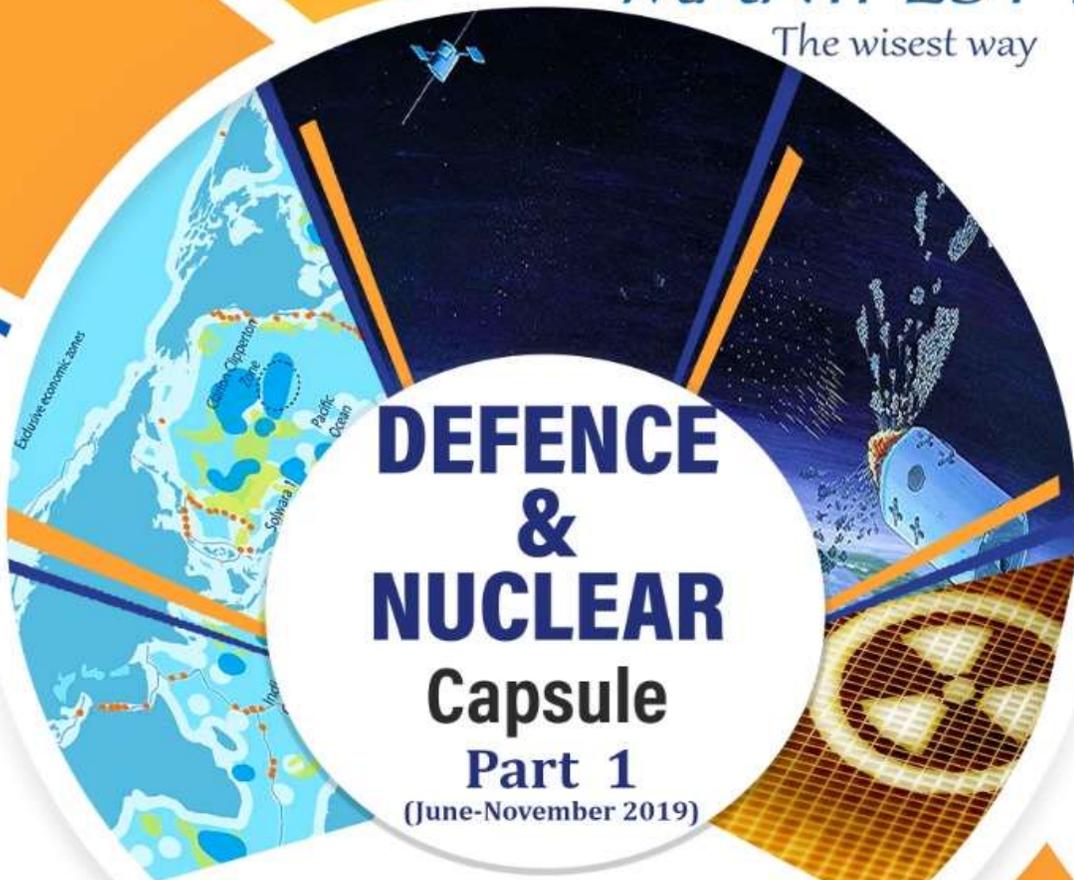




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Deep-Sea mission

- **Why in news?**
 - The Deep Ocean Mission is to be launched by the Ministry of Earth Sciences with a corpus of ₹ 10000 crore and to explore the deep ocean.
- **What's the mission?**
 - The mission will focus on deep-sea mining, ocean climate change advisory services, underwater vehicles and underwater robotics related technologies.
 - Studying climate change, marine biodiversity and survey for compounds like hydrocarbons and minerals are part of the deep ocean mission.
 - This mission includes a desalination plant powered by tidal energy and a submersible vehicle capable of exploring depths of at least 6,000 metres whereas submarines can reach only about 200 metres.

