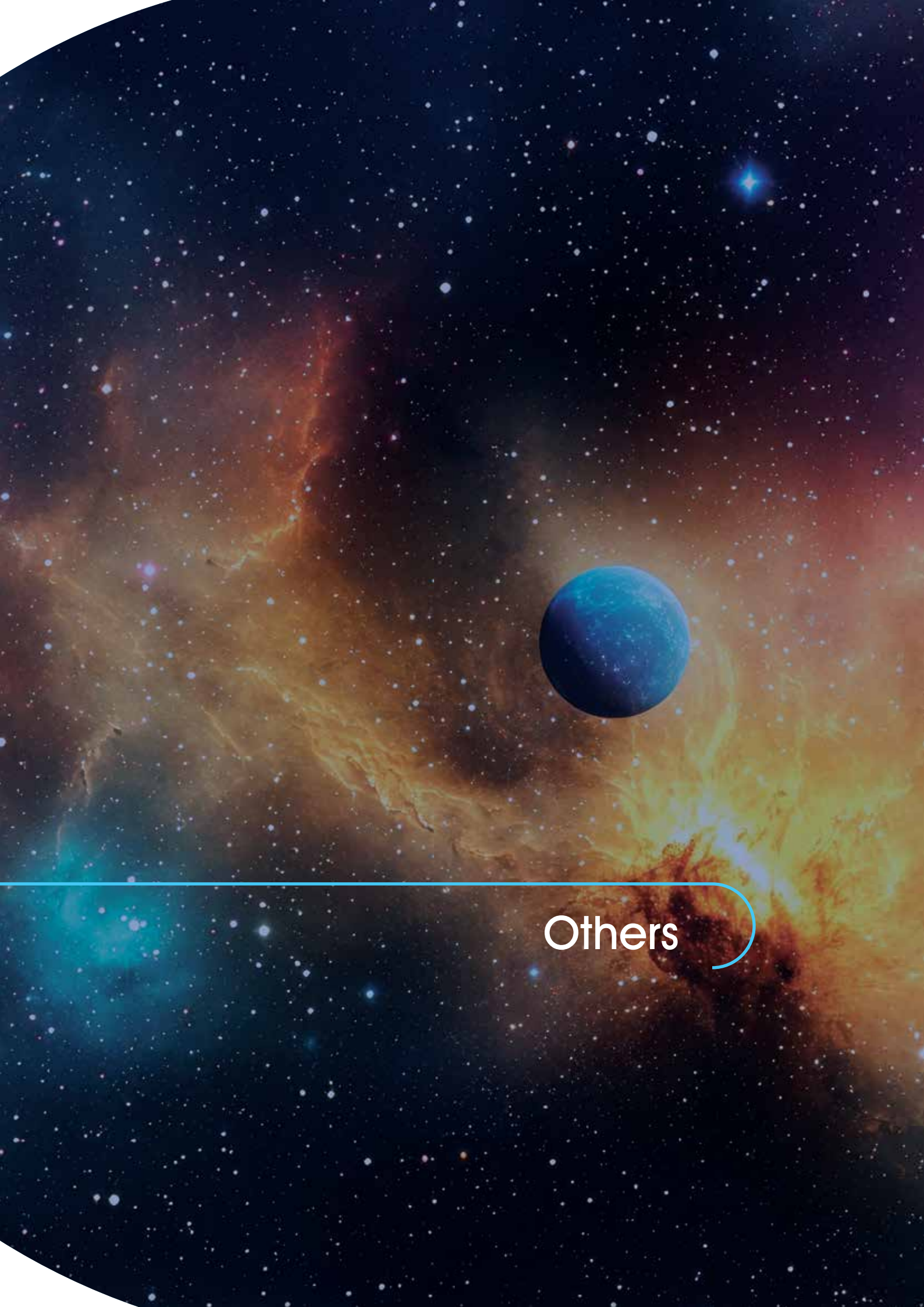
Sl No	Centre/Unit	Total Number of Employees 2025-26	Number of Women Employees 2025-26	
			Scientific & Technical Staff	Administrative Staff
1	VSSC	4577	567	381
2	SAC	1861	219	64
3	URSC	1339	360	55
4	SDSC-SHAR	2125	131	107
5	LPSC	1294	93	93
6	NRSC	770	147	46
7	MCF	301	26	10
8	ISTRAC	419	77	25
9	DOS/ ISRO HQ	200	14	47
10	ADRIN	138	29	8
11	IIRS	103	20	6
12	PRL	287	29	19
13	NARL	71	7	2
14	NESAC	53	7	4
15	IIST	96	20	6
16	HSFC	246	19	13
17	IPRC	674	44	31
18	NSIL	26	1	6
19	ANTRIX	13	1	3
20	IN-Space	44	3	2
	TOTAL	**14637**	**1814**	**928**

3.3 Grant-in-aid

S. No.	Programme Office	Sanction No.	Sanction Date	Name of the Grantee Institute	Purpose of the Grant	Sanctioned Amount (Rs.)
1	RESPOND	DS_2B-13012(2)/38/2025-Sec.2	16/09/2025	Vellore Institute of Technology	Design and Development of Algorithm for illumination, scale, translation and rotation invariant image matching	10,73,250
2	RESPOND	DS_2B-13012(2)/57/2025-Sec.2	26/09/2025	Amrita Vishwavidyapeetham	Development of metallized Graphite electrodes	13,40,800
3	RESPOND	DS-2B-13012(2)/79/2025-Sec.2	14/10/2025	Vellore Institute of Technology	Designing and fabrication of deep UV photon detectors using wide band gap low dimensional material	17,75,000
4	RESPOND	DS_2B-13012(2)/58/2025-Sec.2	23/10/2025	Pandit Deendayal Energy University (PDEU)	Design development and characterization of an autonomous ornithopter (Flapping wing UAV) technology demonstrator	11,53,600
5	RESPOND	DS-2B-13012(2)/89/2025-Sec.2	23/10/2025	Pandit Deendayal Energy University (PDEU)	Design and Development of Algorithm for matching LiDAR intensity image with DEM and optical images	11,12,300
6	RESPOND	DS_2B-13012(2)/121/2025-Sec-2	18/11/2025	Charotar University of Science & Technology	Modelling or data processing hardware/ software for space	36,69,600
7	RESPOND	DS-2B-13012(2)/123/2025-Sec.2	12-02-2025	Pandit Deendayal Energy University (PDEU)	Developing chemometric tools to anayze LIBS spectra acquired under simulated plantary atmospheric conditions	12,48,604

8	RESPOND	DS_2B-13012(2)/78/2025-Sec-2	12-12-2025	Vidyavardhaka College of Engineering	Development of an Apparatus Based on Transient Techniques to Estimate the Thermal Parameters of Aerospace Materials over a Wide Temperature Range	17,45,700
9	RESPOND	DS-2B-13012(2)/66/2025-Sec.2	24/12/2025	International Institute of Information Technology Hyderabad	Advanced Computer Vision + LLM based solutions for Remote Sensing Data Insights"	12,18,107
10	RESPOND	DS-2B-13012(2)/127/2025-Sec.2	29-12-2025	Birla Instityute of Technology & Science Hyderabad	Development of Thrust Measurement System (TMS) for measuring pulse mode thurst for pulse width in the range of 8ms/16ms/32ms/64ms etc	11,09,355
11	RESPOND	No.DS-2B-13012(2)/38/2024-Sec.2	24/07/25	TCG Centre for Research and Education in Science & Technology	Optical phase locked loop for phase stabilization of Raman Beans	24,78,897
12	RESPOND	No.DS-2B-13012(1)/1/2025-Sec.2	01 & 05.2025	Astronautical Society of India	Global Space Exploration Conference (GLEX-2025) during May 07-09, 2025 at New Delhi	2,80,56,000
	TOTAL	**Rupees Four crore fifty nine lakh eighty one thousand two hundred and thirteen**				**4,59,81,213**

CHAPTER 4


Others

4.1 Awards & Recognition

This year brought 23 no's of laurels to ISRO/DOS through prestigious international awards & recognition including:

a. IAA Von Karman Award of 2025
b. AIAA Goddard Astronautics award for Chandrayaan-3 landing
c. Broglio Award by Italian Aerospace Industry Association
d. Vigyan Sri Puraskar 2025
e. ISRO was honoured in a civic reception presided by Hon'ble Governor of TN towards success in Operation Sindoor
f. IAF Global Space Leader Certificate @ IAC 2025 – honoring exemplary leadership in space innovation & global collaboration
g. ISRO is recognized with "Pride of India" award for space research and innovation
h. ASI Awards: 13 awards bagged by ISRO for 2023 & 2024 – Aryabhatta award conferred to Director, URSC
i. National Geospatial Award 2025 - 6 Awards to NRSC
j. Rashtriya Vigyan Puraskar 2025 - 2 Awards to ISRO
k. IIST was awarded the prestigious A++ grade, the highest possible accreditation status by the National Assessment and Accreditation Council (NAAC).
l. DoS conferred with Raj Bhasha Keerti Puraskar – 2nd Prize instituted of DoOL

4.2 Space in Parliament

Indian Space Programme continued to attract the attention of both the Houses of Parliament. Questions answered in Parliament during January, 2025 – December, 2025 are as below:

Questions	Budget Session 2025		Monsoon Session 2025		Winter Session 2025		Total	
	IVth Session of 18th Lok Sabha	267th Session of Rajya Sabha	Vth Session of 18th Lok Sabha	268th Session of Rajya Sabha	VIth Session 18th Lok Sabha	269th Session of Rajya Sabha	LS	RS
Starred Questions	02	00	01	01	00	00	03	01
Unstarred Questions	13	25	14	17	12	11	39	53
Total	**15**	**25**	**15**	**18**	**12**	**11**	**42**	**54**

The Questions were with respect to Venture Capital Fund for Space Sector, Artemis Programme, Cooperation with Private Sector in Space Development, New Draft Space Law, Launches by NSIL, Gaganyaan-1 Mission, Advance Communication Satellite, Startups associated with ISRO, ISRO's Programmes for Students, Foreign and Indigenous Satellites Launched by India, ISRO's Collaboration with Other Space Agencies, Foreign Direct Investment in the Space Sector, Support for NESAC Projects, Space Startups, Chandrayaan-4 Mission, Using remote sensing data for social development and disaster management, Establishment of third launch pad, Updates on the space applications centre of ISRO, Vacancies in ISRO laboratories, Budget allocation and financial management of ISRO, Reducing dependence on foreign satellite broadband providers, Training of Indian astronauts by NASA, Progress made under the Indian Space Policy 2023, Startup encouragement programme, Development of reusable launch vehicle technology, Encouraging private participation in space sector, ISRO SpaDeX mission, Funding support for space technology startups, Developments in space technology, Improvised Distress Alert Transmitter, ISRO missions, Gaganyaan space mission, Moon Mission, Delay in Gaganyaan Mission, NewSpace India Limited, Kulasekarapattinam Spaceport, Space Projects in Ladakh, Public-Private Partnerships in Space Technology Sector, NavIC Navigation System, Planetarium or Space Science Centre in Bihar, Introduction of Space Science in School, Bharatiya Antariksha Station, Space Research Stations, NESAC, India's Space Technology Collaborations, GLEX 2025, Government Support on Flagship Initiative,

4.2

Space in Parliament

Satellite data for agriculture, water resources and disaster management, Support to States for their initiatives in the space sector, Property management and use of Bhuvan GIS platform, Space technology applications for Agriculture, YUVIKA 2025 programme, 'Self-reliant India' in the space sector, Gaganyaan Mission and Viksit Bharat, Strengthening India's Space Programme, Satellites launched by ISRO, Competency of Andhra Pradesh in space technology, Strategies to expand India's share in the global space economy, Funds for ISRO Projects, Technology Transfer Agreement, Vacancy in Department of Space, Applications of Space Technology in various Sectors, Integrated Main Parachute Airdrop Tests (IMAT), NISAR Satellite, Indian space programme's vision and challenges, Outcome of reforms in space sector, Global partnerships for improvements in space sector, Fund utilization challenges for ISRO's flagship missions, Technology transfer to industry, Physical data centres, Status of Chandrayaan-4 mission, Status of Kulasekarapattinam spaceport project, Launch of foreign and domestic satellites and ISRO's upcoming missions.

During the year 2025, the Department-related Parliamentary Standing Committee on Science & Technology, Environment & Forests visited Sriharikota and held discussion with the representatives of the Department of Space/ ISRO on 17.05.2025 and the same committee visited Tirupati on 19.05.2025 and held discussion with the representatives of the Department of Space/ ISRO and National Atmospheric Research Laboratory (NARL). The Parliamentary Standing Committee on Government Assurances (Rajya Sabha) held discussion with the representatives of the Department of Space/ISRO on 22.09.2025 at Bengaluru and the Parliamentary Standing Committee on the Empowerment of Women (2025-26) held discussion with the representatives of the Department of Space/ ISRO HQ on 26.12.2025 at Bengaluru and the same Committee visited Thiruvananthapuram and held discussion with the representatives of the Department of Space/ Vikram Sarabhai Space Centre (VSSC) on 29.12.2025.

