CURRENT AFFAIRS PROGRAM PRE-CUM-MAINS 2024 OCT 2023: BOOKLET-5 YOJANA (OCT) - INFRASTRUCTURE

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1. GENERAL STUDIES-3:

1) UNITY MALLS

- In the Budget 2023-24, Union Finance Minister unveiled a remarkable initiative - the establishment of a '**Unity-Mall**' in each state of the country.
  - These malls are envisioned to be **strategically located**, preferably in the respective state capital, financial capital or one of the prominent tourist centres.
  - **Mall Design, Amenities and features**: The Department of Expenditure in the Ministry of Finance, GoI, has issued comprehensive guidelines to States regarding the construction of Unity Malls:
    - The architectural design of these malls should **signify India's Unity and Grandeur**. They are required to have a standardized signage design, as prescribed by Department for Promotion of Industry and Internal Trade (DPIIT). It should also incorporate **ODOP logo** and **Make in India logo.** Additionally, the states are encouraged to explore the use of **multilingual signage**, showcasing India's rich linguistic diversity.
    - **One Shop(Space) for every state/UT**: The guideline further stipulates that each unity mall should have minimum 36 commercial spaces, with one designated for each state or UT for the sale and promotion of ODOP products. These spaces should have uniform floor space and should be subjected to consistent rental provisions. This is to ensure equitable representation of nation's diversity.
      - It will enable sale of GI products, ODOP offerings and other prominent regional products.
    - Each unity mall should also **allocate commercial space of equal size for every district** within the state, including those districts that have been announced by not yet formally notified.
    - The design should also incorporate **flexibility to accommodate the expansion** of commercial spaces as needed.

- **Range of Essential features**: State-of-the art food court, ample parking facilities, and purpose-built spaces for recreational and cultural activities, all tailored to their respective scales. Functional areas for conferences, events, galleries and exhibitions should also be incorporated into the design.
- These malls should also **offer technology-driven experience** such as VR, AR, Digital displays, and interactive Kiosks.
- Special attentions must be devoted to **ensure convenience and accessibility** in compliance with **National Building Code** standards.
- States have also been urged to provide **financial assistance to facilitate the participation of sellers from distant regions and remote districts**.
    - They are also supposed to empower local ODOP sellers by implementing capacity building programs.
- States are also encouraged to undertake promotional activities aimed at establishing Unity Malls as vibrant cultural hubs and attractive tourist destinations.
- To ensure **long term sustainability** of Unity Malls, their operation and maintenance will be structured under **PPP model**.
    - In this arrangement **ownership of the mall** remain with the **state government**, while **O&M** responsibilities will be entrusted to **private players**.
    - A **concession period** of 30 years have been recommended for this PPP.
    - Furthermore, states are expected to **commit to covering the operational expenses** of the malls if such support become necessary.
- **In case a state/district** chooses **not to participate in the mall**, the private party responsible for Malls' O&M will a**ctively seek out sellers** who can showcase and sell ODOP products in the commercial spaces designated for that specific state or district.
- **Artisans** who are not able to get space within the mall, will be periodically allocated **exhibition spaces** allowing them to display and sell their products.

- **Approval Procedure and State of Implementation**:
  - **DPR is submitted to the DPIIT** which meticulously evaluates and then subsequently recommends an amount, not exceeding the amount allocated for the state, to the Department of Expenditure which grants final approval and disburse the funds.
  - So far, final approval for construction of Unity Mall in 8 states have been given. These include Assam, Chhattisgarh, Gujarat, MP, MHA, Meghalaya, Nagaland and Tripura.

- **Support from Centre:**
  - As part of the Scheme for Special Assistance to States for Capital Expenditure (interest free 50-year loan), a substantial sum of **Rs 5,000 crore** has been specifically earmarked to extend financial support to states for the construction of Unity Mall.
    - The amount is allocated to states based on the number of districts.

- **Contribution of States**:
  - State will provide land for the malls **free of cost** and may also allocate **additional funds for the project from their budget**.

- The initiative to establish **Unity Malls** throughout the nation draws **inspiration from the successful 'Ekta Mall"** in Kevadia, Gujarat.

