



SPACE IN INDIA

Evolution of Indian Space Program

Birth of ISRO

Foundation

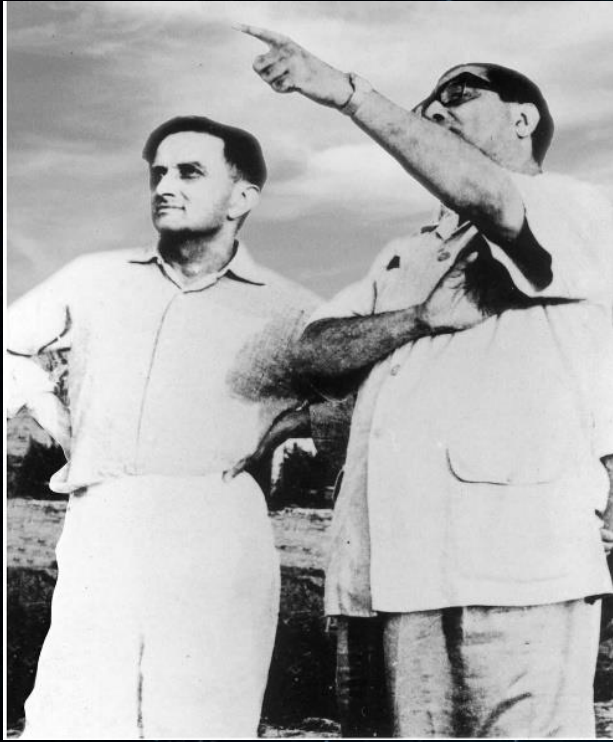


Dr. Vikram Sarabhai



Physical Research Laboratory

Foundation



Dr. Sarabhai and Dr. Bhabha



Sir C. V. Raman



S.S. Bhatnagar

Indian National Committee for Space Research

INCOSPAR
(1962)

Indian Space Research Organization

ISRO
(1969)

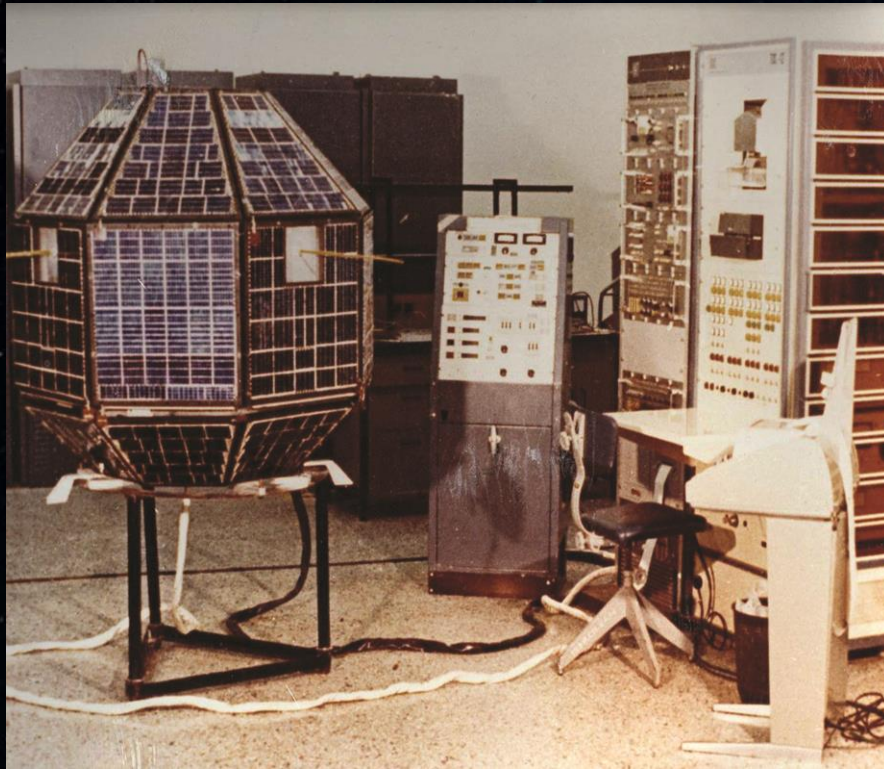


Saint Mary Magdalene Church

The architect of the Indian Atomic energy* program, Dr. Homi J. Bhabha, together with Dr. Sarabhai, were scouting for a suitable location to establish India's first rocket launching station. Such a site should be isolated, near to the sea and close to the magnetic equator.



First Indian Satellite



Model of Aryabhata Satellite
April 19, 1975



Model of Bhaskara-1 Satellite
1979

First Indian Rocket



Rohini -75 (RH-75)