4.3 Vigilance

Disciplinary/Vigilance Cases:

Category of employees	Type of cases	Cases pending as on 01.10.2024	Cases received during the period 01.10.2024 to 30.09.2025	Total (Col. 3+4)	Disposed during 01.10.2024 to 30.09.2025	Pending (Col. 5-6)
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Group-A & Group-B (Gazetted)	Disciplinary (Non-Vigilance)	22	2	24	9	15
	Disciplinary (Vigilance)	0	0	0	0	0
Group-B (Non- Gazetted) & Group C	Disciplinary (Non-Vigilance)	28	18	46	33	13
	Disciplinary (Vigilance)	0	0	0	0	0
	TOTAL	**50**	**20**	**70**	**42**	**28**

Sexual Harassment Cases:

Sl. No.	Particulars	
1.	No. of complaints of sexual harassment received during the period 01.10.2024 to 30.09.2025	**9**
2.	No. of complaints disposed of during the period 01.10.2024 to 30.09.2025	**6**
3.	No. of workshops on awareness programmes against sexual harassment conducted during the period 01.10.2024 to 30.09.2025	**13**

4.4 Progressive use of Hindi

4.4.1 Major Accomplishments

a. This year also, implementation of Official Language Hindi and all other related programs in the Department of Space (DOS) continued with vigour. Official Language Implementation Committee held its quarterly meetings to review the progress in the use of Official Language Hindi. DOS/ISRO and its Centres/Units have also participated in the meetings of Town Official Language Implementation Committee (TOLIC) constituted in their respective towns.

b. Action Taken Report on the minutes of meeting of Department of Space and Department of Atomic Energy Joint Hindi Salahkar Samiti (JHSS) held on 20.03.2023 at Vigyan Bhavan, New Delhi has been prepared on the points pertaining to Department of Space. The 'Resolution' of recently reconstituted Joint Hindi Salahkar Samiti (JHSS) of DOS-DAE has been sent for publication in the Gazette of India and subsequently the proposal has been submitted to PMO for deciding the date for the next meeting.

c. Department took part in the 47th meeting of Central Official Language Implementation Committee on 06.11.2025. Officer on Special Duty (OSD) and Joint Director (OL), DOS Branch Secretariat, New Delhi participated in the meeting held under the Chairmanship of Secretary, Department of Official Language.

d. URSC, Bengaluru and MCF, Hassan of the Department are shouldering the additional responsibilities of TOLIC Secretariat at Bengaluru & Hassan respectively.

e. All the Centres/Units of the Department located in 'A', 'B' and 'C' regions have achieved the target prescribed for Hindi/Bilingual correspondence by the Department of Official Language.

f. Department and its Centres/Units purchased Hindi books for Library in accordance with the target set up by DOL.

g. All advertisements issued by the Department are either in Bilingual (Hindi & English) or in Trilingual (Regional Language, Hindi & English).

h. In order to implement Official Language Hindi in a more meaningful and effective manner and to evaluate the progressive use of Official Language Hindi in DOS/ISRO Units/Centers, an Annual Inspection Program for the year 2024-25 was drawn up by Department. The inspection of concerned Centres/Units has been carried out by all Inspecting Officers.

i. Training Programs in Hindi under Hindi Teaching Scheme were continued in the Department. The percentage of employees having working knowledge of Hindi in most of the Centres/Units of DOS/ISRO is more than 80%. An action plan has been

prepared for imparting training at the earliest to the remaining employees of Units/ Centers within the time limit prescribed by DOL.

j. During every quarter of the year Hindi Workshops were regularly conducted in all the Centres/Units of DOS/ISRO, in which hands-on sessions were organized in order to make the employees more efficient to work in Hindi.

k. Hindi Day and Fifth All India Official Language Conference was organised at Mahatma Mandir, Gandhinagar, Gujarat during 14th-15th September, 2025 by Department of Official Language wherein, large number of officers/employees from Centres/Units of DOS/ISRO participated in this conference.

l. Hindi Day, Hindi Week, Hindi Fortnight and Hindi Month were organised in all the Units/Centers of DOS/ISRO, during which competitions like: Essay Writing; Noting and Drafting; Crossword; Simple Translation; Dictation; Hindi Word Power; What does Picture Say?; Calligraphy; Hindi Typing; General Knowledge Quiz; Solo Singing; Vividha etc. have been conducted. These competitions have been organised for Hindi speaking and other than Hindi speaking employees separately. In this connection, various Hindi competitions were conducted for family members/children of the employees. Cash prizes were awarded to all the winners.

m. Various Centres/Units of Department, being member offices, always play an active role in the activities of their respective TOLICs. Different programs are also conducted under the auspices of TOLIC. Several competitions were conducted by the various Centres/Units of Department as a member office of their respective TOLICs. Also, many Centres/Units of DOS/ISRO participated in the competitions conducted by the member offices and won prizes.

n. 'Incentive Scheme' under which the officers/employees doing maximum work in Hindi during the Hindi month are awarded, continued during the year. Incentive scheme of the Department 'SOLIS' also continued during the year and officers/employees of DOS/ISRO and its Centres/Units were awarded Cash Prizes and Certificates for doing routine work in Hindi.

o. During the year In-house Hindi magazines of various Centres/Units of DOS/ISRO, like Disha; Gagan; Aksh; Abhivyakti; Samvad; Prajwal; Sanket; Sudoor Vahini; Akshansh; Pranod; Nodan Mukur; Vikram; Tarang; Jhalak; Antariksh Dharayein; Antariksh Udaan; Antariksh Arunoday etc. were also brought out by the Department.

p. Several banners; pamphlets; panels/posters/standees; brochures etc. pertaining to ISRO's launches and other outreach programs were brought out in Hindi.

4.4

Progressive use of Hindi

q. Website of the Department is fully in bilingual and it is regularly updated in English as well as in Hindi. The website meticulously follows the GIGW guidelines.

r. 'Action Taken Reports' pertaining to assurances given to Hon'ble Second Sub-Committee of the Committee of Parliament on Official Language during the inspections of NE-SAC, Umiam (held on 25.05.2025); SAC, Ahmedabad (held on 30.06.2025) & MCF, Bhopal (held on 03.07.2025) were submitted within the due dates to Committee Secretariat, New Delhi on 30.09.2025; 29.10.2025 & 24.10.2025 respectively. Recently the inspections of NRSC, Hyderabad; ADRIN, Secunderabad and NARL, Gadanki were held on 17.11.2025 and 21.11.2025 respectively.

s. In order to celebrate 'World Hindi Day' on 10th January, 2026, various competitions are planned in all the Centres/Units of Department. On this occasion, competitions are conducted for Hindi speaking and other than Hindi speaking employees separately.

t. An Official Language Orientation Program for the OL staff across the Department was organized by APEP, Aluva during 29th-30th August, 2025. The program included lectures by experts on various important topics, including the Philosophical aspects of Neo-Language Avenues; Simplification of translation; Possibilities of AI tools in Official Language implementation and familiarization of the Cyber Policy of ISRO; Machine Translation Post-Editing; and Discussions on Revised Quarterly Progress Report and Inspection Questionnaire of the Committee of Parliament on Official Language.

4.4.2 Hindi Technical Seminar

Every year, various Centers/Units of the Department conduct Pool level Technical Seminars in Hindi on various subjects. During Inter Centre Technical Seminar, a session on Official Language is also included. Proceedings are also brought out in electronic/book form. During the year, following Centres/Units of the Department organized Hindi Technical Seminars:

Sl. No.	Center/Unit	Date	Topic
1.	ADRIN, Secunderabad	24th January, 2025	Challenges and Solutions in the Geospatial Sector, Geospatial Policy and Regulations
2.	SDSC SHAR, Sriharikota	25th July, 2025	Contribution of ISRO for developed India

3.	IIRS, Dehradun	29th August, 2025	Advances in Space Science and Technology towards developed India
4.	PRL, Ahmedabad	19th September, 2025	Basic and Applied research in a global perspective - Needs and Prospects
5.	ISTRAC, Bengaluru	21st November, 2025	Emerging Technologies in Space Based Observations, Space Situational Awareness & Satellite Navigation
6.	HSFC, Bengaluru	27th November, 2025	Sustainable Human Presence in Space
7.	VSSC, Thiruvanathapuram	Jan-Mar 2026	A Developed India in 2047 : Emerging Technologies in ISRO and the Roadmap Ahead
8.	URSC, Bengaluru (Inter Centre /All India Level)	February, 2026	Beyond Aryabhatta to Infinite Space

A Hindi Seminar was organized by ISTRAC, Lucknow during 18th-19th December, 2025 exclusively for all the Officials of Administrative areas of all the Centers/Units of DOS/ISRO. The topics were as below: Achievements of Indian languages on the Global Platform; Better and effective OL implementation in Administrative Areas (Administration, Accounts, Stores) - Suggestions, Problems and their Solutions); Role of various training programs in making office work smooth and more productive; Role of Mother Tongue in mental & intellectual development; Challenges of Digital Era and Effect of human interference on Environmental Balance.

4.4.3 Awards for OL Implementation

a. National Level

For the Best implementation of the Official Language, Department of Space was awarded the "Rajbhasha Kirti Puraskar" (Second Prize) for the year 2024-25 by Hon'ble Minister of Home & Co-operation of India. The award was given during the Hindi Day and Fifth All India OL Conference organised at Mahatma Mandir, Gandhinagar, Gujarat during 14th-15th September, 2025 by Department of Official Language.

4.4

Progressive use of Hindi

b. Regional Level

The following Centres/Units of DOS were awarded for best implementation of OL Hindi at regional level during the year:

Sl. No.	Centers/Units	Region	Award	Year
1.	RRSC (South), Bengaluru	South Region (Region-'C')	First	2024-25
2.	NE-SAC, Umiam	North-Eastern Region (Region-'C')	Second	2024-25

c. TOLIC Level

The following Centres/Units of DOS were awarded for the best implementation of OL Hindi by its respective Town Official Language Implementation Committee (TOLIC) during the year:

Sl. No.	Centre/Unit	Region	Award	Year
1.	VSSC, Thiruvananthapuram	'C'	• Second Prize for Best OL Hindi Implementation. • First Prize for In-House Magazine 'Gagan'. • Championship Prize for scoring highest marks in competitions held during OL Parva.	2024-25
2.	IISU, Thiruvananthapuram	'C'	• Second Prize for Best OL Hindi Implementation. • Second Prize for In-House Magazine 'Aksh'.	2023-24

4.5 Right to Information

Right to Information (RTI) Act 2005 is implemented in this Department as per the mandate of RTI Act. With the increased RTI applications and in order to disseminate the information in time, Department of Space/ISRO had decentralized the adjudication of RTI applications/ appeals at Centres/Units/Autonomous Bodies/PSU level with effect from 01/11/2018. In terms of Section 5 & 19 of the Right to Information Act, 2005, all the DOS/ ISRO Centres / Units/ Autonomous Bodies/ PSU(Antrix)/ CPSE(NSIL)/ INSPACe have identified and designated the Transparency Officer, Nodal Officer, Appellate Authority and Central Public Information Officer for implementation of RTI Act.

As per Section 4 (1) (b) of RTI Act, Department of Space has published the following information on the web page: https://www.isro.gov.in/RTI.html

1. RTI Act
2. Guidelines for RTI Logo
3. Handbook on RTI Act
4. Guidelines for obtaining information under RTI Act
5. Suo moto disclosure under Section 4 (1) (b)
   - **i. The particulars of organization, functions and duties**
     1. Organization Chart
     2. Work Allocation in Dept. of Space
     3. Functions and duties
   - **ii. The powers and duties of officers and employees**
   - **iii. The procedure followed in the decision making process including channels of supervision and accountability**
   - **iv. The norms set for discharge of functions**
   - **v. The rules, regulations, instructions, manuals and records, held or under control or used by employees for discharging functions**

The rules and regulations formulated by the Government of India in the form of fundamental Rules, Supplementary Rules, General Financial Rules, Delegation of Financial Powers Rules, etc., are followed with suitable modifications, wherever required. The Following are the rules, manuals, etc., held by the Department of Space used by employees for discharging functions:

1. DOS Employees (CCA Rules)
   1. DOS Employees – CCA Rules – 1976

4.5

Right to Information

2. DOS Employees – CCA Rules – Amendment October 2017
3. DOS Employees – CCA Rules – Amendment January 2019
4. DOS Employees – CCA Rules – Amendment October 2019
5. DOS Employees – CCA Rules – Amendment April 2022

2. DOS Study Leave Rules
    1. Study Leave Rules (Upto 1997)
    2. Study Leave Rules – Amendment – 2006
    3. Study Leave Rules – Amendment – 2015
    4. Study Leave Rules – Amendment – 2021
3. DOS Allotment of Residence Rules
4. DOS Book of Financial Powers
5. DOS Purchase Manual
6. DOS Stores Procedure
7. Transfer Policy – Transfer and posting of Officers in Administrative areas – guidelines
    1. Transfer policy - Transfer and posting of Officers in Administrative areas - guidelines
    2. Guidelines for Inter Centre Transfers in DOS/ISRO - for officials other than officers in Administrative

vi. A statement of the categories of documents that are held or under control

vii. The particulars of any arrangement that exists for consultation with or representation by the members of the public in relation to the formulation of policy or implementation thereof.

viii. A statement of the boards, councils, committees and other bodies consisting of two or more persons constituted as its part or for the purpose of its advice and as to whether meetings of those boards, councils, committees and other bodies are open to the public or the minutes of such meetings are accessible for public

ix. A directory of officers and employees

x. The monthly remuneration received by each of officers and employees including the system of compensation as provided in regulations

xi. The budget allocated to each of its agency indicating the particulars of all plans, proposed expenditures and reports on disbursements made

xii. The manner of execution of subsidy programmes including the amounts allocated and the details of beneficiaries of such programmes

xiii. Particulars of recipients of concessions, permits or authorizations granted.