- **Advantages**:
  - It will **advance infrastructure development** throughout the country and stimulate capital investment within the states.
  - **Contribute to overall economic prosperity**:
    - Expedite progress towards 'Make in India' and 'Atmanirbhar Bharat' initiative.
    - Offers local artisans opportunities to showcase and sell their products, create employment opportunities and facilitate skill development.
    - It also bolsters tourism.
  - Foster national unity and diversity:
    - Champion local cuisine

- Celebrate cultural heritages.

- **Conclusion**:
  - This unique initiative of GoI is poised to play pivotal roles in fostering economic development, providing citizens with recreational spaces, enhancing tourism, and celebrating the rich cultural heritage of our diverse and unique nation distinctively.

2) ROAD INFRASTRUCTURE GETTING SMARTER

- **Introduction**:
  - India has the 2nd largest road network in the world with 63.71 lakh kms of roads. Road transport is the dominant transport sector in India, both in terms of traffic and in terms of contribution to **National Economy** (3.08% of GVA (out of total 4.6% by transport sector)).

- **Types of roads in India**
  - India's road infrastructure is categorized **into six categories**:
    i. **National Highways:** 1.32 lakh kms
      - These are the primary roads of the country and connect large cities and big industrial areas.
      - Their development and maintenance are the responsibility of central government.
      - **Further need of development of National Highways**:
        - Out of the total roads, **only 2.06% is national highway**, but its carrying capacity is 40%.
        - Higher the density of National Highway -> Higher the inter-state trade (Export + Import) as percent of GSDP (ESI)
        - A positive relationship exists between density of NHs and the per capita income in Indian States.
        - Presently, more than 70% of NHs are either **two lane or less**. Thus, there is a lot of scope of improvement.

    ii. **State Highways: 1.79 lakh kms**
      - These roads link all the important centre of industry, trade and commerce of the state and National Highways

    iii. **District Roads**: 6.12 lakh kms
      - These roads connect different parts of the district, important industrial centres and market centres and usually lead to local railways stations

    iv. **Rural Roads:** 45 lakh kms
      - These roads are found in villages and usually are of two types - *Pucca (or metalled)* and *Kutcha* (or non-metalled). They constitute **70% of roads** in India.

v. **Urban Roads: 5.41 lakh kms**
vi. **Project Roads:** 3.43 lakhs kms

- **Rate of Growth of Road Development in India**
  - The CAGR of total road length since **1991 to 2019** has been **3.64%.** This CAGR between 1951 and 1991 was **4.50%** on a much lower base.
  - The total road length in 1951 was **4 lakh kms**; in 1991 it was **23 lakh kms** and in 2019 it was **62 lakh kms**.
  - So, **in last 28 years** (1991-2019), about 40 lakh kms of road has been added in the country.

- **Key Reasons for improvement in road construction** (both quality and quantity) in the last 3 decades:
  1. **Delinking Road Development and Direct Employment**:
     - Until the liberalization reforms (i.e., 1991), the road development was also connected with direct employment leading to labor intensive construction and also putting a cap on the quality of roads.
     - **After 1991**, the mindset changed and the use of **capital intensive high-tech road making equipment was brought into use**.
  2. **Creation of National Highway Authority of India** (NHAI):
     - NHAI became operational in 1995, which increased the focus on and quality of NHs. Before this NH development and maintenance was the responsibility of the state with funding from the centre.
  3. **Creation of State-Level Road Development Corporations**:
     - After the formation of NHAI, many states started thinking of better organizational forms than the PWD for road development under its charge.
       - For e.g., Maharashtra was first state to set up the **Maharashtra State Road Development Corporation Limited (MSRDSCL)** in Aug 1996. It developed Pune-Mumbai expressway.

  4. **Bringing In PPP Partnership**:
     - Initially, the concession agreements were loaded in favor of government and thus attracted very few private players in limited low risk projects.

- » **New Contracting Models and Asset Monetization** also increased PPP's success.
  - BOT (Toll and Annuity)
  - HAM
  - Toll Operate Transfer (TOT) operational model.

