INDIA'S SPACE/DEFENCE PROGRAM/EQUIPMENT

- The Indian Space Research Organization (ISRO) is the national space organization of India with its headquarters in Bangalore, Karnataka. ISRO was established in 1969 AD. The current chairman of the Indian Space Research Organization (ISRO) is S. Somnath.

The Indian space program is conceptualized by Dr. Vikram Sarabhai. Dr. Sarabhai is considered as the Father of the Indian Space Program.

1. VIKRAM SARABHAI SPACE CENTER (V. S.S.C.)

- This space research center is located at Trivandrum (Thiruvananthapuram), Kerala. VSSC is the largest center of ISRO (Indian Space Research Institute). Here rocket launching vehicles, artificial satellites and associated technologies are developed.

2. ISRO SATELLITE CENTER (ISAC)

- This center is located in Bangalore. Here satellite development and related works like design, testing etc. are done. It is the second largest center of ISRO after Vikram Sarabhai Space Center.
- Aryabhatta & Bhaskar were built here. Satellites of IRS and INSAT series are also built here.

3. SHAR CENTER

- This launch center is located at Sriharikota in Andhra Pradesh. This is the main center for launching Satellite Launch Vehicle (SLV) and rockets into space. The country's largest Solid Propellant Booster Plant is also located here.
- This centre has the facilities for solid propellant processing, static testing of solid motors, launch vehicle integration and launch operations, range operations comprising telemetry, tracking and command network and mission control centre.

4. LIQUID PROPULSION SYSTEMS CENTER

- Systems related to the release of spacecraft are developed under this center. Liquid Propulsion Systems Center (LPSC) is ISRO's center of excellence in the field of liquid propulsion for launch vehicle and spacecraft programmes. Its activities are spread across Valiamala / Thiruvananthapuram, Mahendragiri and Bangalore. The main testing and research center is located at Mahendragiri of Tamil Nadu.

5. SPACE APPLICATIONS CENTER (SAC)

- This center is located in Ahmedabad. The Space Applications Center (SAC) is one of the major centers of the Indian Space Research Organization (ISRO). This centre is responsible for the development, realisation and qualification of communication, navigation, earth & planetary observation, meteorological payloads and related data processing and ground systems. Several national level application programmes in the area of natural resources, weather and environmental studies, disaster monitoring/ mitigation, etc are also carried out.

6. DEVELOPMENT AND EDUCATIONAL COMMUNICATION UNIT (DECU)

- The Development and Educational Communication Unit (DECU) located at Ahmedabad is dedicated for realizing satellite communication based social applications in the country. The major activities of DECU are - SATCOM network configuration, implementation, upgradation, migration, utilization, sustenance, social research and evaluation, program production and transmission and training. This center is also famous for studies related to the use of space technology.

ISRO'S SPACE PROGRAMS AND ACHIEVEMENTS

- In **1975**, India successfully launched its first satellite **'Aryabhata'** from the launch station of Russia.
- With the successful test of SLV-3 in 1980, India added its name to the list of countries that could launch their own satellites. **Rohini** is the first satellite of India which was launched by Indian

launch vehicle (SLV-3).

- India launched INSAT-1B in 1983, Which revolutionized India's telecommunication, television broadcasting and weather forecasting.
- India successfully tested the Polar Satellite Launch Vehicle (PSLV) in 1994.
- Chandrayaan-1 was launched by ISRO on 22 October 2008 and Chandrayaan-2 on 22 July 2019.
- Chandrayaan-1 reached the Moon's surface on 14 November 2008 and India's flag was hoisted on the Moon. Whereas the test of Chandrayaan-2 was not successful. Chandrayaan-3 is scheduled to be launched in June, 2023.
- In 2014, India became the fourth country to land its Mangalyaan on the surface of Mars. This mission of India was successful in the first attempt itself.
- In 2017, ISRO created a world record by sending the maximum number of satellites into orbit in a single mission with the help of **PSLV-C37**. It was the **39th mission** of the Indian Polar Satellite Launch Vehicle (PSLV) programme.
- On 5 June 2017, ISRO launched the country's heaviest rocket **GSLV MK III.**
- In 2019, India surprised the world with the successful test of Anti-Satellite (ASAT). India has become the fourth country (after USA, Russia and China) to shoot down a satellite in space.
- **India and Cryogenic Engine:** Indian scientists made the first indigenous cryogenic engine in the year 2003 and the first successful test was conducted in 2014.
- CE-20 is India's second cryogenic engine developed by Indian Space Research Organization (ISRO) for the GSLV Mark-III upper stage.

India's Defence System

- The army is formed for the defence of India, whose supreme commander is the President. But all the work related to defence is done by the Union Cabinet.
- Indian Armed Forces are divided into three parts. The Defence Minister deals with the administration of the Armed Forces.