1. The Department of Space does not give any concession or issue any permit/ authorization.

xiv. Details in respect of the information available to or held by it reduced in an electronic form

The relevant documents relating to procurement management, personnel management and management of services are held by the Department. The following documents are held by the Department:

1. Demands for Grants
2. Annual Report
3. DOS Purchase Manual
4. DOS Stores Procedure
5. DOS Book of Financial Powers
6. DOS Employees (CCA Rules)
    1. DOS Employees – CCA Rules – 1976
    2. DOS Employees – CCA Rules – Amendment October 2017
    3. DOS Employees – CCA Rules – Amendment January 2019
    4. DOS Employees – CCA Rules – Amendment October 2019
    5. DOS Employees – CCA Rules – Amendment April 2022
7. DOS Study Leave Rules
    1. Study Leave Rules (Upto 1997)
    2. Study Leave Rules – Amendment – 2006
    3. Study Leave Rules – Amendment – 2015
    4. Study Leave Rules – Amendment – 2021
8. DOS Allotment of Residence Rules
9. Norms for Recruitment and Career Prospects
10. Transfer policy - Transfer and posting of Officers in Administrative areas – guidelines
    1. Transfer policy - Transfer and posting of Officers in Administrative areas - guidelines
    2. Guidelines for Inter Centre Transfers in DOS/ISRO - for officials other than officers in Administrative

4.5

Right to Information

The above documents are available in electronic form only and no copies are available for sale.

xv. The particulars of facilities available to citizens for obtaining information including the working hours of a library or reading room, if maintained for public use.

xvi. The names, designations and other particulars of the Public Information Officers

1. List of Transparency Officer, Nodal Officers, Appellate Authority, Central Public Information Officers in DOS
2. List of Earlier CPIOs & FAAs from 1.1.2015

xvii. Other Information

1. Official tours of Officers at the level of Joint Secretary (JS) & above.
    1. January 2025 to March 2025
    2. October 2024 to December 2024
    3. July 2024 to September 2024
    4. April 2024 to June 2024
    5. January 2024 to March 2024
    6. April 2023 to June 2023
    7. January 2023 to March 2023
    8. October 2022 to December 2022
    9. July 2022 to September 2022
    10. April 2022 to June 2022
    11. January 2022 to March 2022
2. Telephone numbers and addresses of Secretary and other Officers/Officials of Department of Space dealing with Parliament work
3. Transfer and Posting of Officers in Administrative Areas
4. Audit Report of the DOS/ISRO on proactive disclosure under RTI Act, 2005 (2024-2025)
5. Details of tender bids awarded, names of suppliers, rates and total amount
6. Information regarding CAG and PAC paras as well as action taken reports (ATR) on those paras which have been laid on the table of both houses of parliament

7. Frequently asked Questions (FAQs)
8. Application Fee

6. List of PIOs and APIOs of DOS and ISRO Centres

7. Information under section 25(3) of right to information Act, 2005

8. Annual Report

9. Human Resources

10. Citizen's Charter

11. Public Grievances

12. ISRO's Timeline from 1960s to Today

During the period December 2023 to November 2024, **3313** applications were received and information was disseminated under the provisions of the RTI Act. **503** Appeals were received by the First Appellate Authority and **15** appellants approached the Second Appellate Authority, i.e., Central Information Commission.

4.6 Audit Observations

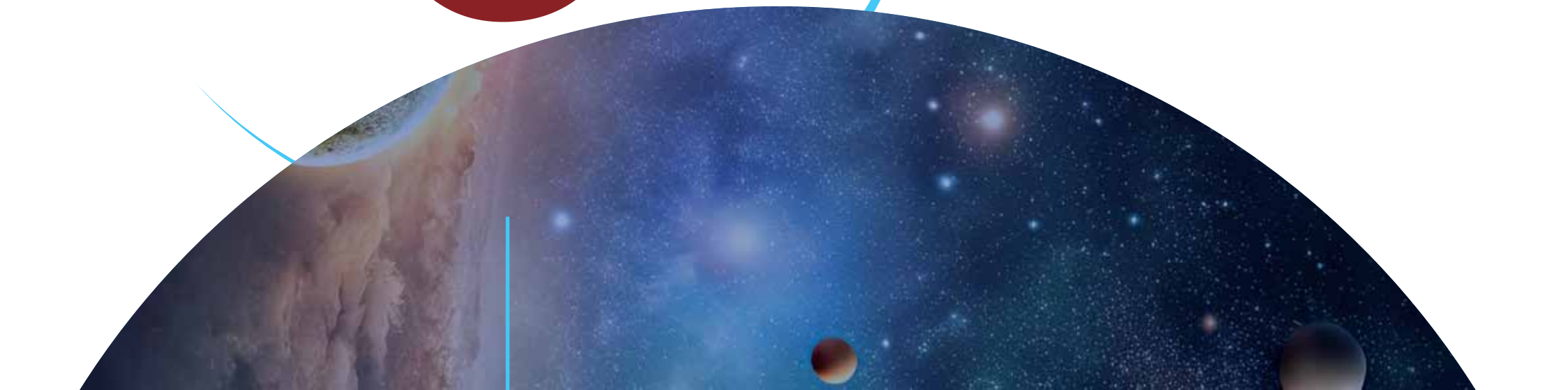
4.6.1 Status of the Action Taken Note (ATN)

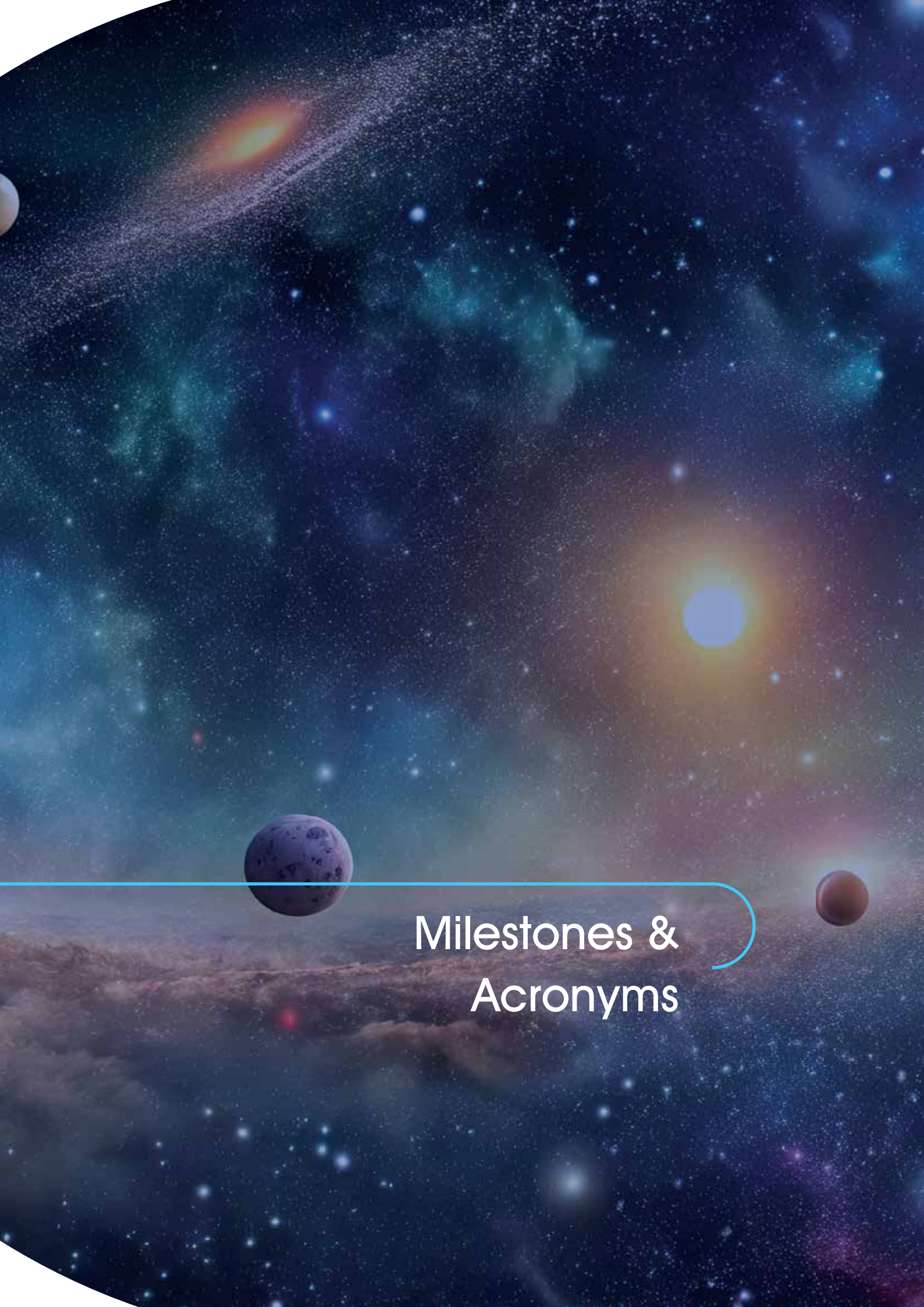
			Details of the Paras/PA reports on which ATNs are pending			
Sl. No	Year	No. of Paras/ PAC reports on which ATNs have been submitted to PAC after vetting by Audit	No. of ATNs not sent by the Ministry even for the 1st time	No. of ATNs sent by the Ministry and awaiting vetting by Audit	No. of ATNs sent but returned with observations and Audit is awaiting their resubmission by the Ministry	No. of ATNs which have been finally vetted by audit but have not been submitted by the Ministry to PAC
1	**2**	**3**	**4**	**5**	**6**	**7**
1	Report No.21 of 2022 (Para No.2.1) Management of fabrication activities at Vikram Sarabhai Space Centre	One	Nil	Nil	Nil	Nil
2	Report No.21 of 2022 (Para No.2.2) Avoidable investment of ₹28.09 crore	One	Nil	Nil	Nil	Nil
3	Report No.21 of 2022 (Para No.2.3) Avoidable payment of Taxes and Duties of ₹69.02 lakhs	One	Nil	Nil	Nil	Nil
4	Report No.21 of 2022 (Para No.2.4) Non-utilisation of GSAT-6 Satellite	One	Nil	Nil	Nil	Nil
5	Report No.21 of 2022 (Para No.2.5) Irregular expenditure of `7.57 crore towards development of Sullurupeta	One	Nil	Nil	Nil	Nil

			Details of the Paras/PA reports on which ATNs are pending			
Sl. No	Year	No. of Paras/ PAC reports on which ATNs have been submitted to PAC after vetting by Audit	No. of ATNs not sent by the Ministry even for the 1st time	No. of ATNs sent by the Ministry and awaiting vetting by Audit	No. of ATNs sent but returned with observations and Audit is awaiting their resubmission by the Ministry	No. of ATNs which have been finally vetted by audit but have not been submitted by the Ministry to PAC
1	**2**	**3**	**4**	**5**	**6**	**7**
6	Report No.24 of 2023 (Para No.2.1) Avoidable payment of ₹1.14 crore on electricity charges	One	Nil	Nil	Nil	Nil
7	Report No.24 of 2023 (Para No.2.2) Sub optimum utilisation of the capacities of GSAT-18 satellite	Nil	Nil	One	Nil	Nil
8	Report No.24 of 2023 (Para No.2.3) Short Closure of project for the development of Special Grade Carbon Fibre	One	Nil	Nil	Nil	Nil

CHAPTER

06





Milestones & Acronyms

5.1 Milestones

1962

- Indian National Committee for Space Research formed and the works on establishing Thumba Equatorial Rocket Launching Station (TERLS), started

1963

- First sounding rocket launch from TERLS (November 21, 1963)

1965

- Space Science and Technology Centre (SSTC) established in Thumba

1967

- Experimental Satellite Communication Earth Station (ESCES) set up at Ahmedabad

1968

- TERLS dedicated to the United Nations (February 2, 1968)