5. **Starting of NHDP**
   - » Started in 1998, this was the biggest road development projects in India (till Bharatmala was launched). It had two major components: the Golden Quadrilateral and the North-Sound & East West Corridors.

6. **Pradhan Mantri Gram Sadak Yojna** launched by MoRD during the Vajpayee regime is the most successful rural road development project in the country. Its success can be attributed to three reasons:
   - » **Selection of villages for connectivity based on objective criteria.**
   - » **Overseeing from independent agencies**, including world bank
   - » **Keeping the project under MoRD** rather than MoRTH
7. **Viability Gap Funding (VGF):** When PPPs were hardly forthcoming for GQ project, the government came up with the idea of mitigating risks by providing VGF with a cap of 40% of the project cost. This increased the interest of bidders and many projects after phase 1 were done through PPP projects.
8. **Increased focus on Expressways**: The first **access-controlled expressways** for fast and streamlined movement was opened between Mumbai and Pune in 2002. While the construction of expressway had a slow start, it has picked up in last 10 years. As of Aug 2023, India has about 5,000 km of operational express way, and other 9,000 kms under construction.
9. **Creation of Focused Organizations:**
   - » **Indian Highway Management Company Limited (IHMCL**) was set up to carry out electronic tolling.
   - » **National Highways & Infrastructure Development Corporation Limited (NHIDCL)** was formed to develop roads in border states.

» **National Highways Logistic Management Limited** was set up in 2020 for developing Multi-Modal Logistic Parks (MMLPs) and the first/last mile port connectivity projects.

10. **Improvement in Road Making Technology**:
    - » As the NHDP rolled out, the import of road infrastructure was brought under Open General License, making it easy for procurement. Further, using the transfer of technology mechanism, domestic manufacturing was encouraged.
11. **Electronic Toll Collection (ETC)**:
    - » It reduced the toll collection time and consequent waiting.
    - » But this technology needs to further evolve, like in developed countries, to the point where vehicles need not slow down for the electronic payments but can have it done while travelling at the maximum speed.

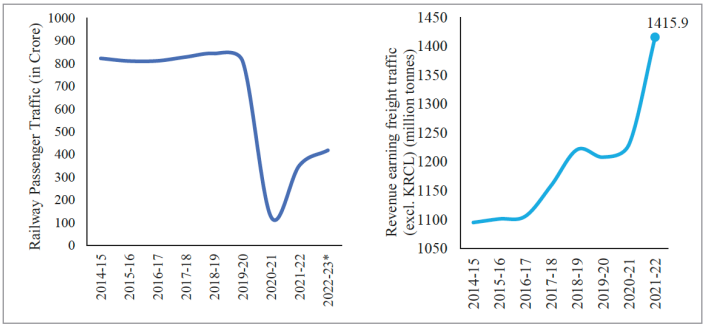
- **Some key challenges which continue and need to be worked upon:**
  - **Safety**: India roads record more than 1.5 lakh deaths every year making Indian roads the deadliest in the world.
    - There is a need to improve engineering, promote awareness among drivers to avoid rash driving; ensuring buffer lanes for turns; and providing for sufficient roadside parking.
  - **Urban Roads (i.e., the city roads)** suffer from a lot of congestion in almost all cities and hampers first/last mile connectivity.
  - **Lane Kms vs Road Kms**:
    - As more multiple lane roads get constructed, it's important to measure lane kms. This will not only help us measure length but also the capacity.
  - **Origin to Destination (OD) Data**:
    - For future planning and development of road network, it is important to get OD data. This can also be used for ETC.
  - **Better Coordination with PPP players**:
    - Significant time and energy are wasted in disputes between the PPP players and the authority. Projects get delayed leading to significant inconvenience.