July 18, 1980



SLV - 3

July 18, 1980

ISRO: Objectives and Programmes

Objective

Civilian use of space technology



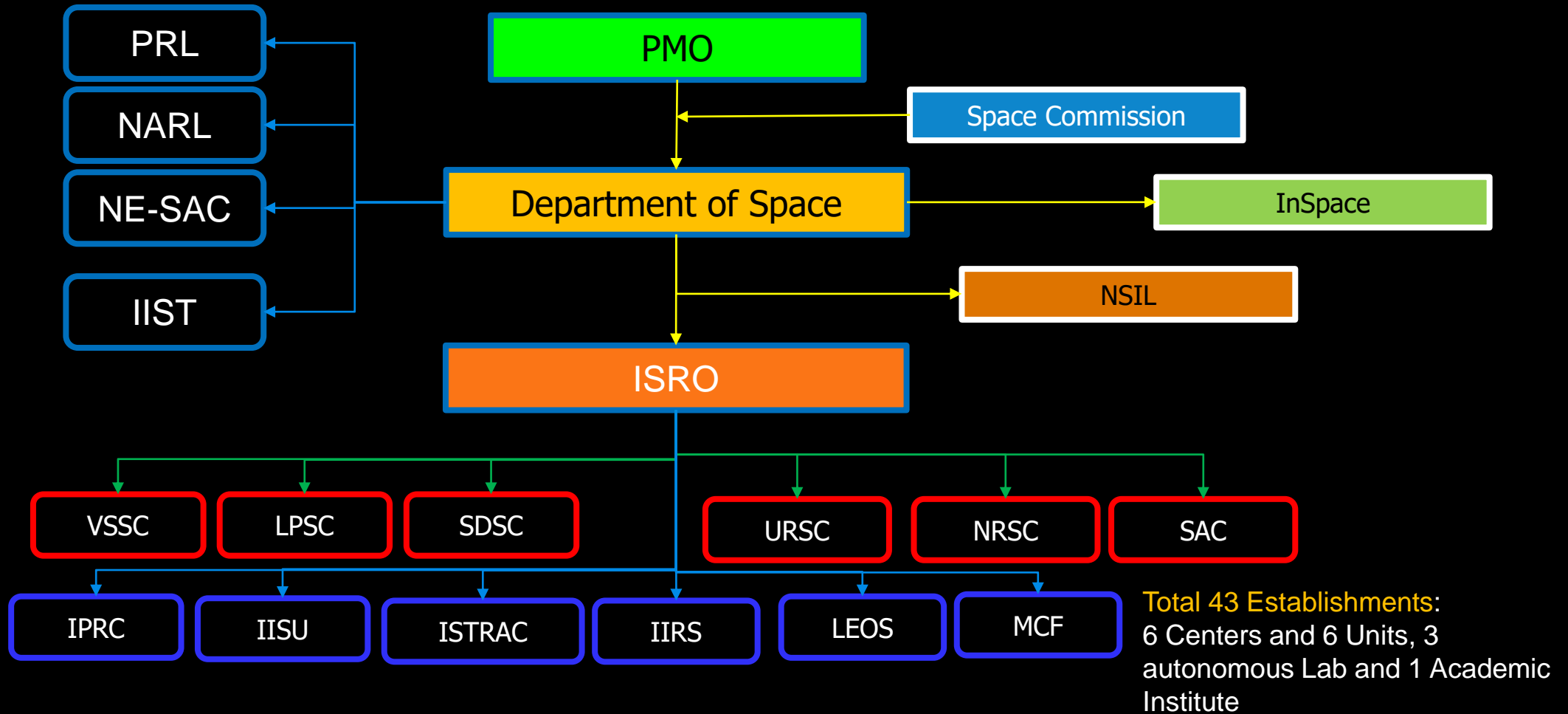
Self reliance

India is fully capable of running its own space program.

Advantages of space program

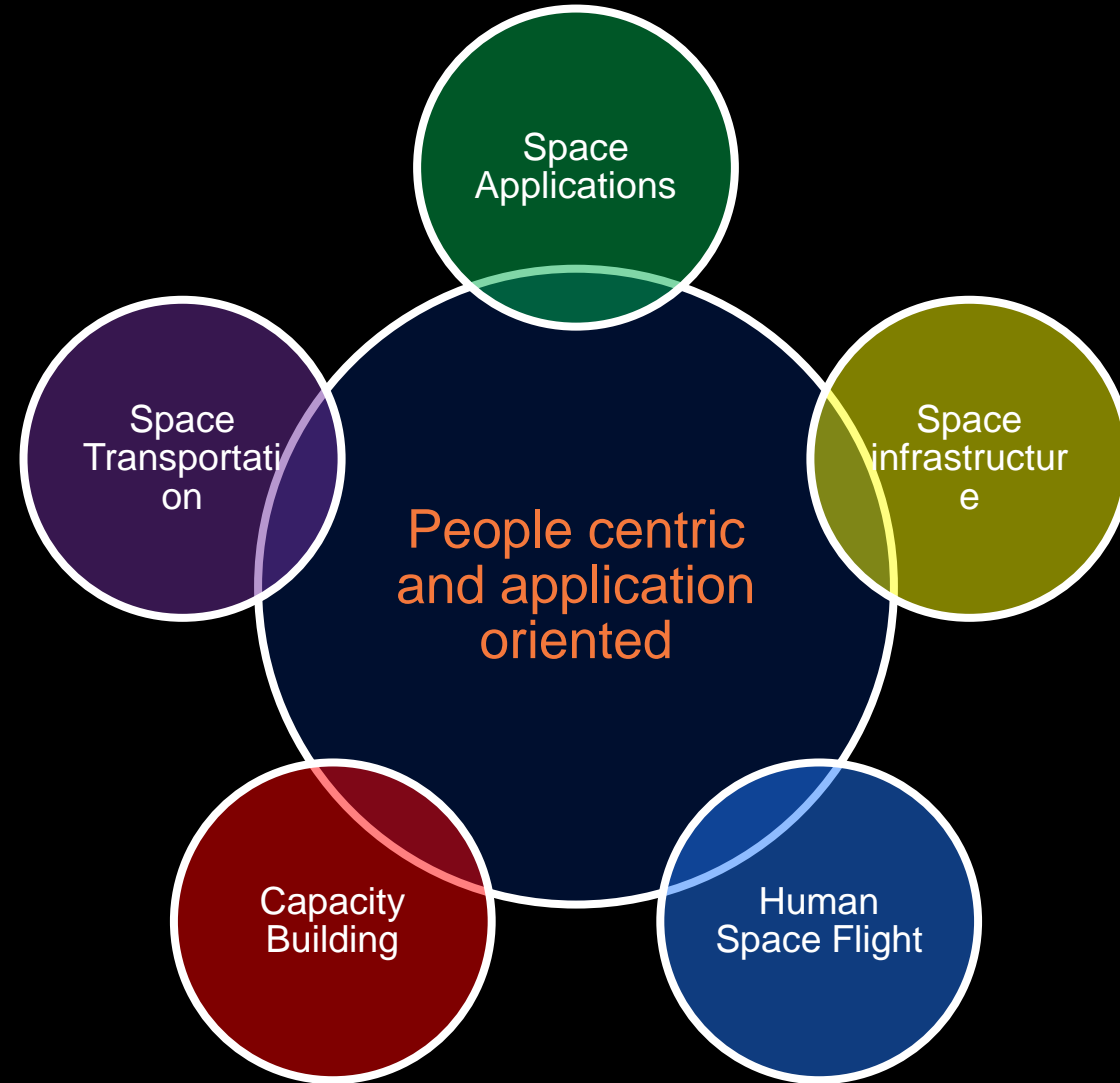
Timely information for many thematic applications i.e. from farmers to fishermen and other common citizens