1969

- ISRO formed (August 15, 1969)

1972

- Space Commission and DOS set up. ISRO was brought under DOS (June 1, 1972)

1972-76

- Air-borne remote sensing experiments

1975

- ISRO becomes Government Organisation (April 1, 1975)
- First Indian Satellite, Aryabhata, launched (April 19, 1975)

1975-76

- Satellite Instructional Television Experiment (SITE) conducted

1977-79

- Satellite Telecommunication Experimental Project (STEP) carried out

1979

- Bhaskara-1, an experimental satellite for earth observations, launched (June 7, 1979)
- First Experimental launch of SLV-3 with Rohini Technology Payload onboard (August 10, 1979). The satellite could not be placed in orbit

1980

- Second Experimental launch of SLV-3. Rohini satellite successfully placed in orbit (July 18, 1980)

1981

- First developmental launch of SLV-3. RS-D1 placed in orbit (May 31, 1981)
- APPLE, an experimental geostationary communication satellite successfully launched (June 19, 1981)
- Bhaskara-II launched (November 20, 1981)

1982

- INSAT-1A launched (April 10, 1982). Deactivated on September 6, 1982

1983

- Second developmental launch of SLV-3. RS-D2 placed in orbit (April 17, 1983)
- INSAT-1B launched (August 30, 1983)

1984

- Indo-Soviet manned space mission (April 1984)

1987

- First developmental launch of ASLV with SROSS-1 satellite onboard (March 24, 1987). The satellite could not be placed in orbit

1988

- Launch of the first operational Indian Remote Sensing satellite, IRS-1A (March 17, 1988)
- Second developmental launch of ASLV with SROSS-2 onboard (July 13, 1988). The satellite could not be placed in orbit
- INSAT-1C launched (July 22, 1988). Abandoned in November 1989

1990

- INSAT-1D launched (June 12, 1990)
- Launch of second operational Remote Sensing satellite, IRS-1B (August 29, 1991)

1**992**

- Third developmental launch of ASLV with SROSS-C on board (May 20, 1992). Satellite placed in orbit
- INSAT-2A, the first satellite of the indigenously-built second-generation INSAT series, launched (July 10, 1992)

1993

- INSAT-2B, the second satellite in INSAT-2 series, launched (July 23, 1993)
- PSLV-D1, the first developmental launch of PSLV with IRS-1E onboard (September 20, 1993). The satellite could not be placed in orbit

5.1 Milestones

1994

- Fourth developmental launch of ASLV with SROSS-C2 onboard (May 4, 1994). Satellite placed in orbit
- PSLV-D2, the second developmental launch of PSLV with IRS-P2 onboard (October 15, 1994). The satellite was successfully placed in Polar Sun Synchronous Orbit

1995

- INSAT-2C, the third satellite in the INSAT-2 series, launched (December 7, 1995)
- Launch of the third operational Indian Remote Sensing Satellite, IRS-1C (December 28, 1995)

1996

- PSLV-D3, the third developmental launch of PSLV with IRS-P3 onboard (March 21, 1996). Satellite placed in Polar Sun Synchronous Orbit

1997

- INSAT-2D, the fourth satellite in INSAT-2 series, was launched (June 4, 1997). Becomes inoperable on October 4, 1997. (An in-orbit satellite, ARABSAT-1C, later renamed INSAT-2DT, was acquired in November 1997 to partly augment the INSAT system)
- PSLV-C1, the first operational launch of PSLV with IRS-1D onboard (September 29, 1997). Satellite placed in orbit

1998

- INSAT system capacity augmented with the readiness of INSAT-2DT acquired from ARABSAT (January 1998)

1999

- INSAT-2E, the last satellite in the multipurpose INSAT-2 series, launched by Ariane from Kourou, French Guiana (April 3, 1999)
- Indian Remote Sensing Satellite, IRS-P4 (Oceansat-1), launched by Polar Satellite Launch Vehicle (PSLV-C2) along with Korean KITSAT-3 and German DLR-TUBSAT from SDSC SHAR, Sriharikota (May 26, 1999)

2000

- INSAT-3B, the first satellite in the third generation INSAT-3 series, launched by Ariane from Kourou, French Guiana (March 22, 2000)

2001

- Successful flight test of Geosynchronous Satellite Launch Vehicle (GSLV-D1) on April 18, 2001, with an experimental satellite GSAT-1 onboard
- Successful launch of PSLV-C3 on October 22, 2001, placing three satellites – India's TES, Belgian PROBA, and German BIRD into Polar Sun Synchronous Orbit

2002

- Successful launch of INSAT-3C by Ariane from Kourou, French Guiana (January 24, 2002)
- Successful launch of KALPANA-1 by ISRO's PSLV-C4 from SDSC SHAR (September 12, 2002)

2003

- Successful launch of INSAT-3A by Ariane from Kourou, French Guiana (April 10, 2003)
- Successful launch of GSLV-D2, the second developmental test flight of GSLV with GSAT-2 onboard from SDSC SHAR (May 8, 2003)
- Successful launch of INSAT-3E by Ariane from Kourou, French Guiana (September 28, 2003)
- Successful launch of Resourcesat-1 by ISRO's PSLV-C5 from SDSC SHAR (October 17, 2003)

2004

- GSLV-F01, the first operational flight of GSLV from SDSC SHAR. EDUSAT successfully placed in GTO (September 20, 2004)

2005

- Successful launch of Cartosat-1 and HAMSAT by PSLV-C6 from the newly established Second Launch Pad at SDSC SHAR (May 5, 2005)
- Successful launch of INSAT-4A by Ariane from Kourou, French Guiana (December 22, 2005)

2006

- GSLV-F02, the second operational flight of GSLV from SDSC SHAR with INSAT-4C onboard (July 10, 2006). The satellite could not be placed in orbit

2007

- PSLV-C7 successfully launches four satellites – India's Cartosat-2 and Space Capsule Recovery Experiment (SRE-1) as well as Indonesia's LAPAN-TUBSAT and Argentina's PEHUENSAT-1 (January 10, 2007)
- Successful recovery of SRE-1 after manoeuvring it to re-enter the earth's atmosphere and descend over the Bay of Bengal about 140 km East of Sriharikota (January 22, 2007)
- Successful launch of INSAT-4B by Ariane launch vehicle from Korou, French Guiana, on March 12, 2007
- PSLV-C8 successfully launched an Italian satellite AGILE on April 23, 2007, under a commercial contract with Antrix Corporation
- Launch of GSLV-F04 with INSAT-4CR onboard from SDSC SHAR on September 2, 2007

5.1

Milestones

2008

- PSLV-C10 successfully launched TECSAR satellite on January 21, 2008, under a commercial contract with Antrix Corporation
- PSLV-C9 successfully launched ten satellites on April 28, 2008: India's Cartosat-2A, Indian Mini Satellite-1 (IMS-1), and eight Nanosatellites for International Customers under a commercial contract with Antrix Corporation
- PSLV-C11 successfully launched the Chandrayaan-1 spacecraft on October 22, 2008
- European Ariane-5 launch vehicle successfully launched W2M satellite on December 21, 2008, jointly built by Antrix / ISRO and EADS Astrium on a commercial basis

2009

- PSLV-C12 successfully launched RISAT-2 and ANUSAT on April 20, 2009
- PSLV-C14 successfully launches Oceansat-2 and six nanosatellites for international customers under a commercial contract with Antrix Corporation (September 23, 2009)

2010

- Successful static testing of GSLV Mk-III Launch Vehicle's S200 Solid Propellant Booster Rocket Stage (January 24, 2010)
- GSLV-D3, the first launch of GSLV with indigenous Cryogenic Upper Stage and GSAT-4 satellite onboard. GSAT-4 could not be placed in orbit (April 15, 2010)
- PSLV-C15, the seventeenth flight of PSLV, successfully launches India's Cartosat-2B and STUDSAT, Algeria's ALSAT-2A, Canada's NLS-1 and NLS-2 on (July 12, 2010)
- Successful Static Testing of GSLV Mk-III Launch Vehicle's L110 Liquid Core Stage (September 8, 2010)
- European Ariane-5 launch vehicle successfully launched HYLAS satellite on November 27, 2010, jointly built by Antrix / ISRO and EADS Astrium on a commercial basis
- GSLV-F06, the seventh launch of GSLV with GSAT-5P satellite onboard, could not place the satellite in orbit (December 25, 2010)

2011

- PSLV-C16 successfully launched India's Resourcesat-2, YOUTHSAT and X-SAT from Singapore on April 20, 2011
- GSAT-8 Communication Satellite launched by Ariane launcher from Kourou, French Guiana, on May 21, 2011
- PSLV-C17 successfully launched GSAT-12 Communication Satellite on July 15, 2011
- Second successful static testing of S-200 booster to be used in GSLV Mk-III on September 4, 2011
- PSLV-C18 successfully launched the Indo-French satellite Megha-Tropiques and three

co-passenger satellites – Jugnu from IIT, Kanpur, SRMSat from SRM University, Chennai and VesselSat–1 from Luxembourg – on October 12, 2011

2012

- PSLV, in its twenty-first flight (PSLV-C19), launched India's first Radar Imaging Satellite (RISAT-1) from Sriharikota on April 26, 2012
- In its twenty-second flight (PSLV-C21), PSLV successfully launched French earth observation satellite SPOT-6 along with Japanese microsatellite PROITERES from Sriharikota on September 09, 2012
- India's heaviest communication satellite, GSAT-10, was successfully launched by Ariane-5 VA 209 from Kourou, French Guiana, on September 29, 2012

2013

- PSLV, in its twenty-third flight (PSLV-C20), successfully launched Indo-French Satellite SARAL along with six smaller satellites from abroad from Sriharikota on February 25, 2013
- PSLV, in its twenty-fourth flight (PSLV-C22), successfully launched India's first dedicated navigation satellite IRNSS-1A from Sriharikota on July 01, 2013
- India's advanced weather satellite INSAT-3D was successfully launched by Ariane-5 VA- 214 from Kourou, French Guiana, on July 26, 2013
- India's advanced communication satellite GSAT-7 was successfully launched by Ariane-5 VA-215 from Kourou, French Guiana, on August 30, 2013
- Mars Orbiter Mission, India's first interplanetary mission to planet Mars, was successfully launched by PSLV-C25 from Sriharikota on November 05, 2013
- Trans Mars Injection Manoeuvre performed on Mars Orbiter Spacecraft on December 01, 2013, to place it in Mars Transfer Trajectory

2014

- In its first successful flight with indigenous Cryogenic Upper Stage, GSLV-D5 successfully placed GSAT-14 into GTO on January 05, 2014
- PSLV, in its twenty-sixth flight (PSLV-C24), successfully launched IRNSS-1B, the second satellite of the Indian Regional Navigation Satellite System (IRNSS) from SDSC SHAR, Sriharikota, on April 04, 2014
- PSLV-C23 Successfully launched French Earth Observation Satellite-SPOT 7 and four other co-passenger satellites from SDSC SHAR, Sriharikota, on June 30, 2014
- India's Mars Orbiter Spacecraft successfully entered into an orbit around planet Mars on September 24, 2014
- PSLV, in its twenty-eighth flight (PSLV-C26), successfully launched IRNSS-1C, the third satellite of the Indian Regional Navigation Satellite System (IRNSS) from SDSC SHAR, Sriharikota, on October 16, 2014

5.1

Milestones

- India's communication satellite, GSAT-16 successfully launched by the Ariane-5 VA221 from Kourou, French Guiana, on December 07, 2014
- The first experimental suborbital flight (LVM3-X / CARE) of India's next-generation launch vehicle LVM3 (GSLV Mk-III) was successfully conducted from Satish Dhawan Space Centre SHAR, Sriharikota on December 18, 2014. The CARE module carried onboard to a height of 126 km successfully recovered

2015

- PSLV-C27 Successfully Launches India's Fourth Navigation Satellite IRNSS-1D on March 28, 2015 from SHAR, Sriharikota
- PSLV-C28 successfully launched three identical DMC3 commercial Earth Observation Satellites, along with two smaller satellites from the United Kingdom, into a polar Sun Synchronous Orbit on July 10, 2015, from SHAR, Sriharikota
- Geosynchronous Satellite Launch Vehicle (GSLV-D6), equipped with the indigenous Cryogenic Upper Stage (CUS), successfully launched 2117 kg GSAT-6 into a GTO on August 27, 2015, from SHAR, Sriharikota
- AstroSat, India's first dedicated astronomy satellite successfully launched by PSLV-C30 on September 28, 2015, from SHAR. Along with AstroSat, six satellites from international customers - LAPAN-A2 of Indonesia, NLS-14 (Ev9) of Canada, and four identical LEMUR satellites of the USA – were also launched by this PSLV flight
- The 3164 kg GSAT-15 carrying Ku-band transponders and GAGAN payload was launched successfully by the European Ariane-5 VA-227 from Kourou, French Guiana, on November 11, 2015
- In its thirty-second flight conducted from SDSC SHAR, Sriharikota on December 16, 2015, PSLV-C29 successfully launched six satellites from Singapore (400 kg TeLEOS-1 as primary satellite and five other co-passenger payloads)