DEEP OCEAN MISSION

➤ Deep Sea Mining through 'Underwater Vehicles' and 'Underwater Robotics'

➤ Asserting exclusive rights to explore polymetallic nodules from seabed over **75,000 sq km of areas in international water**

➤ Estimated polymetallic nodules resource potential: **380 million tonnes (MT)**

➤ Development of ocean climate change advisory services

➤ Technology for sustainable utilisation of marine bio-resources

THESE POLYMETALLIC NODULES CONTAIN

Manganese | **92.6 MT**

Nickel | 4.7

Copper | 4.3

Cobalt | 1

(*figures are rounded off)

➤ Deep ocean survey and exploration

➤ Energy from the ocean and offshore-based desalination

➤ Krill fishery from southern ocean

- This mission will enable India to exploit the resources of the Central Indian Ocean Basin (CIOB).
- India has been allocated 75,000 square kilometers in the CIOB by the United Nations International SeaBed Authority for the exploration of poly-metallic nodules.
- Now ISRO has successfully developed a design for its crew module, a sphere shaped capsule.
- A three-member crew can be accommodated in the sphere, one of the key components of the manned submersible vehicle.
- NIOT is tasked with aspects like electronics and navigation for the manned submersible.
- Multiple agencies, including the Goa based National Centre for Polar and Ocean Research, Centre for Marine Living Resources and Ecology at Kochi and Indian National Centre for Ocean Information Services (Hyderabad) are involved in the initiatives.

Polymetallic nodules-

- Polymetallic nodules (manganese nodules) are potato-shaped, largely porous nodules found in abundance of deep sea rugs on the seafloor of world oceans.
- They are composed of manganese and iron, nickel, copper, cobalt, lead, molybdenum, cadmium, vanadium, titanium, of which nickel, cobalt and copper are considered to be of economic and strategic importance.
- This will help India meet India's energy requirements for the next 100 years.

- It has been estimated that 380 million metric tons of polymetallic nodules are available at the bottom of the Central Indian Ocean.

QRSAM (Quick Reaction Surface to Air Missile)

- **Why in news?**
- India has successfully test fired the QRSAM technology.
- **What is this?**
- It is basically a missile system and has been developed to replace the 'Akash' missile defence system, with a 360-degree coverage.
- The QRSAM weapon system, which operates on the move, comprises fully automated command and control, active array battery surveillance radar, active array battery multifunction radar and launcher.
- Both the radars are four-walled having 360-degree coverage with search on move and track on move capability.
- It is developed by DRDO and has been tested from the Odisha coast, Chandipur.
- It is expected to be ready for induction by 2021.
- With a strike range of 25-30 kms, it uses solid fuel propellant.
- It is capable of hitting several targets at once.
- It is capable of hitting low flying objects.
- It is predominantly developed for the Indian Army and is in possession of State-of-the-art technology like array radar, radio frequency seeker and so on.

Hypersonic Demonstrator Vehicle Technology (HSDTV)

- **Why in the news?**
- DRDO recently fired the HTDV and succeeded in the maiden attempt.
- Hypersonic Technology Demonstrator Vehicle (HSDTV)— Hypersonic Technology Demonstrator Vehicle (HTDV), a DRDO initiative for both military and civil purposes.
- It's basically a scramjet-powered hypersonic vehicle.



- The only other countries that possess this technology are the US, Russia and China.
- It can cruise up to a speed of mach 6 (or six times the speed of sound) and rise up to an altitude of 32. km in 20 seconds.
- It has a range of uses, including missiles of the future, and energy-efficient, low cost and reusable satellite-launch vehicle.
- It has been developed by DRDO with Israeli, British and Russian assistance.
- Scramjet Engine Technology Demonstrator-Multi-stage satellite launch vehicles actually carry satellites into orbit, which can only be used once (expendable).
- These launch vehicles carry a thrust oxidizer (70%) along with the burning fuel.
- They're always expensive and hard to make.
- Ramjet, Scramjet and Dual Mode Ramjet (DMRJ) are the three air-breathing engine designs being developed by various space agencies that can use atmospheric oxygen during their travel through the atmosphere to significantly reduce overall propellant consumption.
- A ramjet is an air-breathing jet engine that uses forward motion to compress incoming air for combustion without a rotating compressor.
- Gas is pumped into the combustion chamber, mixing hot compressed air and igniting.
- Ramjets operate most efficiently at supersonic speeds around Mach 3 (three times the sound speed) and up to Mach 6 speeds.
- Ramjet efficiency begins to drop when the vehicle reaches hypersonic speeds.
- A scramjet engine is an improvement over the ramjet engine as it works effectively at hypersonic speeds, facilitating supersonic combustion. Hence

its called Supersonic Combustion Ramjet, or Scramjet.

- A dual mode ramjet (DMRJ) is a type of jet engine where a ramjet transforms into Mach 4-8 scramjet, which means it can operate efficiently in both subsonic and supersonic combustor modes.