ISRO Organization Chart



Total 43 Establishments:
6 Centers and 6 Units, 3
autonomous Lab and 1 Academic
Institute

Dimensions of the Indian Space Program



ISRO Major Programmes



Communication & Weather Missions

CH-1,2,3, MoM, Aditya L1



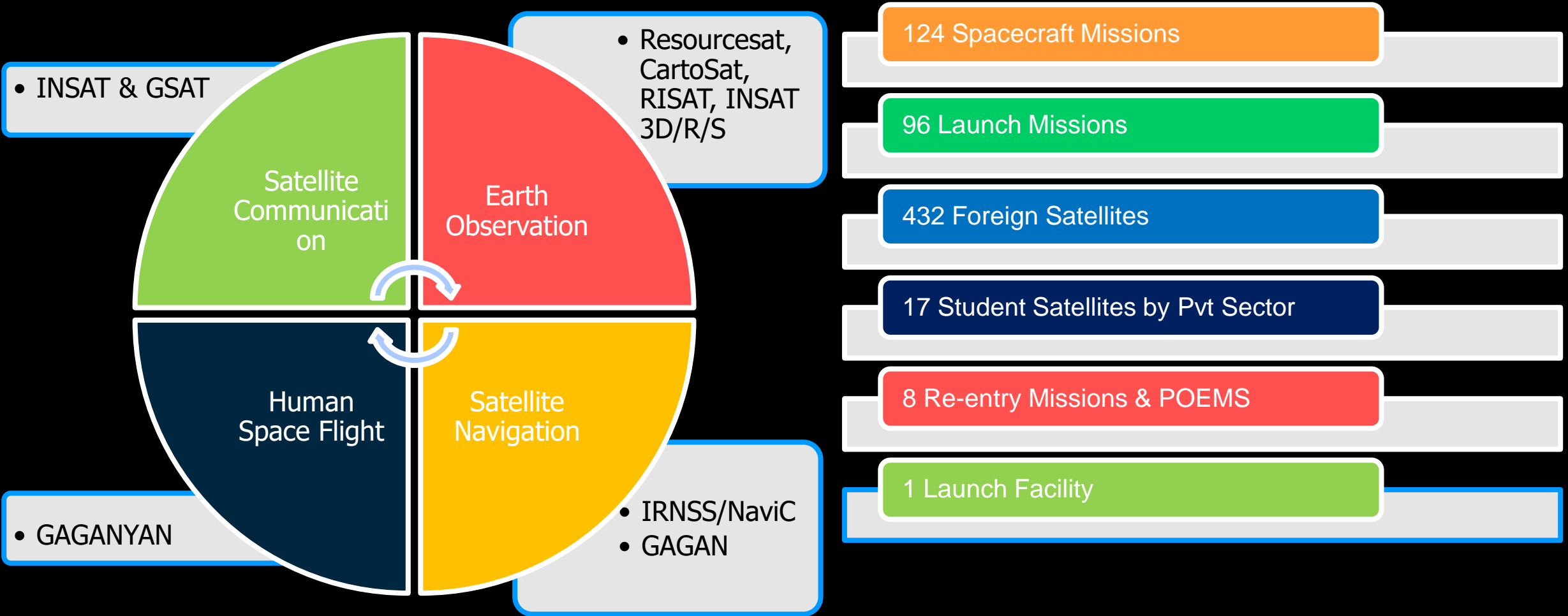
Earth Observation Application

Satellite based Navigations

Human Space Flight Programme



India's current Space Assets



Space Science & Planetary Exploration Missions

CHANDRAYAAN-1, 2 & 3

The Chandrayaan programme also known as the Indian Lunar Exploration Programme is an ongoing series of outer space missions by the Indian Space Research Organization (ISRO) for the exploration of the Moon.