- **Conclusion:**
    - Given the traction that India has built on road infrastructure, we should hope that the challenges are addressed and the momentum enhanced for development

3) RAIL INFRASTRUCTURE

- Railways in India began in **1853**, when the first train steamed off from **Mumbai to Thane, a distance of 34 kms**.
- From that modest beginning today, Indian Railways have grown into vast network of **more than 7,000 stations**, over **68,000 kms** of route length and around **130,000 bridges**. It is the **fourth largest railway network in the world** under single management.
- The Indian railways is also one of the **largest employers** in the country by employing more than **13 lakh** workmen.
- **Railway Passenger and Freight Traffic** (as per ESI 2022-23)
    - **Passenger Traffic** was 809 crore in FY20 which dipped to 125 crore in FY21 and has recovered to 351.9 crore in 2021-22.
    - During the **FY20,** IR carried 1.2 billion tonnes of freight and 8.1 billion passengers - making it the world's largest passenger carrier and fourth largest freight carrier. The freight was sustained by IR despite the COVID-19 lockdown. Between FY21 and FY22, there was a sharp increase in freight traffic.

Figure XII.7: Railways passenger as well as freight traffic have seen strong growth post Covid-19 period



Note: * For FY23 the data is from April-November, 2022
Source: Ministry of Railways

- **Capital Expenditure** on infrastructure in railways has received tremendous boost since 2014. It has seen a continuous increase in the last four years with CAPEX (BE) of Rs 2.5 lakh crore in FY23.

A) OTHER ASPECTS ABOUT RAILWAY INFRASTRUCTURE

- **Central Public Sector Enterprises under Ministry of Railways**:
  - There are 12 CPSEs under the administrative control of Ministry of Railways viz. RITES Limited; IRCON International Limited; IRFC; CONCOR; KRCL; MRVC, IRCTC, RCIL; RVNL; DFCCIL; KMRCL; and BCL.

- **Research & Development:**
  - The **Research Design and Standards Organization (RDSO)** at Lucknow is the R&D wing of Indian Railways. It acts as a consultant to Indian Railways in technical matters. It also provides consultancy to other organizations connected with railway infrastructure and design.

- **Railway Finance**:
  - **Separate Railway Budget in the past**: Since 1924-25, Railway Budget was being presented separately to Parliament since 1924-25 owing to the separation convention. The main reason behind the separation convention was to ensure **stability of civil estimates** as railway finance used to be a sizable part of the general finance.

  - **Merging of the general budget and railway budget** has taken place since FY18. This gives a holistic picture of the financial position of the government. It facilitates multimodal transport planning.

- **Railway Electrification**:
  - **IR's Mission 100% Electrification** policy is seen as a pivotal for the country's entire energy sector.
    - **Advantages:**
      - Reducing crude oil imports and saving forex was the initial motivation.
      - **Environment benefits** of electrification are becoming more important reasons now.
      - **Better quality of service** is also ensured by electric rails. The average speed is higher.
    - **Progress**: As of March 2023, electrification on IR has been extended to **58,812 Route Kms** including Konkan Railways.

- **Rail Tourism**:
  - IR connects various tourist destinations in the country and is thus the prime mover of tourism in the country.
  - **Under Bharat Gaurav Train Policy**, the railways have introduced **theme-based Tourist Circuit Trains**. This will showcase rich cultural heritage and magnificent historical places to the people of India and the world through professionals of the tourism sector and other potential service providers.
    - Under this, State Tourism Development Corporations or any other potential service provider may run theme-based tourist circuit trains covering any destination of their choice.
    - Ministry of Tourism supports this by provision of better quality LHB coaches under Bharat Gaurav Train Policy and gives approximately 33% concession in the charges due to the Railway, for promotion of railway tourism.
  - Further, specialized tourism products, mostly train based, are also introduced from time to time in association with IRCTC and selected states

B) NATIONAL RAIL PLAN 2030

- Indian railways have prepared a National Rail Plan (NRP) for India - 2030.
- The plans is to create **future ready** Railway system by 2030.
- The NRP is aimed to formulate strategies based on both **operational capacities and commercial policy initiatives** to increase modal share of the Railways in freight to **45%** (at present it is around 27%) and to sustain it.
- **Other aspects:**
  - **Reduce transit time of freight** substantially by **increasing average speed of freight trains to 50Kmph**.
  - As part of the National Rail Plan, **Vision 2024 has been launched** for accelerated implementation of certain critical projects by 2024 such as: 100% electrification, multi-tracking of congested routes, upgradation of speed to 160 kmph on Delhi-Howrah and Delhi-Mumbai routes, upgradation of speed to 130kmph on all other Golden Quadrilateral-

Golden Diagonal (GQ/GD) routes and elimination of all Level Crossings on all GQ/GD route.