ARMY

- It is headed by the Chief of the Army Staff. Its headquarter is in New Delhi.
- It is divided into 7 commands whose details are as follows:

Command	Headquarter
Western Command	Chandi Mandir
Northern Command	Udhampur
Central Command	Lucknow
Eastern Command	Kolkata
Southern Command	Pune
Southwestern Command	Jaipur
Training Command	Shimla

NAVY

- It is headed by the chief of the Naval Staff of the rank of Admiral. Its headquarter is in Delhi. The entire Navy is divided into three commands. Each command is headed by a Vice Admiral.

Command	Headquarter
Eastern Command	Vishakhapatnam
Western Command	Mumbai
Southern Command	Kochi

AIR FORCE

- Its head is of the rank of 'Air Chief Marshal' who is called 'Chief of the Air Staff'. Its headquarter is in New Delhi. The Air Force is divided into 7 commands, the details of which are as follows-

Command	Headquarter
Eastern Command	Shillong
Central Command	Allahabad
Southern Western Command	Gandhinagar
Western Command	New Delhi
Southern Command	Thiruvananthapuram
Training Command	Bangalore
Maintenance Command	Nagpur

RANKS OF OFFICERS

Army	Airforce	Navy
General	Air Chief Marshal	Admiral
Lieutenant General	Air Marshal	Vice Admiral
Major General	Air Vice Marshal	Rear Admiral
Brigadier	Air Commodore	Commodore
Colonel	Group Captain	Captain
Lieutenant Colonel	Wing Commander	The Commander

Major	Squadron Leader	Lieutenant Commander
Captain	Flight Lieutenant	Lieutenant
Lieutenant	Flying Officer	Sub Lieutenant

MILITARY TRAINING INSTITUTES OF INDIA

Army	
National Defence Academy (NDA)	Khadakwasla (Maharashtra)
Indian Military Academy (IMA)	Dehradun
National Defence College	New Delhi
Defence Services Staff College	Wellington
Air Force	
Air Force Academy	Hyderabad
Air Force Technical College	Jalahalli (Bangalore)
Airforce Administrative College	Coimbatore
Navy	
Indian Naval Academy	Kochi
I.N. S. Chilka	Bhubaneswar
I.N.S. Shivaji	Lonavala

INDIA'S INTERNAL SECURITY SYSTEM

Organization	Foundation Day	Head-quarter
National Cadet Corps (NCC)	16 April 1948	New Delhi
Assam Rifles (AR)	24 March 1835	Shillong (Meghalaya)
Central Reserve Police Force (CRPF)	27 July 1939	New Delhi
Home Guards (HG)	1946	In different states
Territorial Army (TA)	1949	In different states
Indo-Tibetan Border Police (ITBP)	2 October 1962	New Delhi
Border Security Force (BSF)	1 December 1965	New Delhi
Central Industrial Security Force (CISF)	10 March 1969	New Delhi
National Security Guard (NSG)	22 September 1986	New Delhi
Rapid Action Force (RAF)	1992	New Delhi
Coast Guard	18 August 1978	New Delhi
Sashastra Seema Bal (SSB)	1963 [2003]	New Delhi

- **CBI - Central Bureau of Investigation:** Central Bureau of Investigation was established in April **1963**. Its headquarter is in New Delhi. The current CBI director is **Subodh Kumar Jaiswal**.
- **NIA - National Investigation Agency:** NIA was constituted under the National Investigation Agency Act, 2008. Its headquarter is in **New Delhi**. It is the central agency for investigation and prosecution of crimes in matters such as national security, smuggling of fake Indian currency, human trafficking, nuclear weapons, special offences. The current NIA director is **Dinkar Gupta**.
- **IB - Intelligence Bureau:** The Intelligence Bureau was established during the British rule itself, which was reconstructed in 1947 under the Ministry of Home Affairs. Its headquarter is in **New Delhi**. Current IB chief is Tapan Deka.
- **RAW-Research and Analysis Wing:** RAW is an important international intelligence organization of India. Its headquarter is in New Delhi. The IB could not work well in the Indo-China war of 1962 and the Indo-Pakistani war of 1965. Therefore, a capable and independent wing RAW was established by the Government of India to collect international information. It was established on **21 September 1968**. Its headquarter is in **New Delhi**.

  The current RAW director is **Samant Kumar Goel**.

DEFENCE EQUIPMENT OF INDIA

Missiles developed under the Integrated Guided Missile Development Program (IGMDP)

AGNI

- It is a **surface-to-surface ballistic missile. Agni P** is the sixth missile in the Agni series of ballistic missiles. This missile is capable of hitting targets up to **2000 km**.
- Apart from inter-continental ballistic missiles Agni-5, the Indian armoury of the Agni series includes Agni-1, Agni-2, Agni-3 and Agni-4. Agni-

5 is a strategic missile with a **maximum range of 5000 km**.