2016

- The Polar Satellite Launch Vehicle, in its 33rd flight (PSLV-C31), launches IRNSS-1E, the fifth satellite of the Indian Regional Navigation Satellite System (IRNSS), on January 20, 2016, from SDSC SHAR, Sriharikota
- The Polar Satellite Launch Vehicle, in its 34th flight (PSLV-C32), launches IRNSS-1F, the sixth satellite of the Indian Regional Navigational Satellite System (IRNSS) on March 10, 2016, from SDSC SHAR, Sriharikota
- The Polar Satellite Launch Vehicle, in its 35th flight (PSLV-C33), launches IRNSS-1G, the seventh satellite of the Indian Regional Navigation Satellite System (IRNSS), into a Sub-Geosynchronous Transfer Orbit (Sub-GTO) on April 28, 2016, from SDSC SHAR, Sriharikota

- India's Reusable Launch Vehicle-Technology Demonstrator (RLV-TD), successfully flight tested on May 23, 2016, from SDSC SHAR, Sriharikota. RLV-TD is one of the most technologically challenging endeavors of ISRO towards developing essential technologies for a fully reusable launch vehicle to enable low-cost access to space
- India's Polar Satellite Launch Vehicle, in its 36th flight (PSLV-C34), launches the 727.5 kg Cartosat-2 Series Satellite for earth observation and 19 co-passenger satellites together weighing about 560 kg at lift-off into a 505 km polar Sun Synchronous Orbit (SSO) on June 22, 2016, from Sriharikota. The co-passenger satellites are from the USA, Canada, Germany, and Indonesia, as well as two satellites (SATHYABAMASAT and SWAYAM) from the Indian University / Academic Institute
- 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 SHAR
- India's Geosynchronous Satellite Launch Vehicle (GSLV), in its tenth flight (GSLV-F05), launches INSAT-3DR, an advanced weather satellite weighing 2,211 kg into a Geostationary Transfer Orbit (GTO) on September 08, 2016, from SDSC SHAR, Sriharikota
- India's Polar Satellite Launch Vehicle, in its 37th flight (PSLV-C35), launches the 371 kg SCATSAT-1 for weather-related studies and seven co-passenger satellites into polar Sun Synchronous Orbit (SSO) on September 26, 2016, from SDSC SHAR Sriharikota. Co-passenger satellites are ALSAT-1B, ALSAT-2B, ALSAT-1N from Algeria, NLS-19 from Canada, and Pathfinder-1 from USA, as well as two satellites PRATHAM from IIT Bombay and PISAT from PES University, Bengaluru
- India's latest communication satellite, GSAT-18, was inducted into the INSAT / GSAT system on October 06, 2016, from Kourou, French Guiana, by Ariane-5 VA-231. Weighing 3,404 kg at lift-off, GSAT-18 carries 48 communication transponders to provide services in Normal C-band, Upper Extended C-band, and Ku-bands of the frequency spectrum along with a Ku-band beacon for accurately pointing ground antennas towards the satellite
- In its 38th flight (PSLV-C36), ISRO's Polar Satellite Launch Vehicle successfully launched a 1,235 kg Resourcesat-2A Satellite on December 07, 2016, from Satish Dhawan Space Centre SHAR, Sriharikota. This is the 37th consecutively successful mission of PSLV

2017

- In its thirty-ninth flight (PSLV-C37), ISRO's Polar Satellite Launch Vehicle successfully launched the 714 kg Cartosat-2 Series Satellite along with 103 co-passenger satellites on February 15, 2017, from SHAR, Sriharikota. This is the thirty-eighth consecutively successful mission of PSLV. The total weight of all the 104 satellites carried onboard PSLV-C37 was 1378 kg. This is the highest number of satellites launched in a Single Flight

5.1 Milestones

- India's Geosynchronous Satellite Launch Vehicle, in its eleventh flight (GSLV-F09), successfully launched the 2230 kg South Asia Satellite (GSAT-9) from SDSC SHAR, Sriharikota, into its planned Geosynchronous Transfer Orbit (GTO) on May 05, 2017. This is the fourth consecutive success achieved by GSLV carrying indigenously developed Cryogenic Upper Stage
- The first developmental flight (GSLVMk-III D1) of India's heavy-lift launch vehicle GSLV Mk-III was successfully conducted on June 05, 2017, from SHAR, Sriharikota, with the launch of the GSAT-19 satellite. This was the first orbital mission of GSLVMk-III, which was mainly intended to evaluate the vehicle's performance, including that of its fully indigenous cryogenic upper stage during the flight. Weighing 3136 kg at lift-off, GSAT-19 is the heaviest satellite launched from Indian soil
- ISRO's Polar Satellite Launch Vehicle PSLV-C38 successfully launched the 712 kg Cartosat-2 Series Satellite along with 30 co-passenger satellites on June 23, 2017, from SHAR, Sriharikota. This is the thirty-ninth consecutively successful mission of PSLV
- India's communication satellite, GSAT-17, was inducted into the INSAT/GSAT system on June 29, 2017, from Kourou, French Guiana by Ariane-5 VA-238. The 3477 kg GSAT-17 carries communication payloads in C-band, Extended C-band, and S-band for providing various services to the country. The satellite also carries equipment for meteorological data relay and satellite-based search and rescue services
- The forty-first flight of India's Polar Satellite Launch Vehicle (PSLV-C39), carrying IRNSS-1H Navigation Satellite, conducted on August 31, 2017, from Satish Dhawan Space Centre SHAR, Sriharikota, was unsuccessful

2018

- In its 42nd flight, PSLV-C40 successfully launched the 710 kg Cartosat-2 Series Remote Sensing Satellite along with 30 co-passenger satellites on January 12, 2018, from SHAR, Sriharikota. The co-passenger satellites comprise one microsatellite and one nanosatellite from India as well as 3 microsatellites and 25 Nanosatellites from six countries, namely, Canada, Finland, France, the Republic of Korea, the UK and the USA
- GSLV-F08, in its 12th flight as a Geosynchronous Satellite Launch Vehicle (GSLV) launched GSAT-6A from the Second Launch Pad (SLP) in SHAR, Sriharikota, on March 29, 2018. However, the satellite lost communication with the ground station
- India's Polar Satellite Launch Vehicle, in its forty-third flight (PSLV-C41) in, launched IRNSS-1I Satellite from First Launch Pad (FLP) of SDSC SHAR, Sriharikota, on April 12, 2018. The IRNSS-1I is the eighth satellite to join the NavIC navigation satellite constellation
- A major technology demonstrator called as Pad Abort Test was successfully carried out at SHAR, Sriharikota, on July 05, 2018. This was one of the tests to qualify for a Crew Escape System, a critical human spaceflight technology. The first Pad Abort Test

demonstrated the safe recovery of the crew module in case of any exigency at the launch pad

- PSLV-C42 Successfully Launched two foreign satellites from SDSC, SHAR, Sriharikota on September 16, 2018. This mission launched two earth observation satellites, NovaSAR and S1-4 (together weighing nearly 889 kg) of M/s Surrey Satellite Technologies Limited (SSTL), the United Kingdom, under commercial arrangement with Antrix Corporation Limited
- On November 14, 2018, GSLV Mk-III D2 successfully launched a communication satellite, GSAT-29, into orbit weighing about 3423 kg from SDSC SHAR, Sriharikota
- PSLV-C43, on November 29, 2018, successfully launched India's Hyperspectral Imaging Satellite (HysIS) and 30 international co-passenger satellites. HysIS, the primary satellite of the PSLV-C43 mission, weighing about 380 kg, is an earth observation satellite configured around Indian Mini Satellite-2 (IMS-2) bus. The co-passengers of HysIS include 1 Microsatellite and 29 nanosatellites from 8 different countries. These satellites have been commercially contracted for launch through Antrix Corporation Limited, the commercial arm of ISRO
- ISRO's next-generation high throughput communication satellite, GSAT-11, was successfully launched on December 05, 2018, from the Kourou launch base, French Guiana, by Ariane-5 VA-246. Weighing about 5854 kg, GSAT-11 is the heaviest satellite built by ISRO. GSAT-11 is the forerunner in the series of advanced communication satellites with multi-spot beam antenna coverage over the Indian mainland and Islands. GSAT-11 will play a vital role in providing broadband services across the country. It will also provide a platform to demonstrate new-generation applications
- GSLV-F11 successfully launched GSAT-7A, ISRO's 39th communication satellite, on December 19, 2018, from the Second Launch Pad (SLP) of SHAR, Sriharikota. GSAT-7A, with a lift-off mass of 2250 kg, is a geostationary satellite carrying communication transponders in Ku-band. The Satellite is built to provide communication capability to users over the Indian region

2019

- PSLV-C44 successfully launched Microsat-R and Kalamsat-V2 on January 24, 2019, from Sriharikota
- On February 06, 2019, GSAT 31 was successfully launched from Kourou, French Guiana, on board the Arianespace rocket
- EMISAT and 28 customer satellites were successfully launched onboard PSLV-C45 on April 01, 2019, from Sriharikota. The launch viewing gallery was inaugurated and opened to the public for viewing launches live from Sriharikota
- On May 22, 2019, RISAT-2B satellite was successfully launched onboard PSLV-C46 from Sriharikota

5.1 Milestones

- Chandrayaan-2 satellite was successfully launched into an earth orbit by GSLV Mk-III M1 on July 22, 2019
- On November 27, 2019, Cartosat-3 and 13 customer satellites were successfully launched by PSLV-C47 from Sriharikota
- On December 11, 2019, PSLV-C48 successfully launched RISAT-2BR1satellite and 9 customer satellites from Sriharikota

2020

- On January 17, 2020, GSAT-30 was successfully launched from Kourou, French Guiana, on board the Arianespace Ariane-5 VA-251 rocket
- EOS-01 and nine customer satellites were successfully launched by PSLV-C49 on November 07, 2020, from Sriharikota
- PSLV-C50 successfully launched CMS-01 on December 17, 2020, from Sriharikota

2021

- On February 28, 2021, PSLV-C51 successfully launched Amazonia-1 and 18 co-passenger satellites from Sriharikota. It marked the first dedicated launch for NSIL. Out of 18 co-passengers, four were from IN-SPACe and the remaining from NSIL
- GSLV-F10 carrying EOS-03 was launched from Sriharikota on August 12, 2021. The mission could not be accomplished as intended due to a technical anomaly

2022

- On February 14, 2022, PSLV-C52 injected Earth Observation Satellite EOS-04, a Radar Imaging Satellite designed to provide high-quality images under all weather conditions, into an intended sun-synchronous polar orbit. It also placed a student satellite, INSPIREsat-1 and a technology demonstrator satellite, INS-2TD, which is a precursor to India-Bhutan Joint Satellite (INS-2B)
- On June 22, 2022, GSAT-24, a communication satellite weighing 4180 kg with Pan India coverage for meeting DTH applications, was launched successfully through Arianespace. It was the first Demand Driven mission by NSIL, post space reforms
- On June 30, 2022, PSLV-C53 launched three satellites DS-EO satellite, NeuSAR satellite, and SCOOB-I satellite. All satellites belonged to Singapore.This was the second dedicated commercial mission of NewSpace India Limited (NSIL). This mission performed PSLV Orbital Experimental Module (POEM) activity to conduct scientific experiments using the spent PS4 stage as an orbital platform. It was first time that the PS4 stage would orbit the earth as a stabilized platform
- On August 7, 2022, the first developmental flight of a small satellite launch vehicle (SSLV) was conducted. The vehicle could not place the satellites into 356 km circular orbits but placed in 356 km x 76 km elliptical orbit and thus fell short of its target

- On October 23, 2022, LVM3 placed 36 satellites of OneWeb in their intended orbits. This was a dedicated commercial mission for a foreign customer through NSIL. This was one of the biggest commercial orders executed by ISRO. With this launch, the LVM3 enters into the global market in a grand manner
- On November 18, 2022, the first launch of a launch vehicle built by a private company in India was accomplished. Vikram-S, a suborbital launch vehicle from M/s Skyroot Aerospace Pvt. Ltd., Hyderabad, was launched successfully from SDSC, Sriharikota
- A private launch pad and mission control center was established within the ISRO campus at SDSC SHAR, Sriharikota, for the first time. The launch pad is designed and operated by a private company, an Indian space-tech start-up, Agnikul. It was inaugurated by Chairman ISRO, on November 25, 2022
- On November 26, 2022, PSLV-C54 successfully launched the EOS-06 satellite along with eight nanosatellites into two different SSPOs. The mission used two Orbit Change Thrusters (OCTs) introduced in the Propulsion Bay Ring of the Vehicle to achieve two different orbits. Nanosatellites included the India-Bhutan Satellite

2023

- On February 10, 2023, SSLV-D2 injected Earth Observation Satellite EOS-07, having experiments including mm-Wave Humidity Sounder and Spectrum Monitoring Payloads. It also placed Janus-1 of Antaris, USA and AzaadiSAT-2 realised by 750 girl students across India guided by Space Kidz India, Chennai
- On March 26, 2023, the LVM3 M3 vehicle launched 36 numbers of OneWeb India-2 satellites into their intended 450 km circular orbit with an inclination of 87.4 degrees. This contract was executed through NSIL
- On April 2, 2023, the Reusable Launch Vehicle Autonomous Landing Mission (RLV LEX) was conducted. The test was performed at the Aeronautical Test Range (ATR), Chitradurga, Karnataka. The autonomous landing was carried out under the exact conditions of a Space Re-entry vehicle's landing "high speed, unmanned, precise landing from the same return path" as if the vehicle arrives from space
- On April 22, 2023, PSLV-C55 vehicle successfully launched TeLEOS-2 satellite. This is a dedicated commercial mission through NSIL with TeLEOS-2 as primary satellite and Lumelite-4 as a co-passenger satellite. The satellites weigh about 741 kg and 16 kg, respectively. The mission had the PSLV Orbital Experimental Module (POEM), where the spent PS4 stage of the launch vehicle would be utilized as an orbital platform to carryout scientific experiments through non-separating payloads. The payloads belong to ISRO/Department of Space, Bellatrix, Dhruva Space, and the Indian Institute of Astrophysics
- On May 29, 2023, GSLV-F12 vehicle deployed the NVS-01 navigation satellite, weighing about 2232 kg, into a Geosynchronous Transfer Orbit. NVS-01 is the first of the

5.1

Milestones

second- generation satellites envisaged for the Navigation with Indian Constellation (NavIC) services. NVS series of satellites will sustain and augment the NavIC with enhanced features and incorporate L1 band signals additionally to widen the services.