INS Vela

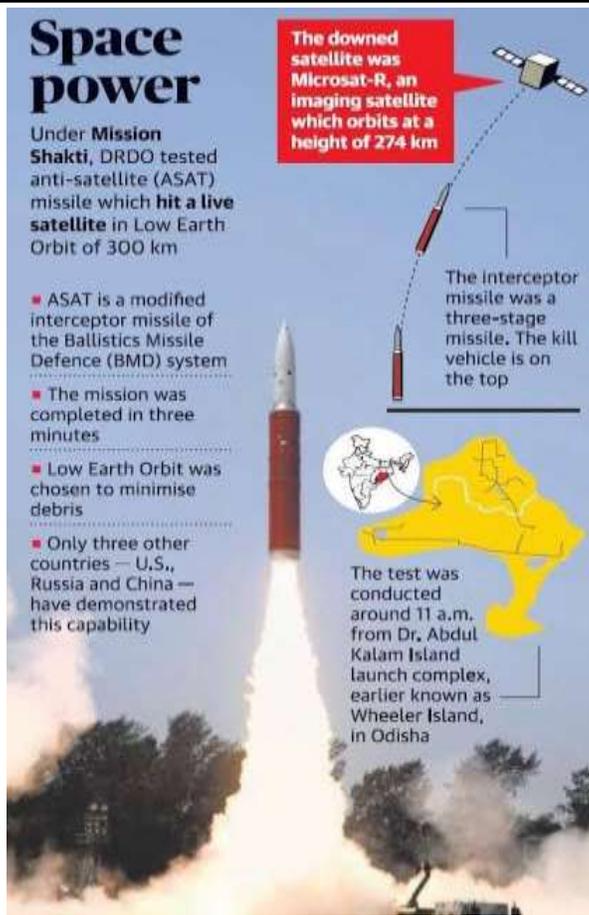
- **Why in news?**
- As construction was completed, INS Vela was launched at Mumbai's Mazagon Docks shipbuilders.
- **What is INS Vela?**
- It is the fourth submarine of the Scorpene class that Mazagon Dock Shipbuilders Ltd has constructed under project 75I by technology transfer.
- The MDL's experience with the Scorpene project and technology transfer is ready to build future submarines.
- The AIP in such submarines allows them to operate under water for more than 21 days in accordance with variables such as velocity.
- A complete list of submarines of this class are INS Kalvari-Active, INS Khanderi-Sea Test, INS Karanj – Sea Test, INS Vela–Sea Test, INS Vagir which is under construction.

ASAT Mission / Missile or Shakti Mission

- **Why in News?**
- India shot down a live satellite in Lower Earth Orbit.
- **Mission and importance-**
- On March 27, 2019 DRDO successfully conducted Mission Shakti, an anti-satellite missile test.
- The test made India the fourth country after the US, Russia and China to have tested an ASAT weapon.
- India's successful demonstration of the ASAT capability is said to signify its ability to intercept an intercontinental ballistic missile.
- India used the Kinetic Kill space technology.
- Test was done in a lower atmosphere to ensure no space debris or debris generated from the test would not last for a long duration.
- The test was done to verify whether India has the capability to safeguard space assets.

Scorpene Class Submarine:

- Under a programme called Project 75, India is committed to building six Scorpene-class submarines at a cost of around ₹25,000 crore.
- These are diesel farmed submarines developed jointly by the French company Naval Group (formerly DCNS) and the Spanish Company Navantia.
- Such submarines may perform various duties, which typically include anti-surface and anti-submarine warfare.
- They include diesel and Air-Independent Propulsion (AIP) replacements.
- A Non-nuclear submarine can work without the exposure to atmospheric oxygen (by surfacing or using a snorkel) through AIP underwater propulsion technology.
- The modified version of the nuclear propulsion systems with ethanol and oxygen producing heat is
- The Ministry of Defense started Project 75 to purchase 24 submarines in 1997.
- After the Kargil War in 1999, a 30-year submarine building plan was approved by the Security Committee, requiring two simultaneous factories with six submarines.
- The principal international treaty on space is the 1967 Outer Space Treaty of which India is a signatory and ratified it in 1982.