PRITHVI

- It is a Short-range **surface-to-surface** ballistic missiles. India has 3 Prithvi missiles. In this, Prithvi-1 has a range of 150 km, Prithvi-2 has a range of 250 km and **Prithvi-3** has a range of **350 km**.

AAKASH

- It is a medium-range **surface-to-air** missile. The missile was inducted into Indian Air Force in 2014 and Indian Army in 2015. Its firing range is up to **80 km**.

TRISHUL

- It is a **surface to air** missile. It is a short range **supersonic** missile. There is also a naval version of the Trishul known as '**Torpedo MK 2**'.

NAG

- It is a third generation anti-tank guided missile. It can attack both **surface-to-surface** and **air-to-surface**. **HELINA** is the air-to-surface version of Nag, integrated with the Dhruv helicopter.

BRAHMOS

- Brahmos is a **Supersonic Cruise Missile**. Its range is up to **300 kilometers**. The BrahMos missile has a maximum speed of more than Mach 3 i.e. It is capable of reaching speed of upto Mach 3 and can hit its target with pinpoint accuracy. It can be launched from **submarine, ship, combat aircraft and land**.

NIRBHAY

- It is a sub-sonic cruise missile. It is capable of being launched from **surface, sea** and **air**.
- Its firing range is up to **1000 km**. The specialty of the Nirbhay missile is that it can fly at a very low altitude due to which it cannot be caught by the radar systems.

SAGARIKA

- This missile is capable of carrying nuclear warheads and can be fired from the sea (even from submarines). Its firing range is up to 700 km.

DHANUSH

- This missile is capable of carrying 500 kg warhead. Its firing range is 350 km. It can hit its target both on land and at sea with pin point accuracy.

PRAHAR

- It is a surface-to-surface missile. Its firing range is upto 150 km.

SHAURYA

- It is a **surface-to-surface ballistic missile**. Its firing range is 700-1900 km. It can achieve a speed up to Mach 7.5. It is a **hypersonic missile**.

DIFFERENCE BETWEEN BALLISTIC AND CRUISE MISSILES

Ballistic Missile	Cruise Missile
The size of a ballistic missile is very large.	The size of cruise missile is small.
Ballistics missiles can carry large and heavy warheads or explosives with them.	It is capable of carrying very light weight bombs.
It is at a very high altitude from the earth, due to which it is not easy to hide it from the radar.	This missile moves at a height of only 15 to 20 meters from the surface of the earth, so it cannot be caught by the radar.
This missile hits its target by moving on a parabolic trajectory.	This missile penetrates the target by moving parallel to the earth's surface.
Fuel can be kept in ballistic missiles.	Fuel cannot be kept in reserve in a cruise missile.

Hypersonic (greater than Mach 5): They travel at least five times the speed of sound (Mach 5).

Supersonic (Mach 1 to 5): These missiles travel faster than the speed of sound.

Subsonic (less than Mach 1): These missiles travel at speeds slower than the speed of sound.

AIR-CRAFT CARRIER

- India has two aircraft carriers INS Vikramaditya and INS Vikrant.
- India's two major Nuclear Submarines are INS Chakra and INS Arihant respectively.
- Some major Diesel electric Submarines: INS Shishumar, INS Kalvari, INS Sindhughosh.
- India has major tanks: T-72 Tank, T-90 Tank, T-90 Bhishma Tank and Arjun Tank. India has made its own tanks of the Ajeya series from the T-72 tank.

Aircraft	Country of Origin	Role
Sukhoi 30Mk-I	Russia	Fighter
MiG 29	Soviet Union	Fighter
Mirage 2000	France	Fighter
Jaguar	France and UK	Fighter
MiG 21	Soviet Union	Fighter
DassaultRafale	France	Fighter
Tejas (HAL)	India	Fighter
Ilyushin 76	Soviet Union	Transport
C-17 Globemaster	United States	Transport
C-130J Super Hercules	United States	Transport
Antonov 32	Soviet Union	Transport
Boeing 737	United States	Transport
BAE Hawk	United Kingdom	Trainer
HAL Kiran	India	Trainer
Pilatus PC-7	Switzerland	Trainer
Ilyushin 78	Russia	Air-to-air Refueller

Helicopters		
HAL Rudra	India	Attack Helicopter
HAL LCH	India	Attack Helicopter
Mi-35	Soviet Union	Attack Helicopter
Apache AH64E	USA	Attack Helicopter
Chinook	USA	Transport Helicopter
Mi-8/Mi-17	Soviet Union	Transport Helicopter
Mi-26	Soviet Union	Transport Helicopter
HAL Dhruv	India	Transport Helicopter
HAL Cheetah	France + India	Transport Helicopter
HAL Chetak	France + India	Transport Helicopter