- Identify new Dedicated Freight Corridors and new High Speed Rail Corridors.
- Assess rolling stock requirement for passenger traffic as well as wagon requirement for freight.
- Assess Locomotive requirement to meet twin objectives of 100% electrification (Green Energy) and increasing freight modal share.
- **Assess the total investment in capital** that would be required along with a periodical break up.
- Sustained involvement of the Private Sector in areas like operations and ownership of rolling stock, development of freight and passenger terminals, development/operations of track infrastructure etc.

C) VANDE BHARAT EXPRESS

- **Vande Bharat Express** is India's first indigenous semi-high-speed train. It has been manufactured by **Integral Coach Factory, Chennai** and is a successful step towards 'Make in India' and 'Atmanirbhar Bharat'.
- These trains have **ultra-modern feature**s like quick acceleration, substantial reduction in travel time, maximum speed of 160 kmph, on-board infotainment and GPS based passenger information system, automatic sliding doors, retractable footsteps and Zero discharge vacuum bio toilets, CCTV cameras, etc. and other contemporary features as per global standards.
- **As of July 2023**, 50 Vande Bharat Train services are running on the Indian Railways, connecting states having Broad Gauge Electrified network.
  - The first Vande Bharat Express train was flagged off on **15th Feb 2019,** on the New Delhi-Kanpur-Allahabad-Varanasi route.
- The introduction of trains, including Vande Bharat services, is an ongoing process on Indian Railways subject to operational feasibility, traffic justification etc.

4) S&T: ADITYA-L1

- It is **India's first observatory class space based solar mission**. It was launched in Sep 2023 by ISRO. It has a mission life of **5 years** during which its payloads will **study various aspects of sun**. It will be serving as a **space weather station** and the data from the spacecraft will aid in making models and predicting storms in advance.

- **Why study sun from space and specifically from Lagrangian point 1?**
  - **Why study sun from Space?**
    - Various types of radiations from sun are not able to reach earth due to **atmosphere of the earth and earth's magnetic field** making their study difficult from earth.
  - **Why from Lagrangian Points?**
    - A Satellite placed in the **halo orbit around the Lagrangian point 1 (L1)** of the Sun-Earth system has the major advantage of **continuously viewing the Sun without any occultation/ eclipses.**