- On July 14, 2023, the LVM-3 M4 vehicle, in its fourth operational flight, launched Chandrayaan-3 to a precise Geo Transfer Orbit (GTO).
- On July 30, 2023, PSLV-C56 launched DS-SAR satellite, along with 6 co-passengers. Configured in its core-alone mode, C56 launched a 360 kg satellite into a Near-Equatorial Orbit (NEO) at 5 degrees' inclination and 535 km altitude.
- On August 5, 2023, following a series of manoeuvres, Chandrayaan-3 was inserted into the lunar orbit. The lander module was successfully separated from the propulsion module on August 17, 2023. The lander module was brought to a 25 km x 134 km orbit around the moon on August 20, 2023.
- On August 23, 2023, Chandrayaan-3 soft-landed on the moon.
- On August 24, 2023, the rover descended on the lunar surface. For over 14 Earth days, in-situ scientific experiments were conducted on the moon, near its south pole.
- On September 03, 2023, a hop test was conducted on Chandrayaan-3 lander. On October 13, 2023, the propulsion module was brought to an Earth-bound orbit, demonstrating the capability of Earth-return manoeuvres.
- On September 2, 2023, PSLV-C57 launched Aditya L1, the first Indian solar observatory, into precise orbit. Four manoeuvres and a planned trajectory correction manoeuvre ensured Aditya-L1's Trans-Lagrangean Point 1 Insertion (TL1I) on October 8, 2023.
- On October 18, 2023, the Gaganyaan TV D1 Test Flight was accomplished. The Crew Escape System performed as intended. Performance of various separation systems incorporated into the Crew Escape System, the characteristics and deceleration systems demonstration at higher altitude & its recovery was demonstrated

2024

- The Aditya-L1 observatory was successfully injected into Halo orbit L1 on January 6, 2024
- PSLV-C58 successfully launched XPoSat, (X-ray Polarimeter Satellite) India's first dedicated polarimetry mission to study various dynamics of bright astronomical X-ray sources in extreme conditions on January 1, 2024, into the intended orbit. Both the XSPECT and POLIX payloads began astronomical observations during January and February respectively
- PSLV-C58 had the PSLV Orbital Experimental Module-3 (POEM-3) that successfully conducted 10 experiments through payloads identified and supplied by ISRO and IN-SPACe

- On February 17, 2024, GSLV-F14 successfully deployed INSAT-3DS, a meteorological satellite into the Geosynchronous Transfer Orbit (GTO). GSLV-F14/INSAT-3DS mission is fully funded by the Ministry of Earth Sciences (MoES). The satellite initiated Earth imaging operations with the first set of images captured on March 7, 2024
- On March 22, 2024, the Reusable Launch Vehicle Autonomous Landing Mission (RLV LEX-02) landing experiment, the second of the series, was conducted at Aeronautical Test Range (ATR), Chitradurga in Karnataka. After accomplishment of RLV-LEX-01 mission in last year, RLV-LEX-02 demonstrated the autonomous landing capability of RLV from off-nominal initial conditions at release from Helicopter. The RLV was made to undertake more difficult manoeuvres with dispersions, correct both cross-range and downrange and land on the runway in a fully autonomous mode.
- On June 23, 2024, Reusable Launch Vehicle Autonomous Landing Mission (RLV LEX - 03) was conducted at the Aeronautical Test Range (ATR) in Chitradurga, Karnataka. RLV LEX-03 re-demonstrated the autonomous landing capability of the RLV under more challenging release conditions (cross range of 500 m against 150 m for LEX-02) and more severe wind conditions.
- On July 22, 2024, the second experimental flight for the demonstration of Air Breathing Propulsion Technology was carried out. The Propulsion systems were symmetrically mounted on either side of a RH-560 Sounding rocket and launched from SDSC, Sriharikota. The flight test achieved satisfactory performance of the Sounding Rocket along with successful ignition of the Air Breathing propulsion systems.
- On August 16, 2024, the third developmental flight of SSLV was successfully launched. The SSLV-D3, in its third and final development flight, launched EOS-08 satellite.
- On Nov 19, 2024, GSAT-N2 satellite was successfully launched on-board Falcon-9 of M/s SpaceX, USA.
- On Dec 05, 2024, PSLV-C59 vehicle launched Proba-3 satellite. This is a dedicated commercial mission conducted through NSIL, featuring the launch of the Proba-3 satellite for an In-Orbit Demonstration (IOD) mission aimed at showcasing precise formation flying. The mission comprised of two spacecrafts viz., the Coronagraph Spacecraft (CSC) and the Occulter Spacecraft (OSC), both launched together in a stacked configuration.
- On December 30, 2024, PSLV-C60 vehicle successfully launched SpaDeX satellites. SpaDeX mission is a cost-effective technology demonstrator mission for the demonstration of in-space docking. The SpaDeX mission consists of two small spacecraft (about 220 kg each) which are launched independently and simultaneously, into a 470 km circular orbit at 55° inclination.
- PSLV-C60 had the PSLV Orbital Experimental Module-4 (POEM-4) that carried a total of 24 payloads, of which 14 payloads are from ISRO/DOS Centres and 10 payloads are

5.1

Milestones

from various Non-Government Entities (NGEs) comprising Academia and Start-ups that have been received through IN-SPACe.

2025

- On January 6, 2025, ISRO shared the first batch of scientific data from Aditya-L1 -India's pioneering solar observatory - with scientists worldwide at ISRO Headquarters in Bengaluru.
- On January 16, 2025, ISRO successfully completed docking of two SPADEX satellites (SDX-01 & SDX-02). After the first docking, undocking, and circumnavigation, the two spacecrafts were docked again on April 20, 2025. The spacecraft then switched to combined control mode, and power transfer between them was tested and completed successfully on April 21, 2025.
- On January 21, 2025, a Public-Private Partnership (PPP) was initiated by formal agreement for establishing 12 Earth Observation satellite constellation in order to enhance India's satellite surveillance capabilities.
- On January 29, 2025, GSLV-F15 vehicle launched NVS-02 satellite weighing about 2250 kg, into a Geosynchronous Transfer Orbit. This launch marked the 100th Launch from the India's Spaceport - Sriharikota.
- ISRO developed the first "Make-In-India" 32-bit Microprocessors for space applications jointly with SCL, Chandigarh. On March 5, 2025, the first batches of two 32-bit microprocessors for space use were handed to Department of Space (DoS) by Ministry of Electronics and Information Technology (MeitY).
- On March 27, 2025, ISRO successfully completed the life test of 1000hrs on the 300mN Stationary Plasma Thruster, that is developed for induction into the Electric Propulsion System of satellites.
- On May 18, 2025, PSLV-C61 mission, ISRO's 101st launch endeavour, was attempted and performance was normal till 2nd stage. Due to an observation in 3rd stage, the mission could not be accomplished.
- During March to May, 2025, a series of hot tests for Semi-cryo engine Power Head Test Article (PHTA) were successfully completed.
- On June 16, 2025, Honourable Minister of Home Affairs of India, Shri Amit Shah inaugurated the Integrated Control Room for Emergency Response (ICR-ER). It is established as a national command center using ISRO's satellite data for real time disaster management.
- On June 25, 2025, Axiom-04 mission was launched by SpaceX with ISRO astronaut Shubhanshu Shukla aboard a Dragon spacecraft. During the historic 18-day scientific stay at the International Space Station (ISS), Group Captain Shubhanshu Shukla completed a suite of seven microgravity experiments aimed at enhancing understanding of human spaceflight and microgravity science and returned back to earth safely.

- On July 30, 2025, NASA-ISRO Synthetic Aperture Radar (NISAR), the first joint satellite of ISRO and NASA was launched successfully by ISRO's GSLV-F16 Mission from Satish Dhawan Space Centre, Sriharikota.
- On August 8, 2025, first static test of the KALAM 1200 Motor - the first stage of Vikram-1 Launch Vehicle of a private startup, M/s Skyroot Aerospace Pvt. Ltd. (SAPL) is accomplished successfully by ISRO in Satish Dhawan Space Centre, Sriharikota.
- On August 24, 2025, ISRO accomplished first Integrated Air Drop Test (IADT-01) for Gaganyaan program at Satish Dhawan Space Centre (SDSC), Sriharikota.
- On August 27, 2025, Dr. V. Narayanan, Chairman, ISRO / Secretary, Department of Space laid the foundation for the Launch Pad at the SSLV Launch Complex (SLC) at Kulasekarapattinam, Tuticorin Dt., Tamil Nadu.
- On September 10, 2025, a technology transfer agreement was signed between NewSpace India Limited, ISRO, IN-SPACe & Hindustan Aeronautics Limited (HAL) for the transfer of the Small Satellite Launch Vehicle (SSLV) technology at ISRO Headquarters, Bangalore.
- On November 02, 2025, LVM3 launch vehicle successfully launched the heaviest Indian communication satellite, CMS-03, a multi-band communication satellite, into Geosynchronous Transfer Orbit (GTO). This mission (LVM3-M5) also successfully achieved the first-ever in-space restart of its indigenously developed C25 cryogenic upper stage, powered by the CE-20 engine.
- Physical Research Laboratory (PRL), Ahmedabad, discovered a new exoplanet, TOI-6038A b, having a dense sub-Saturn size with a mass of 78.5 Earth masses and a radius of 6.41 Earth radii in a wide binary system. The planet orbits a bright, metal-rich F-type star every 5.83 days in a circular orbit.
- On December 24, 2025, LVM3 launch vehicle successfully launched the BlueBird Block-2 communication satellite of AST SpaceMobile, USA into its intended orbit. This mission marks the 6th operational flight of LVM3.