Chandrayaan-1: 22 October 2008

Chandrayaan-2: 22 Jul 2019 – 7 Sept 2019

Chandrayaan-3: 14 July 2023- 23 August 2023



CHANDRAYAAN-1 & 2

Major Findings:

- Build indigenous scientific and technical capability to execute planetary space Missions.
- Discovery of water molecules in Lunar Surface.



Major Findings:

- The orbiter, which is still active, did experiments on Lunar Atmospheric composition, trace elements, and more.
- Detection of sodium, Hydroxyl and Water molecules, Distribution of Gas in Lunar Atmosphere, Presence of Rare elements such as magnesium, aluminum, silicon, calcium, titanium, iron etc.

CHANDRAYAAN-3

- India Became first country to successfully landed (soft landing) on lunar south pole;
- Detected various important elements on lunar surface such as Sulphur, aluminum, calcium, iron, chromium, titanium, manganese, silicon, and oxygen.
- Observed and confirmed Moonquake.



Chandrayaan-3 Lander on the Moon
August 30, 2023

CHANDRAYAAN-3

FACTS AND FIGURES

Name
Chandrayaan-3

Launch Vehicle
GSLV-MkIII

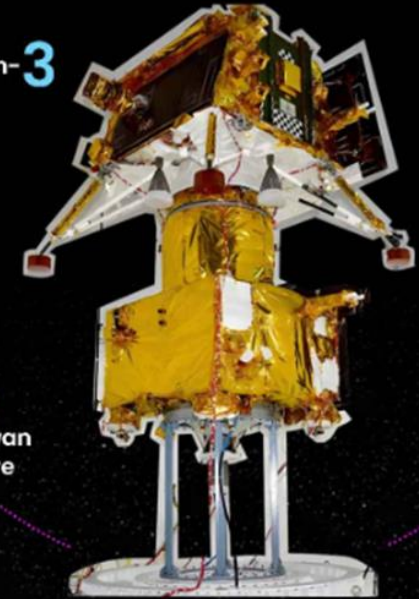
Destination
Moon

Mission Components

- Propulsion Module
- Lander
- Rover

Launch site
Satish Dhawan
Space Centre
Sriharikota

Mission life
1 lunar daylight
period or roughly
14 Earth days



Mass
3900 kg

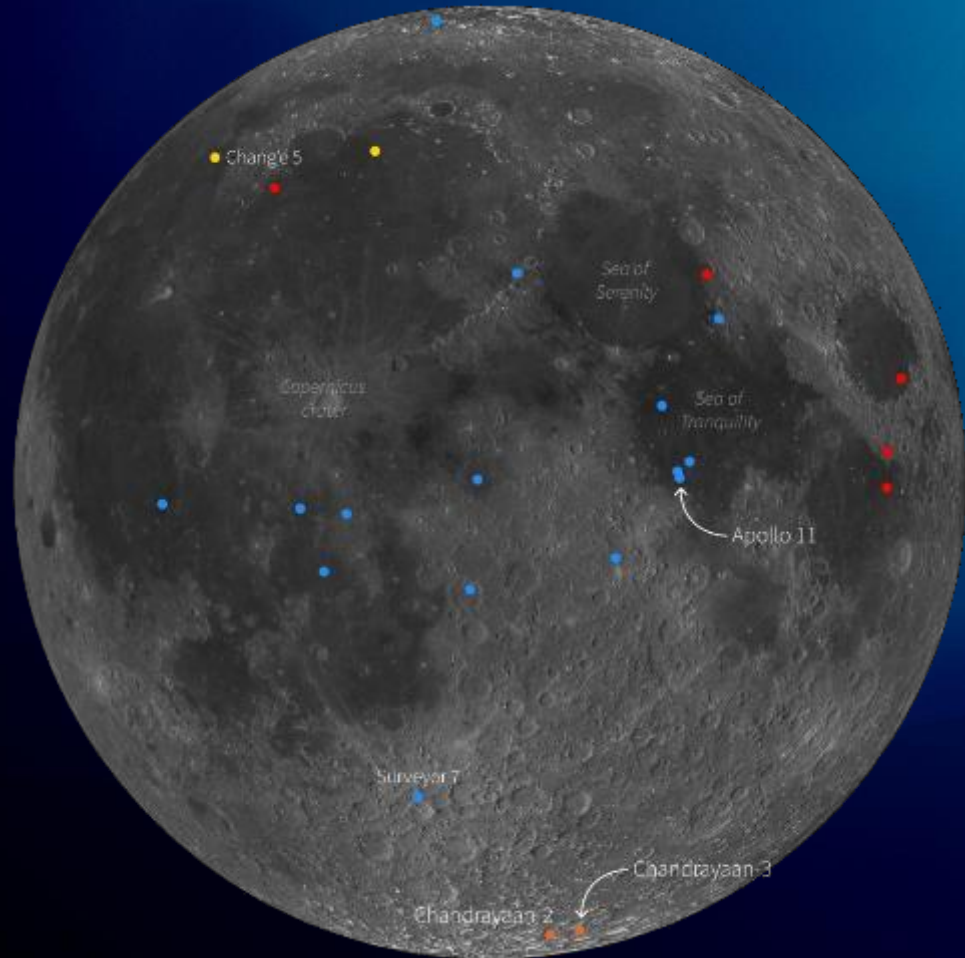
Landing site

Moon
South polar region



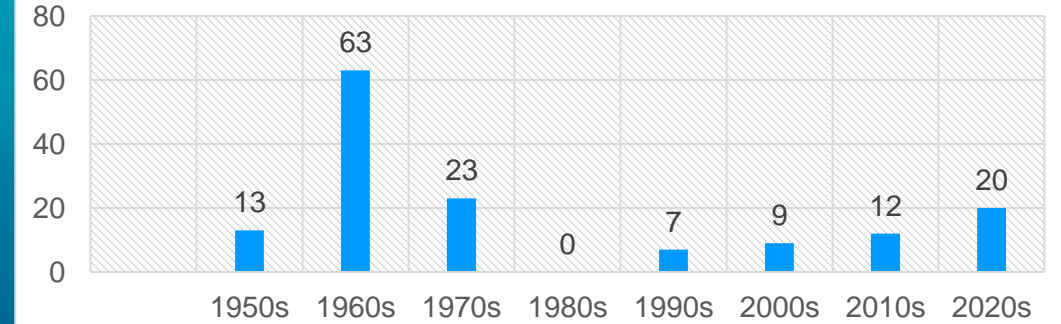
Completed & Planned Moon Missions

Moon Landing Sites

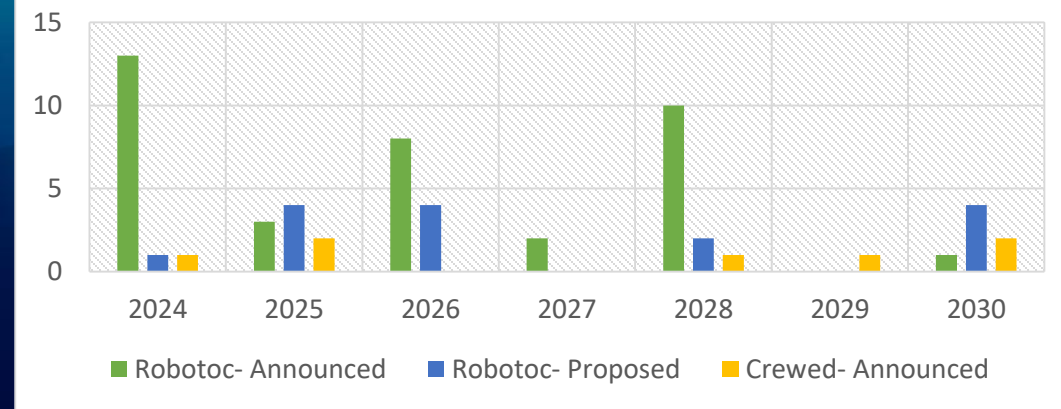


- USA
- USSR
- China
- India

No. of Missions Completed



Future Lunar Missions



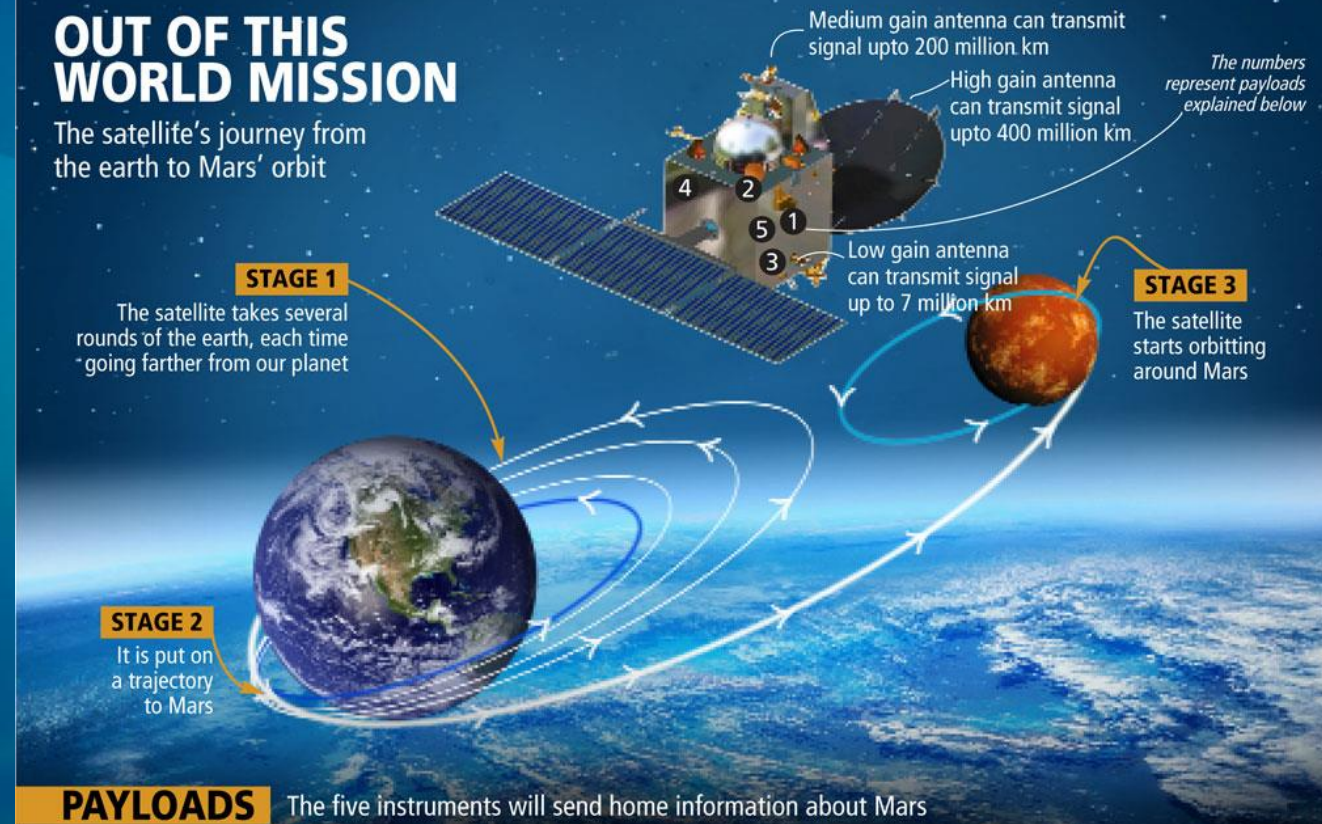
Source – NASA space science coordinated Archive & Internet resources