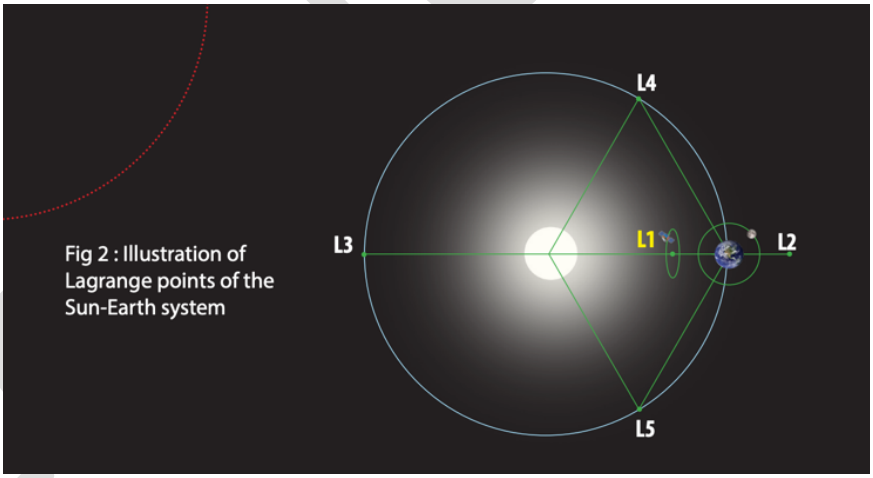
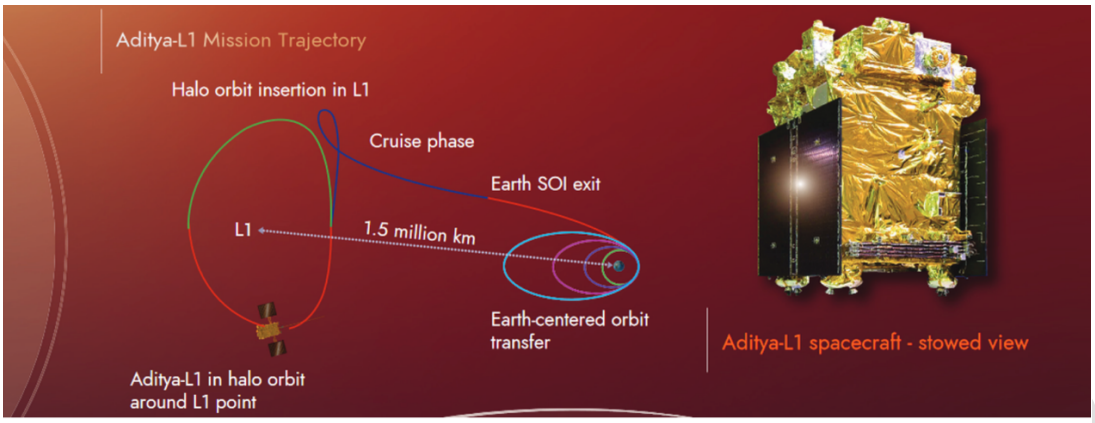


Fig 2 : Illustration of Lagrange points of the Sun-Earth system

- **What Trajectory ADITYA-L1 follows to reach Lagrangian Point-1**: Through various orbit raising manoeuvres and cruise phase, it will be placed in a halo orbit around the Lagrangian Point-1 (L1) of the Sun Earth System, which is about **1.5 million km** from the Earth.



The path Aditya-L1 will take to get to L1. | Photo Credit: ISRO

- **Major Science Objectives**:
  - Understand the **coronal heating and solar wind acceleration**: It will observe the flow of energy in the sun's outer atmosphere to test competing theories for the heating of sun's corona.
  - Understanding initiation of **Coronal Mass Ejection (CME),** flares and near earth space weather: By analysing X-Ray radiation, it will seek to understand how violent solar storms are born.
  - To understand **coupling and dynamics of the solar atmosphere**
  - To understand **solar wind distribution** and temperature anisotropy.

- **Various Payloads of ADITYA-L1:** It goes with **7 payloads**:

  a) **Visible Emission Line Coronagraph (VELC):** It can peek as close as **1.05 solar radii**, a region never imaged by any solar telescope. It can thus give us more information about **coronal mass ejection**.

  b) **Solar Ultraviolet Imaging Telescope (SUIT):** It will observe UV radiations from different zones of the solar atmosphere. It will help us to better understand the climate variation on earth.

  c) **Solar Low Energy X-Ray Spectrometer** (SoLEXS)

  d) **High Energy L1 Orbiting X-Ray Spectrometer** (HEL1OS)

  e) **Aditya Solar Particle Experiment (ASPEX):** In-situ measurements of solar particles and ions.

  f) **Plasma Analyzer Package for Aditya** (PAPA)

g) **Advanced Tri-axial High Resolution Digital Magnetometers**

- With the help of e, f, and g scientists can predict probable geomagnetic storms and better understand space weather dynamics.

Conclusion: If the mission succeeds, it will be a resounding vindication of India's investment in space science research, which can on the one hand spur fundamental enquiry of our cosmos and on the other generate knowledge of strong societal relevance.

2) S&T: SPACE INFRASTRUCTURE IN INDIA

- **Background**:
  - Space activities in India began with the establishment of the **Indian National Committee for Space Research (INCOSPAR)** in 1962. In the same year, work on establishment of Thumba Equatorial Rocket Launching Station (TERLS) near Thiruvananthapuram was also started.