5.2 Acronyms

AAI	Airport Authority of India
ACL	Antrix Corporation Limited
ACCF	Automated Continuous Cleaning Facility
AEB	Brazilian Space Agency
AET	Actual Evapotranspiration
AF	Active Fire
AGB	Above Ground Biomass
AGEOS	Antarctica Ground Station for Earth Observation Satellites
AI	Artificial Intelligence
AIDAA	Italian Association of Aeronautics and Astronautics
AJNIFM	Arun Jaitley National Institute of Financial Management
AL1SC	Aditya-L1 Support Cell
AM	Additive Manufacturing
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
ANUSAT	Anna University Satellite
AO	Announcement of Opportunity
AOD	Aerosol Optical Depth
APEP	Ammonium Perchlorate Experimental Plant
APPLE	Ariane Passenger Payload Experiment
APV	Approach with Vertical Guidance
APXS	Alpha Particle X-ray Spectrometer
AQUA	Aqua Earth-Observing Satellite Mission
ARIES	Aryabhatta Research Institute of Observational Sciences
APPF	AP Process Facility
AS	Arabian Sea
ASA	Australian Space Agency
ASAAN	Applications of Space Techniques for Agricultural Assessment in NER
ASCI	Administrative Staff College of India
ASDMA	Assam State Disaster Management Authority
ASI	Italian Space Agency
ASI	Astronautical Society of India
ASIC	Application Specific Integrated Circuit
ASLP	Augmentation of Second Launch Pad Project

ASLV	Augmented Satellite Launch Vehicle
ASMS	Aquifer Sustainability Management System
ASSC	AstroSat Support Cell
ADRIN	Advanced Data Processing Research Institute
ATF	Astronaut Training Facility
ATN	Action Taken Note
ATR	Aeronautical Test Range
AV	Audio- Video
AVCF	Antariksh Venture Capital Fund
AVIRIS-NG	Airborne Visible / Infrared Imaging Spectrometer – Next Genration
AWiFS	Advanced Wide Field Sensor
AWS	Amazon Web Services
BAH	Bharatiya Antariksh Hackathon
BAS	Bharatiya Antariksh Station
BE	Budget Estimate
BIEC	Bangalore International Exhibition Centre
BIRD	Bispectral and Infrared Remote Detection
BIS	Bureau of Indian Standards
BISAG-N	Bhaskaracharya National Institute for Space Applications and Geo-informatics
BMGE	Bharat Mobility Global Expo
BRO	Border Roads Organisation
BSNL	Bharat Sanchar Nigam Limited
BTS	Bangalore Tech Summit
CANSAT	Can Satellite
CAQM	Commission for Air Quality Management
CARE	Acre Module Atmospheric Re-entry Experiment
CAS	Control Actuator System
CATF	Compact Antenna Test Facility
CBRI	Central Building Research Institute
C-DAC	Centre for Development of Advanced Computing
CDMA	Code Division Multiple Access
CDMP	Centralised Demineralized Water Plant
CE	Cryogenic Engine

5.2

Acronyms

CECS	Crew Escape systems Conical Shroud
CeNSE	Centre for Nano Science and Engineering
CEOS	Committee on Earth Observation Satellites
CEOS	Crew Escape systems Ogive Shroud
CES	Crew Escape System
CESB	Crew Emergency Safety Building
CGMS	Coordination Group for Meteorological Satellites
CHACE	CHandra's Atmospheric Composition Explorer
CI	Convective Initiation
CII	Confederation of Indian Industry
CJM	CES Jettisoning Motor
CM	Crew Module
CME	Continuing Medical Education
CME	Coronal Mass Ejections
CMICF	Crew Module Integration and Checkout Facility
CMPS	Crew Module Propulsion System
CMS	Communication & Data Relay Satellite
CMUS	Crew Module Up-righting System
CNC	Computer Numerical Control
CO	Carbon Monoxide
CoE	Centre of Excellence
COO	Chief Operating Officer
CORS	Continuously Operating Reference Station
COSPAR	Committee on Space Research
COSPAS	Cosmicheskaya Sistema Poiska Avariynich Sudov
CPSE	Central Public Sector Enterprise
CRIS	Centre for Railway Information System
CSA	Charge Sensitive Amplifier Crew Seat Assembly
CSC	Centre Safety Committee
CSC	Coronagraph Spacecraft
CSIR	Council of Scientific and Industrial Research
CSR&SD	Corporate Social Responsibility and Sustainable Development
CSSTEAP	Centre for Space Science and Technology Education in Asia and the Pacific

CTF	Common Technical Facilities
CTPT	Cryogenic Turbo Pump Test Facility
CUG	Closed User Group
CUS	Cryogenic Upper Stage
CWC	Central Water Commission
DAE	Department of Atomic Energy
DAT	Distress Alert Transmitter
DAT-SG	Distress Alert Transmitter - Second Generation
DCS	Data Communication System
DD	Doordarshan
DES	Delhi Earth Station
DFSAR	Dual Frequency Synthetic Aperture Radar
DGFT	Directorate General of Foreign Trade
DHRC	Directorate for Human Rating Certification
DISHA	Disturbed and quiet-time Ionosphere-thermosphere System at High Altitudes
DLR	German Aerospace Centre
DM	Demineralised
DMC	Disaster Monitoring Constellation
DMS	Disaster Management Support
DMSP	Disaster Management Support Programme
DoHS	Directorate of Health Services
DOL	Department of Official Language
DoS	Department of Space
DoT	Department of Telecommunications
DPE	Department of Public Enterprises
DR	Disaster Recovery
DSNG	Digital Satellite News Gathering
DSRQ	Directorate of Safety, Reliability and Quality
DSS	Decision Support System
DST	Department of Science & Technology
DTH	Direct-to-home
DWR	Doppler Weather Radars
EADS	European Aeronautic Defence and Space Company

5.2 Acronyms

EC	European Commission
ECIL	Electronics Corporation of India Limited
ECLSS	Environment Control and Life Support System
ECMWF	European Centre for Medium Range Weather Forecasts
ECV	Essential Climate Variable
EDUSAT	Educational Satellite
EGC	Engine Gimbal Control
EIA	Equatorial Ionization Anomaly
EMA	Electromechanical actuators
EMISAT	Electromagnetic Intelligence Gathering Satellite
EMU	Electric Multiple Unit
ENSO	El Niño–Southern Oscillation
EO	Earth Observation
EOS	Earth Observation Satellite
EPB	Earth's Equitorial Plasma Bubble
ERNET	Education and Research Network
ERT	Electrical Resistivity Tomography
ESA	European Space Agency
ESCES	Experimental Satellite Communication Earth Station
ESTEC	European Space Research and Technology Centre
EUMETSAT	European Organisation for Exploitation of Meteorological Satellites
EWG	Expert Working Group
EWS	Early Warning System
FGDTs	Fundamental Geospatial Data Themes
FIR	Flight Information Region
FLEWS	Flood Early Warning System
FLO	Fork Lift Operator
FLP	First Launch Pad
FOC	Full Operations Capability
FRAMS	Forest Resource Analysis & Management System
FS	Financial Sanction
GAC	Global Area Coverage
GAGAN	GPS Aided Geo Augmented Navigation
GB	Giga Bytes

Gbps	Gigabits per second
GDB	GNSS Digital Baseband
GDD	Growing Degree Days
GDP	Gross Domestic Product
GEDI	Global Ecosystem Dynamics Investigation
GeM	Government e-Marketplace
GEO	Geostationary Earth Orbit
GEOLUT	Geostationary Earth Orbiting Local User Terminal
Geo MGNREGA	GIS Implementation of MGNREGA
GG	Gas Generator
GHe	Gaseous Helium
GH2	Gaseous Hydrogen
GIGW	Guidelines for Indian Government Websites
GIS	Geographical Information System
GLCRS	Gaganyaan Launch Complex & Recovery Systems
GLEX	Global Space Exploration Conference
GLOF	Glacial Lake Outburst Flood
GloFASS	Global Flood Awareness System
GNSS	Global Navigation Satellite System
GN2	Gaseous Nitrogen
GoI	Government of India
GPR	Ground Penetrating Radar
GPS	Global Positioning System
GSaaS	Ground Station as a Service
GSAT	Geosynchronous Satellite
GSLV	Geosynchronous Satellite Launch Vehicle
GTO	Geosynchronous Transfer Orbit
GUI	Graphical User Interface
GUIT	Gaganyaan Umbilical Integration and Test Facility
GW	Gravitational Wave
GWP	Ground Water Prospecting
HAL	Hindustan Aeronautics Limited
HAT	High Altitude Test
HAVA	Hypersonic Air Breathing Vehicle with Air frame integrated system

5.2

Acronyms

HCO	Hyderabad Camp Observatory
HEM	High-Altitude Escape Motor
HLTFI	High Level Task Force for Investment
HLVM3	Human - Rated Launch Vehicle Mark-3
HPC	High-Performance Computing
HPM	High-Altitude Pitch Motor
HSFC	Human Space Flight Centre
HTPB	Hydroxyl-Terminated PolyButadiene
HTS	High Throughput Satellite
HVD	Heavy Vehicle Driver
HVI	Hyper Velocity Impact
HYLAS	Highly Adaptable Satellite
HysIS	Hyperspectral Image Sensor
H_2	Hydrogen
i2P2M	International Institute of Projects and Program Management
IA	Implementation Arrangement
IAC	International Astronautical Congress
IADT	Integrated Air Drop Test
IAF	International Astronautical Federation
ICESAT	Ice, Cloud and land Elevation Satellite
ICET	Integrated Cryogenic Engine and stage Test facility
ICR-ER	Integrated Control Room for Emergency Response
ICT	Information & Communication Technology
IDRSS	Indian Data Relay Satellite System
IDSN	Indian Deep Space Network
IDTR	Institute of Driving and Traffic Research
IFMC	In Flight and Maritime Connectivity
IGCAR	Indira Gandhi Centre for Atomic Research
i-GOT	Integrated Government Online Training
IIA	Indian Institute of Astrophysics
IIRS	Indian Institute of Remote Sensing
IISc	Indian Institute of Science
IISER	Indian Institutes of Science Education & Research
IIST	Indian Institute of Space Science and Technology

IISU	ISRO Inertial Systems Unit
IIT	Indian Institute of Technology
IITs	Indian Institute of Technologies
IITM	Indian Institute of Tropical Meteorology
IMAT	Integrated Main Parachute Airdrop Test
IMD	India Meteorological Department
IMEWG	International Mars Exploration Working Group
IMGEOS	Integrated Multi-Mission Ground Segment for Earth Observation Satellites
IMJS	Indo-Mauritius Joint Satellite
IMS	Indian Mini Satellite
INC	IRNSS Navigation Centre
INCOIS	Indian National Centre for Ocean Information Services
INCOSPAR	Indian National Committee for Space Research
INMCC	Indian Mission Control Centre
INRIM	Italian National Institute of Metrological Research
INS	ISRO Nano Satellite
INSAT	Indian National Satellite
IN-SPACe	Indian National Space Promotion and Authorization Center
INSPIRESat	International Satellite Program in Research & Education Satellite
IOC	Initial Operations Capability
IOCL	Indian Oil Corporation Limited
IOD	Indian Ocean Dipole
IOD	In-Orbit Demonstration
IPA	Isopropyl Alcohol
IPAB	Integrated Product Assurance Board
IPI	Indian Photo-Interpretation Institute
IPRC	ISRO Propulsion Complex
IPT	Integrated Processors Test
IR	Indian Railways
IRCDR	IRNSS CDMA Ranging Stations
IRF	Swedish Institute of Space Physics
IRIMS	IRNSS Range & Integrity Monitoring Stations
IRNSS	Indian Regional Navigation Satellite System

5.2

Acronyms

IRNWT	IRNSS Network Timing Facility
IRS	Indian Remote Sensing
ISECG	International Space Exploration Coordination Group
ISITE	ISRO Satellite Integration and Test Establishment
ISO	International Organisation for Standardisation
ISRO	Indian Space Research Organisation
ISRU	In-Situ Resource Utilization
ISS	International Space Station
ISSDC	Indian Space Science Data Centre
IST	Indian Standard Time
ISTRAC	ISRO Telemetry, Tracking and Command Network
ITecS	ISRO Technical Standards
ITPF	Integrated Titanium alloy tank Production Facility
ITS	Inter Tank Structure
ITTP	ISRO Technical Training Programme
ITU	International Telecommunication Union
ITU-R	International Telecommunication Union – Radio Communication Sector
IUCAA	Inter-University Centre for Astronomy and Astrophysics
IWV	Integrated Water Vapour
JAXA	Japan Aerospace Exploration Agency
JHSS	Joint Hindi Salahkar Samiti
JPIP	Joint Project Implementation Plan
JPL	Jet Propulsion Laboratory
JPMC	Joint Policy and Management Committee
JPSS	Joint Polar Satellite System
JWG	Joint Working Group
KaRIn	Ka-band Radar Interferometer
KASA	Korea Aerospace Administration
KITSAT	Korean Institute of Technology Satellite
LAXPC	Large Area X-ray Proportional Counter
LCLU	Land Cover and Land Use
LED	Light Emitting Diode
LEM	Low Altitude Escape Motor

LEMUR	Low Earth Multi-Use Receiver
LEO	Low Earth Orbit
LEOLUT	Low Earth Orbiting Local User Terminal
LEOP	Launch and Early Orbit Phase
LEOS	Laboratory for Electro-Optics Systems
LGS	Length of Growing Season
LGS	Landing Gear System
LH2	Liquid Hydrogen
LiDAR	Light Detection and Ranging
LIN	Liquid Nitrogen
LISS	Linear Imaging Self-Scanning
LME	LOX-Methane Engine
LMLV	Lunar Module Launch Vehicle
LOX	Liquid Oxygen
LPJ-GUESS	Lund–Potsdam–Jena General Ecosystem Simulator
LPM	Low Altitude Pitch Motor
LPSC	Liquid Propulsion Systems Centre
LSA	Launch Services Agreement
LSB	Launch Service Building
LULC	Land Use / Land Cover
LULC	Land Use Land Cover
LuPEX	Lunar Polar Exploration
LUTs	Local User Terminals
LVD	Light Vehicle Driver
LVHM	Launch Vehicle Health Monitoring
LVM 3	Launch Vehicle Mark III
L&T	Larsen & Toubro
MAG	Magnometer
MANIT	Maulana Azad National Institute of Technology
MCC	Mission Control Centre
MCF	Master Control Facility
MCS	Monitoring, control and surveillance
MeitY	Ministry of Electronics and Information Technology
MEMS	Micro-Electro-Mechanical Systems