About the doctrine:

- India's strategy is entirely retaliatory and not negative.
- "Nuclear weapons are only used to repress a nuclear attack in Indian territory or any part on Indian forces," was the key in the doctrine.
- However, the doctrine made it clear that the "nuclear repressive-nuclear strike in India" is massive and aimed at inflicting intolerable damage.
- China, too, has a NFU program and there is no cause for concern about the Chinese-Indian nuclear situation.
- On the other hand, Pakistan is continually trying to make nuclear threats more prominent in order to contain India's terrorist reaction and at the same time call international attention.
- **Initial use of Nuclear Weapons:**
 - The initial use of nuclear weapons will require massive growth of the capacity of India to supply nuclear weapons.
 - There is currently no evidence that the production of Indian missiles has dramatically increased in recent times.
 - Ultimately, the surveillance, tracking and reconstruction (ISR) capabilities of India's infrastructure should be improved to such a degree that India is assured of taking the majority of its opponent's arms out.
 - India's nuclear alerting protocol should be significantly altered.
 - The main advantage of NFU is that it minimizes the likelihood of nuclear use.
 - This is because the probability of resolving the crisis is increased by miscommunications, misjudgement, misunderstanding and fog of war.
 - Instead, if the two powers are NFUs, there's a greater likelihood of politicians stepping back from the edge because they know that a nuclear war can not be won.
 - NFU also offers an opportunity to cooperate with China for a Global No First Use order (GNFU). Instead of raising doubts about own adherence, India should take the lead in seeking a GNFU policy.
 - Given that the strategic climate in India is developing rapidly, all strategic issues must be considered clearly.

- The old project 75 was put in the new plan called 75I project, in which the Navy will procure six diesel-energetical submarines with advanced air-conditioning propulsion systems to allow them to remain in the sea for long periods and increase their operating range considerably

The capability achieved through the Anti-Satellite missile test provides credible deterrence against threats to our growing space-based assets from long range missiles and proliferation in the types and numbers of missiles.

Nuclear Doctrine of India

Why in news?

- The Indian Nuclear Doctrine is a well-stitched, rational nuclear policy which has been a promise of Indians not to be the first to use nuclear weapons in conflict, after a 1998 nuclear test (No First Use Policy).
- Rajnath Singh, the Defense Minister said that this doctrine is subject to change in later stages in the light of tensions between India and Pakistan.

The Indian Ocean Area (IOR) Data Fusion Centre (IFC)

● Why in news?

- The Indian Ocean Region (IOR) Information Fusion Center (IFC) was launched in 2018 and has played a good role.

● IFC for IOR:

- In order to improve maritime security in and beyond the region, the IFC-IOR has been developed to create a coherent and shared image of the maritime situation as a hub for maritime knowledge around the world.
- IFC is the single point core for the development of a smooth, actual-time picture of almost 7,500 km of the shoreline, created by the Gurugram Information and Analysis Centre of the Indian Navy.
- Data will be shared through this Center, either about "clean sailing" or fishing, with countries in the region to raise awareness about the sea domain in the Indian Ocean.
- The Indian Ocean has a wealth of natural resources. The Indian Ocean Basin accounts for 40 percent of global production of offshore oil.
- Fishing is approximately 15 percent of the global total in the Indian Ocean.
- Mineral resources of equal importance, including poly metallic modules containing nickel, cobalt and iron nodules and large manganese, copper, coal, zinc, silver and gold deposits are found on the seabed.
- IOR also includes a number of coastal and island nations and increase of maritime piracy in the region needs to be countered.
- IFR-IRO must ensure that mutual cooperation, information exchange and communication on the issues and risks that exist in the region will be helpful to the world as a whole.
- As of now, it provides services to 18 countries and up to 15 security centers in several locations.

NATGRID

● Why in news?

- The new project of National Intelligence Grid (NATGRID) intends to link social media accounts to an extensive database of entry and exit records, banking and telephone details, among others.

● What does NATGRID look like?

- The project, initially started in 2009, post Mumbai terror attacks, with a budget of ₹2,800 crore, is an online database for collating scattered pieces of information and putting them on one platform.
- At least 10 central agencies like Intelligence Bureau (IB), Research and Analysis Wing (R&AW) and others will have access to the data on a secured platform.
- The project gathered pace in 2016.
- The 10 user agencies will be linked independently with certain databases that would be procured from 21 providing organisations and include telecom, tax records, bank, immigration, etc. to enable the generation of intelligence inputs.
- The proposal has received resistance from the intelligence agencies, as linking the social media accounts to sensitive government data could expose the system to "trojan attacks."
- Intelligence agencies had also earlier opposed the NATGRID itself amid fears that it would impinge on their territory and possibly result in leaks on the leads they were working on to other agencies.
- NATGRID's data recovery centre has been constructed in Bengaluru.