  - **ISRO** was formed on 15th Aug 1969, and superseded INCOSPAR with an expanded role. In 1972, **Space Commission** and **Department of Space (DOS)** were constituted by the GoI, and ISRO was brought under DOS.
    - **ISRO** is the space agency of India. It is involved in science, engineering, and technology to harvest the benefits of our space for India and mankind. It has established major space systems for communication, television broadcasting, and remote sensing. It has also developed satellite launch vehicles like PSLV, GSLV, LVM-3 etc. It also contributes to science and science education in the country. It has launched Indian's NAVIC, Chandrayaan, MOM-1, Aditya-L1 and several other incredible missions.
    - **Space Commission** formulates the policies and oversees the implementation of the Indian Space Program to promote

development and application of space science and technology for the socio-economic benefit of the country.

- **DOS** implements these programs through ISRO and other associated organizations:

- **The Major establishments of DOS and their area of activities are:**

A) VIKRAM SARABHAI SPACE CENTRE (VSSC):

- Located in Thiruvananthapuram, it is responsible for design and development of **launch vehicle (rocket) technology**. Its major programs include, PSLV, GSLV, LVM-3, RLV, Rohini Sounding Rockets etc.

B) UR RAO SATELLITE CENTRE (URSC)

- Located in Bengaluru, it is the lead centre for design and development of **satellites** including communication, navigation and remote sensing satellites. These satellites provide applications in the areas of telecommunication, television broadcasting, VSAT services, tele-medicines, tele-education, navigation, weather forecasting, disaster warning etc.

C) SATISH DHAWAN SPACE CENTRE (SDSC)-SHAR

- It is the '**Spaceport of India**'. It is the backbone of the ISRO in providing **launch base infrastructure** for the Indian Space Program.
- It is located at Sriharikota, Andhra Pradesh.

D) LIQUID PROPULSION SYSTEMS CENTRE (LPSC)

- It is the lead centre of ISRO for the design, development, and realization of advanced **propulsion systems for launch vehicles**.
- It is primarily responsible for developing and deploying **earth storable, cryogenic, semi-cryogenic, and electric propulsion systems for ISRO's launch vehicles and satellites**.

- Its activities are spread across **its two campuses**, namely, LPSC, Valiamala, Thiruvananthapuram, and LPSC, Bengaluru.

E) SPACE APPLICATION CENTRE (SAC)

- Located in Ahemedabad, it's a major R&D centre of ISRO.
- It develops space borne and air-borne **instruments and payloads** and their applications for national development and societal benefits.
- For e.g., the **communication transponders** developed at this centre for the INSAT and GSAT series of satellites are used by the government and private sector for VSAT, DTH, Internet, broadcasting etc.
- It also designs and develops **optical and microwave sensors** for satellites, signal and image processing software, GIS software, and many applications for Earth Observation Program of ISRO.

F) HUMAN SPACE FLIGHT CENTRE (HSFC)

- Set up in 2019, it is the lead centre for ISRO's Human Spaceflight program.
- It undertakes multidisciplinary R&D activities in new domains of human science and technology while conforming to high standards of reliability and human safety.
- It is currently focused on **Gaganyaan mission** and is working on end-to-end mission planning, development of orbital module, life support systems, selection and training of astronauts etc.
- It is currently operating from ISRO-HQ campus, Bengaluru.

G) NATIONAL REMOTE SENSING CENTRE

- It is responsible for **establishment of ground centres 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 etc.

H) ISRO PROPULSION COMPLEX (IPRC)

- Located in Mahendragiri, it is responsible for assembly, integration and testing of liquid propulsion systems for operational and developmental launch vehicles.
- It is also responsible for qualification, testing and acceptance of liquid engines, cryogenic engines, spacecraft engines etc.

I) ISRO TELEMETRY, TRACKING AND COMMAND NETWORK (ISTRAC)

- It is responsible for providing telemetry, tracking and command (TTC), and mission control services to major launch vehicle, laboratory for electro-Optics Systems (LEOS) and Interplanetary Spacecraft missions of ISRO.
- It is also responsible for operating the complex ground segment of NaVIC.