5.2

Acronyms

MEMU	Mainline Electric Multiple Unit
MEOLUT	Medium Earth Orbiting Local User Terminal
MEOSAR	Medium Earth Orbit Search and Rescue
MHA	Ministry of Home Affairs
MHz	Mega Hertz
MI&B	Ministry of Information & Broadcasting
MIL STD	Military Standard
MMDRPS	Multi Mission Meteorological Data Receiving & Processing System
MMOD	Micro-Meteoroid and Orbital Debris
MNCFC	Mahalanobis National Crop Forecast Centre
MoA&FW	Ministry of Agriculture & Farmers Welfare
MODIS	Moderate Resolution Imaging Spectroradiometer
MoES	Ministry of Earth Sciences
MoHUA	Ministry of Housing and Urban Affairs
MoPTIT	Ministry of Posts, Telecommunication and Information Technology
MoS	Minister of State
MOSDAC	Meteorological and Oceanographic Satellite Data Archival Centre
MoSPI	Ministry of Statistics and Program Implementation
MOM	Mars Orbiter Mission
MoU	Memorandum of Understanding
MOX	Mission Operations Complex
MP	Madhya Pradesh
MPC	Monopulse Comparator
ML	Machine Learning
MLM	Mars Lander Mission
MLS	Mobile Launch Structure
MRIC	Mauritius Research and Innovation Council
MR&LC	Mission Readiness & Launch Clearance
MSC	Mediterranean Shipping Company
MSDE	Ministry of Skill Development & Entrepreneurship
MSS	Mobile Satellite Services
MT	Metric Ton
MTTF	Monopropellant Thruster Test Facility
MW	Mega Watt

NAL	National Aerospace Laboratory
NARL	National Atmospheric Research Laboratory
NASA	National Aeronautics and Space Administration
NASRDA	National Space Research and Development Agency
NavIC	Navigation with Indian Constellation
NCMRWF	National Centre for Medium Range Weather Forecasting
NCVET	National Council for Vocational Education and Training
NDEM	National Database for Emergency Management
NDMA	National Disaster Management Authority
NDVI	Normalised Difference Vegetation Index
NEC	North Eastern Council
NEO	Near Equatorial Orbit
NEP	National Education Policy
NER	North Eastern Region
NER	Net Effective Radiation
NER-DRR	North Eastern Regional node for Disaster Risk Reduction
NE-SAC	North Eastern-Space Applications Centre
NeSDR	North Eastern Spatial Data Repository
NE-SPARKS	North East Students' Programme for Awareness, Reach, and Knowledge on Space
NETRA	NEtwork for space object TRacking and Analysis
NGEs	Non-Governmental Entities
NGLV	Next Generation Launch Vehicle
NGOs	Non-Government Organisations
NHP	National Hydrology Project
NHPC	National Hydroelectric Power Corporation
NIAS	National Institute of Advanced Studies
NICES	National Information System for Climate and Environment Studies
NIR	Near Infra Red
NISAR	NASA-ISRO Synthetic Aperture Radar
NIT	National Institute of Technology
NM	National Meet
NMPTTF	New Monopropellant Thruster Test facility
NMS	Network Management System

5.2

Acronyms

NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NRCS	Normalized Radar Cross-Section
NRSC	National Remote Sensing Centre
NRT	National Real-Time
NSIL	New Space India Limited
NSpD	National Space Day
NSQF	National Skill Qualifications Framework
NSSS	National Space Science Symposium
NSTIs	National Skill Trainings Institutes
NTLF	New LAM Test Facility
NTPC	National Thermal Power Corporation
NVS	Navigation Satellite
O_3	Ozone
OCM	Ocean Colour Monitor
OCT	Orbit Change Thrusters
OL	Official Language
OM	Orbital Module
OMA	Orbital Module Adaptor
OMPF	Orbital Module Preparation Facility
ONGC	Oil and Natural Gas Corporation
ORV	Orbital Re-entry Vehicle
OSC	Occulter Spacecraft
OSD	Officer on Special Duty
OTA	Over The Air
OTC	Open Top Chamber
OT	Overshooting cloud top
PAPA	Plasma Analyser Package for Aditya
PARC	Polarimetric Active Radar Calibrator
PAT	Pad Abort Test
PDEU	Pandit Deendayal Energy University
PDF	Post-Doctoral Fellowship
PDR	Preliminary Design Review
PG	Post Graduation

PHD	Doctor of Philosophy
PHMS	Personal Hygiene Management System
PHTA	Power Head Test Article
PIE	Pre-Incubation Entrepreneurship
PIF	PSLV Integration Facilities
PISAT	PESIT Imaging Satellite
PM	Propulsion Module
PMA	Programme Management & Authorization
PMAD	Programme Management & Authorization Directorate
PMFBY	Pradhan Mantri Fasal Bima Yojana
PMKSY	Pradhan Mantri Krishi Sinchayee Yojana
PMMSY	Pradhan Mantri Matsya Sampada Yojana
POEM	PSLV Orbital Experimental Module
POLIX	Polarimeter Instrument in X-rays
PPP	Public-Private Partnership
PPTF	Proof Pressure Testing Facility
PRADAN	Professional Assistance for Development Action
PRAGATI	Pro-Active Governance and Timely Implementation
PRL	Physical Research Laboratory
PROBA	PRoject for On-Board Autonomy
PROITERES	Project of OIT Electric-Rocket-Engine onboard Small Space Ship
PSE	Public Sector Enterprise
PSLV	Polar Satellite Launch Vehicle
PSVI	Peak of Season Vegetation Index
QCI	Quality Council of India
R&D	Research & Development
RAC-S	Regional Academic Centres for Space
RAMBHA-LP	Radio Anatomy of Moon Bound Hypersensitive Ionosphere & Atmospehere
RCS	Reaction Control System
RE	Revised Estimate
REE	Rare Earth Element
RESPOND	Sponsored Research

5.2

Acronyms

REWARD	Rejuvenating Watersheds for Agricultural Resilience through Innovative Development
RF	Radio Frequency
RF	Random Forest
RFCT	Radio Frequency Compatibility Tests
RFP	Request For Proposal
RISAT	Radar Imaging Satellite
RLC	Reusable Launch Vehicle
RLSV LEX	Reusable Launch Vehicle Autonomous Landing Mission
RLV-TD	Reusable Launch Vehicle Technology Demonstrator
RMT-L	Rail MSS Terminal-Locomotive
RN	Radio Networking
RNP	Required Navigation Performance
ROCERS	Remote sensing enabled Online Chemical Emergency Response System
ROP	Regional Outreach Programme
ROSCOSMOS	Russian Federal Space Agency
ROW	Right of Way
RRSCs	Regional Remote Sensing Centres
RRSLs	Regional Reference Standards Laboratories
RS	Rohini Satellite
RTI	Right to Information
RTIS	Real-time Train Information System
RTRS	Rail Track Rocket Sled
SAARC	South Asian Association for Regional Cooperation
SAAW	Space Applications Adoption Workshops
SAC	Space Applications Centre
SAFE	Scheme for Assistance to Families in Exigency
SAR	Synthetic Aperture Radar
SARAL	Satellite with ARgos and ALtika
SARSAT	Search and Rescue Satellite Aided Tracking
SAS	South Asia Satellite
SAS&R	Satellite Aided Search and Rescue
SA-SC	Sentinel Asia Steering Committee

SATCOM	Satellite Communications
SBaaS	Satellite Bus as a Service
SCATSAT	Scatterometer Satellite
SCC	Satellite Control Centre
SCL	Semiconductor Laboratory
SCOMET	Special Chemicals, Organisms, Materials, Equipment & Technology
SCTIMST	Sree Chitra Tirunal Institute for Medical Sciences & Technology
SDCSS	Satish Dhawan Centre for Space Science
SDGs	Sustainable Development Goals
SDMA	Space Division Multiple Access
SDSC SHAR	Satish Dhawan Space Centre Sriharikota High Altitude Range
SEBI	Securities and Exchange Board of India
SIF	Sun-induced chlorophyll fluorescence
SILAAS	Satellite Integrated Landslide Assessment and Alert System
SIP	Simulated Input Profile
SITE	Satellite Instructional Television Experiment
SLC	SSLV Launch Complex
SLP	Second Launch Pad
SLV	Satellite Launch Vehicle
SM	Service Module
SMC	SATCOM Monitoring Centre
SMC	Space Manufacturing Clusters
SMF	Service Module Fairing
SMS	Static Mock-up Simulator
SOI	Sphere of Infleunce
SOLIS	Space Official Language Implementation Scheme
SOLVE	Sub-Orbital Launch Vehicle for Experiments
SOP	Standard Operating Procedure
SPADEX	Space Docking Experiment
SPARC	Satellite data Processing, Acquisition and Reconfigurable Card
SPL	Space Physics Laboratory
SPPU	Savitribai Phule Pune University
SPROB	Solid Propellant Space Booster Plant
SPS	Standard Positioning Service

5.2

Acronyms

SPV	Special Purpose Vehicle
SRC	Siwana Ring Complex
SROSS	Stretched Rohini Satellite Series
SSA	Space Situational Awareness
S-SAR	S-Band Synthetic Aperture Radar
SSC	Swedish Space Centre
SSIDH	Space based Support for Integrated Development of Horticulture in NER
SSLV	Small Satellite Launch Vehicle
SSP	Shared Socioeconomic Pathways
SSPO	Sun-synchronous Polar Orbit
SSTC	Space Science and Technology Centre
SSTL	Surrey Satellite Technology Limited
SSTM	Sea Surface Temperature Monitor
STAC	Spatio-Temporal Asset Catalogue
START	Space science and Technology Awareness Training
STC	Space Technology Cells
STCs	Space Technology Cells
STEM	Science, technology, Engineering & Mathematics
STEP	Satellite Telecommunication Experimental Project
STUDSAT	Student Satellite
SWG	Science Working Group
SWIR	Short Wave Infrared
SWOT	Surface Water and Ocean Topography
SXT	Soft X-ray Telescope
S&PW	Strategy & Planning Wing
TAF	Technology Adoption Fund
TB	Terra Byte
TCPO	Town and Country Planning Organization
TD	Technical Directorate
TDS	Technology Demonstration Satellite
TEC	Total Electron Count
TEI	Trans Earth Injection
TERLS	Thumba Equatorial Rocket Launching Station

TES	Technology Experiment Satellite
TiE	The Indus Entrepreneurs
TIM	Technical Interface Meeting
TIP	Technology Implementation Partners
TLP	Third Launch Pad
TL1I	Trans-Lagrangean Point 1 Insertion
TMS	Thrust Measurement System
TNA	Training Needs Analysis
ToO	Target of Opportunity
TOLIC	Town Official Language Implementation Committee
TOSS	Transfer Orbit Satellite Service
ToT	Transfer of Technology
TPS	Thermal Protection System
TRC	Technical Review Committee
TRISHNA	Thermal Infra-Red Imaging Satellite for High-resolution Natural Resource Assessment
TROPOMI	TROPOspheric Monitoring Instrument
TTA	Technology Transfer Agreements
TTC	Telemetry, Tracking and Telecommand
TUB	Technical University of Berlin
TV	Test Vehicle
TVAC	Thermo-Vacuum
TWT	Trisonic Wind Tunnel
T&E	Test and Evaluation
UAE	Ukraine, United Arab Emirates
UAF	Upper Stage Assembly Facility
UAV	Unmanned Aerial Vehicle
UG	Under Graduation
UHF	Ultra High Frequency
UHI	Urban Heat Island
UNCCD	United Convention to Combat Desertification
UNCOPUOS	United Nations Committee on the Peaceful Uses of Outer Space
UP	Uttar Pradesh
URSC	U R Rao Satellite Centre

5.2

Acronyms

USA	United States of America
USGS	United States Geological Survey
UT	Union Territory
UT	Universal Time
UV	Ultra Violet
UWaIS	Urban Water - Information System
VCSS-MCS	Vessel Communication and Support System for Monitoring, Control and Surveillance
VDI	Virtual Desktop Infrastructure
VEDAS	Visualization of Earth observation Data and Archival System
VISWAS	VAST Insurance Scheme Whenever Accident Strikes
VLCC	Virtual Launch Control Centre
VNIR	Very Near Infra Red
VNIT	Visvesvaraya National Institute of Technology
VOM	Venus Orbiter Mission
VSAT	Very Small Aperture Terminal
VSSC	Vikram Sarabhai Space Centre
VTVL	Vertical Take-off and Vertical Landing
WAB	Winter Algal Blooms
WDC	Watershed Development Component
WGCV	Working Group on Calibration and Validation
WPC	Wireless Planning & Coordination
WSE	Water Surface Elevation
WVEQ	Water Volume Equivalents
XGBoost	Extreme Gradient Boosting Model
XPoSat	X-ray Polarimeter Satellite
XPPS	XPoSat Proposal Processing System
XSPECT	X-ray Spectroscopy and Timing
YES-TECH	Yield Estimation System using Technology
YUVIKA	Yuva Vigyani Karyakram

ISRO'S NEXT FRONTIER