MARS ORBITAR MISSION (MOM)

Mars Orbiter Mission (MOM), India's first interplanetary mission to planet Mars was launched onboard PSLV-C25 on November 05, 2013. ISRO has become the fourth space agency to successfully send a spacecraft to Mars orbit.

OUT OF THIS WORLD MISSION

The satellite's journey from the earth to Mars' orbit



PAYLOADS

The five instruments will send home information about Mars



1. MARS COLOUR CAMERA

It will take pictures of Mars' surface. The photos will put the information provided by other instruments on the orbiter into context. It will also give information on the dynamic events on the planet such as weather



2. LYMAN ALPHA PHOTOMETER

It will study the ratio of deuterium and hydrogen. Isotope deuterium is heavier and does not escape from the atmosphere as easily as hydrogen. The data will answer the question if water is present in the planet, or was present in the past



3. THERMAL INFRARED IMAGING SPECTROMETER

It was readied at Space Applications Centre (SAC), Ahmedabad. It will map the surface composition and mineralogy of the planet by measuring thermal emissions



4. MARS EXOSPHERIC NEUTRAL COMPOSITION ANALYSER

It will study Martian atmosphere. This will be the first in situ mapping of the atmosphere there. It will measure radial, diurnal and seasonal variations in the Martian exosphere



5. METHANE SENSOR

It will scan the entire Martian disc within six minutes and measure very low levels of methane—in parts per billion quantities. This is the first time that methane in the atmosphere of the planet will be measured by use of a satellite

ADITYA - L1

An Indian solar observatory at Lagrangian point L1 for 'Observing and understanding the chromospheric and coronal dynamics of the Sun

ADITYA-L1 MISSION

- The first Indian space-based observatory-class solar mission

- **Launched** by ISRO's PSLV XL rocket from Satish Dhawan Space Centre SHAR (SDSC-SHAR), Sriharikota

- at L1 point where it can view the sun without any eclipse. L1 lies between Sun-Earth line

LAUNCH DATE: **2 Sep, 2023**

DISTANCE: **1.5 mn km** (from earth)