J) MASTER CONTROL FACILITY (MCF)

- It is responsible for **on-orbit Operations (OOP)** and **Launch & Early Orbit Phase (LEOP)** operations of geostationary/geosynchronous & IRNSS class of spacecrafts of ISRO.
- It is located at Hassan in Karnataka.

K) ISRO INTERTIAL SYSTEMS UNIT (IISU)

- Located in Thiruvananthapuram, it is responsible for design and development of inertial systems for launch vehicles and satellites. These include mechanical and optical gyros, Altitude reference systems, accelerometer packages etc.

L) LABORATORY FOR ELECTRO OPTICS SYSTEMS (LEOS)

- Located in Bengaluru it is responsible for design, development and production of altitude sensors, high resolution imaging optics, and special purpose science instruments for several spacecrafts.

M) INDIAN INSTITUTE OF REMOTE SENSING (IIRS)

- IIRS, Dehradun, is a premier institute with primary aim to build capacity in Remote Sensing and Geoinformatics and their applications through education and training programs at the postgraduate levels.

N) DEVELOPMENT AND EDUCATIONAL COMMUNICATION UNIT (DECU)

- Located in Ahemedabad, it is responsible for implementation of satellite-based societal applications in the country.
- It is involved in the system definition, planning, implementation, and social research & evaluation of such applications.

O) PHYSICAL RESEARCH LABORATORY (PRL)

- PRL, Ahemedabad is an autonomous body under DOS, and a premier research institute engaged in basic research in the areas of Astronomy and Astrophysics, solar physics, planetary science and exploration, space and atmospheric sciences, geosciences, theoretical physics, atomic, molecular and optical physics etc.

P) NATIONAL ATMOSPHERIC RESEARCH LABORATORY

- Located in Gadanki near Tirupati, it is an autonomous organization engaged in **cutting edge research in atmospheric and space sciences** with the vision of developing capability to predict the behaviour of the earth's atmosphere through observations and modelling.

Q) NORTHEASTERN-SPACE APPLICATIONS CENTRE (NE-SAC)

- It is an autonomous organization under DOS and Northeastern Council (NEC). It has the mandate of providing **space-based governance and development** by taking up projects in the fields of natural resource management, infrastructure planning, healthcare, education, emergency communication etc.

- It also conducts training and capacity building in the field of geospatial technology and UAV based remote sensing applications.

R) INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY

- Established in 2007 at Thiruvananthapuram, it is Asia's first Space University. It aims to provide **high quality education** in Space S&T to meet the demands of the Indian Space Program. It offers undergraduate, postgraduate, doctoral and post-doctoral programs.

S) ANTRIX CORPORATION LIMITED (ACL)

- It is a GoI company under the administrative control of DOS.
- It is engaged in providing space sector products and services worldwide ranging from supply of hardware and software, earth observation and scientific missions, transponder lease services, launch services etc.

T) NEW SPACE INDIAN LIMITED (NSIL)

- Incorporated in 2019, it is a CPSE, under the administrative control of DOS. It focuses on commercially utilization of R&D work of ISRO centres and other DOS constituents.
- The emergence of NSIL would spur the growth of Indian industries in the space sector and enable Indian industries to scale up manufacturing and production base.

U) INDIAN NATIONAL SPACE PROMOTION AND AUTHORIZATION CENTRE (IN-SPACE)

- It is an independent nodal agency under Department of Space (DoS). It was set up in 2020 to boost commercialization of Indian Space Activities and encourage private sector participation.

- It will permit and oversee the following activities of **non-Government Private Entities** (NGPEs):
    - Building of launch vehicles and satellites and providing space-based service as per the definition of space activities.
    - Sharing ISRO infrastructure/premise etc.
    - Establishment of temporary facilities within the premise of ISRO
    - Establishment of **new space infrastructure and facilities**, by NGPEs, in pursuance of space activities based on safety norms and other statutory guidelines and necessary clearance.
    - Building of Spacecrafts by NGPEs for registration as Indian satellites and all associated infrastructure
    - Using of spacecraft data and rolling out of space-based services and all other associated infrastructure for the same.