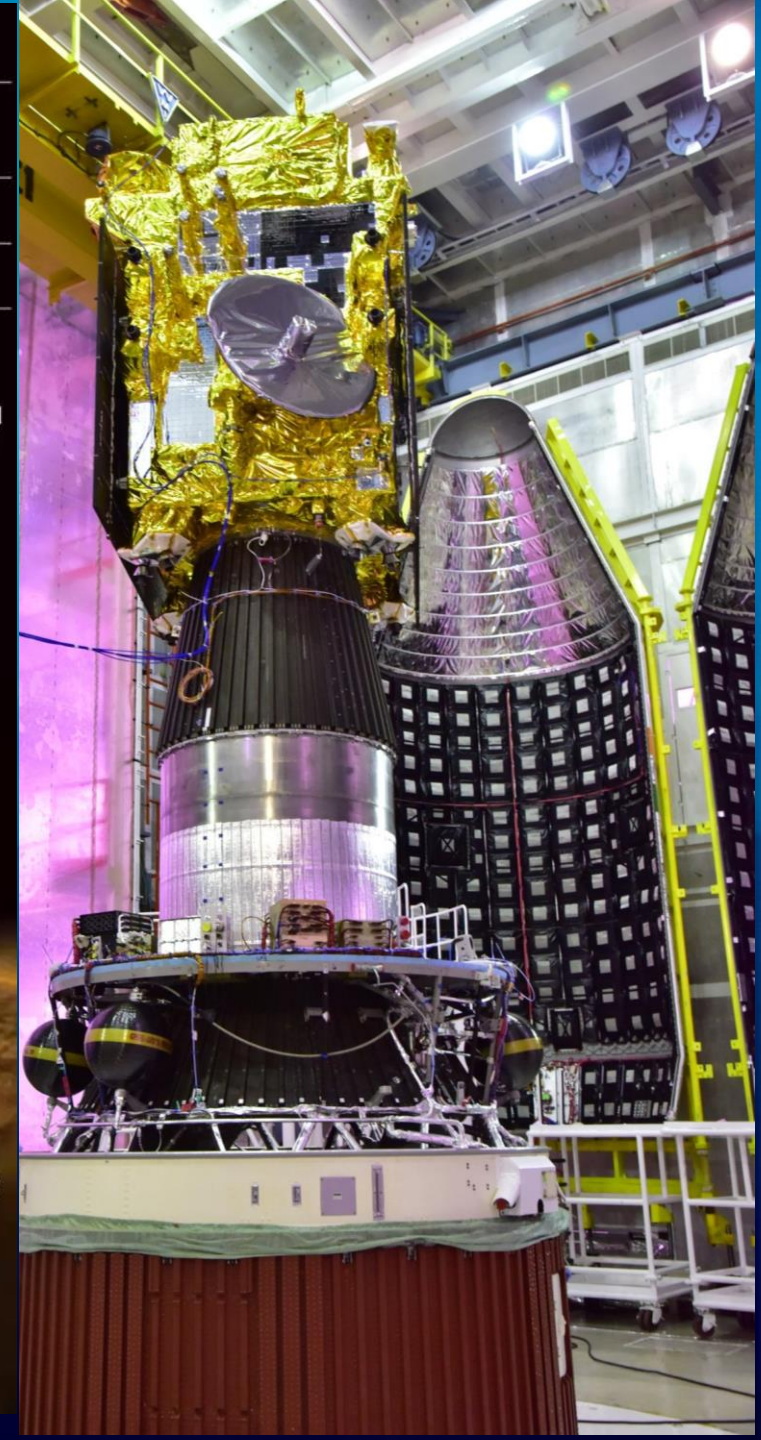
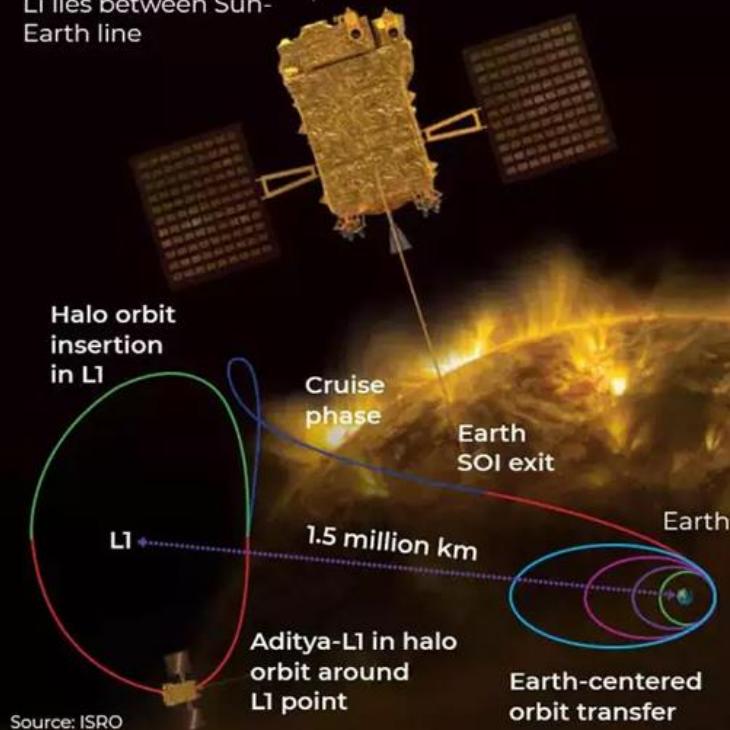
COST: **378.53 cr**

TIME: **4 months**

PAYLOADS: **7** (VELC, SUIT, SoLEXS, HELIOS, ASPEX, PAPA, Digital Magnetometers)

MAJOR OBJECTIVES:

To understand corona, solar wind, solar atmosphere, sun flares, and near-earth space weather





Space In India: Evolution of Indian Space Program

Question and Answer Session

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ISRO Centers

Vikram Sarabhai Space Centre(VSSC), Thiruvananthapuram



Vikram Sarabhai Space Centre(VSSC), Thiruvananthapuram

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U.R.Rao Space Centre (URSC), Bengaluru

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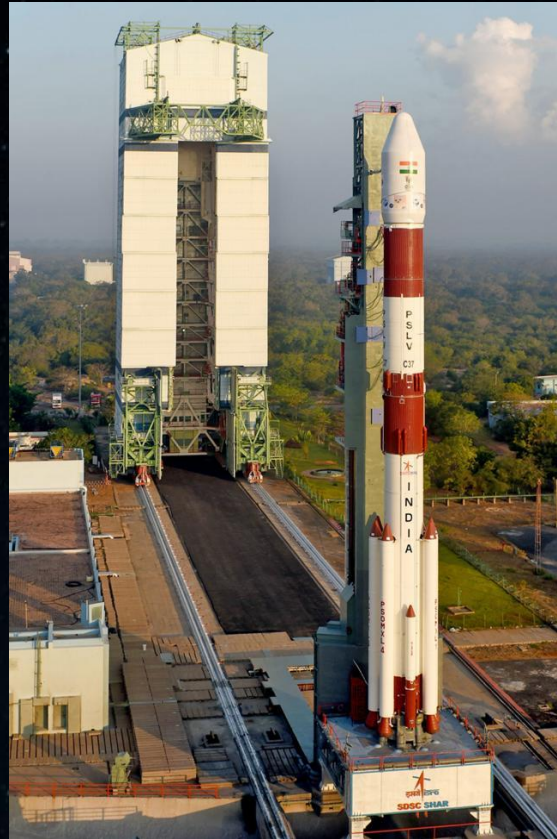


Sathish Dhawan Space Centre, Sriharikota



Sathish Dhawan Space Centre, Sriharikota

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First Launch Pad (FLP)



Second Launch Pad (SLP)

Liquid Propulsion System Center.



Bengaluru



Valaimala

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ISRO Propulsion Complex (IPRC)

Equipped with the state-of-the-art facilities necessary to realise the cutting-edge propulsion technology products for the Indian space programme.



IPRC, Mahendragiri

- ❖ Ground testing of earth storable propellant stages, cryogenic stages for launch vehicles,
- ❖ High altitude testing of upper-stage engines and spacecraft thrusters, testing subsystems, production
- ❖ Supply of cryogenic propellants for the Indian cryogenic rocket programme.
- ❖ A Semi-cryogenic Cold Flow Test facility (SCFT) established at IPRC.

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Space Applications Centre (SAC)

Development and Educational Communication Unit, Ahmedabad

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ISRO Telemetry, Tracking and Command, Bengaluru



Byalalu

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Master Control Facility (MCF)

ISRO Inertial Systems Unit (IISU)



IISU at Thiruvananthapuram conducts research and development in inertial sensors and systems and allied satellite elements.

Laboratory for Electro-Optics Systems (LEOS)



LEOS is engaged in designing, developing, and producing Electro-Optic sensors and camera optics for satellites and launch vehicles. The sensors include star trackers, earth sensors, sun sensors & processing electronics.

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National Remote Sensing Centre (NRSC), Hyderabad



Aerial Services and Digital Mapping (ASDM)

Indian Institute Of Remote Sensing (IIRS)



Capacity Building through training, education and research in the field of Remote Sensing, Geographic Information System (GIS) technology and applications.

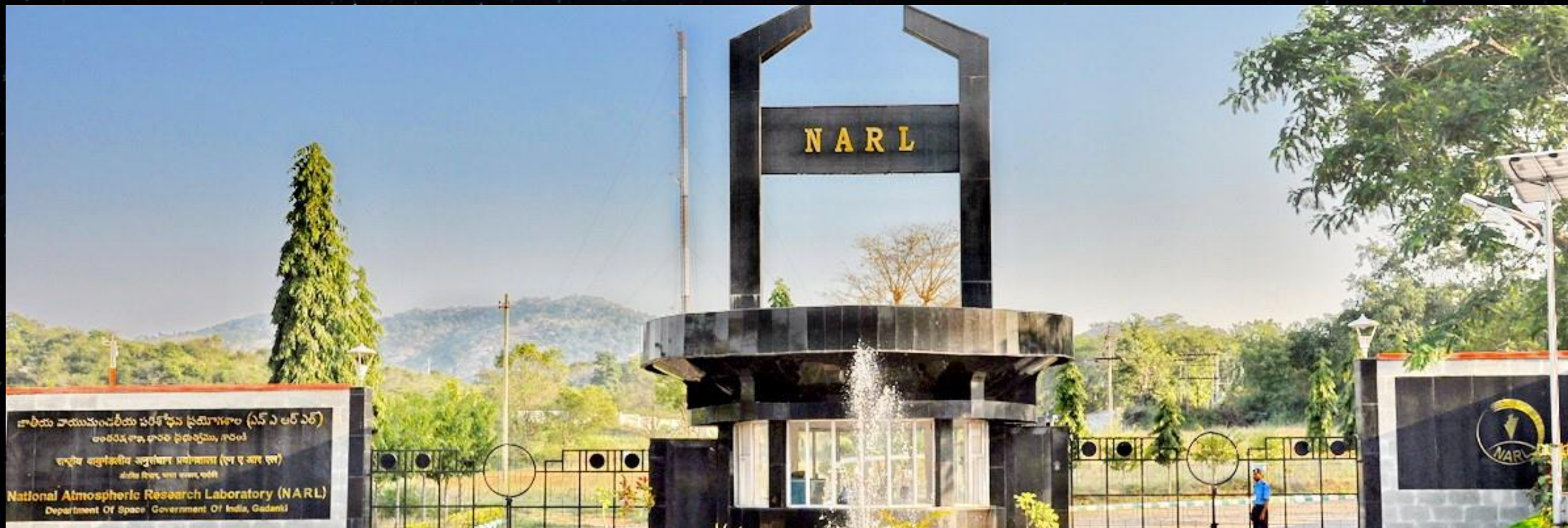
Physics Research Laboratory (PRL)



Solar Observatory, Udaipur



National Atmospheric Research Laboratory, Tirupati



Indian Institute Of Space Science and Technology(IIST)



North Eastern-Space Application Center



New Space India Limited (NSIL)

Enabling Indian Industries to scale up high-technology manufacturing base for space programme through technology transfer mechanisms, catering to emerging global commercial small satellite launch service market, satellite services for various domestic and international application needs and enabling space technology spin-offs for betterment of mankind through industry interface



Human Space Flight Center (HSFC)

