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Full Ship Shock Trials

- The U.S. Navy carried out a Full Ship Shock Trial (FSST) on the USS Gerald R Ford, its newest and most advanced nuclear-powered aircraft carrier, to ensure its hard enough to withstand the battle conditions.
- After the World War II, the US Navy started to conduct FSSTs of new ship designs using live explosives, to confirm whether these ships continue to meet mission requirements under harsh battle conditions.
- With the FSSTs, the US aims to improve the shock proofing of their ship systems to minimise damage from such "near miss" explosions.
- In FSSTs, an underwater explosive charge is set off near an operational ship, and system and component failures are documented, as per a 2007 document on the subject by the JASON group of elite US scientists.
- Such trials are usually conducted on ships that are the first of a new class to be built – like the Gerald R Ford.

Antarctic Treaty

- The 1959 Antarctic Treaty celebrates its 60th anniversary. This Treaty is the only example of a single treaty that governs a whole continent.
- The Antarctic Treaty was signed between 12 countries in Washington on 1st December 1959 for making the Antarctic Continent a demilitarized zone to be preserved for scientific research only.
- Headquartered in Buenos Aires, Argentina, it entered into force in 1961 and has since been acceded by many other nations.
- **Members -** Twelve original signatories are Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the Union of Soviet Socialist Republics, the UK and the US.
- Currently, the treaty has 54 parties. India became a member in 1983.
- **Definition** - Antarctica is defined as all of the land and ice shelves south of 60°S latitude.
- Some important provisions of the Treaty are,
    - Antarctica shall be used for peaceful purposes only
    - Freedom of scientific investigation in Antarctica and cooperation toward that end… shall continue
    - Scientific observations and results from Antarctica shall be exchanged

and made freely available
    - Prohibition of military activities, nuclear tests and the disposal of radioactive waste.
    - Neutralising territorial sovereignty, this means a limit was placed on making any new claim or enlargement of an existing claim.
- It put a freeze on any disputes between claimants over their territories on the continent.

Antarctic Treaty System

- It is the whole complex of arrangements made for the purpose of regulating relations among states in the Antarctic by resolving the disputes that are arisen over the years.
- Other than the Antarctic Treaty, the other major International Agreements of the Treaty System are,
    - Convention for the Conservation of Antarctic Seals (1972)
    - Convention on Conservation of Antarctic Marine Living Resources (1980)
    - Protocol on Environmental Protection to the Antarctic Treaty (1991)
- Its purpose is to ensure in the interests of all mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes.
- These agreements are legally binding and purpose-built for the unique geographical, environmental and political characteristics of the Antarctic and form a robust international governance framework for the region.

Proposed Integrated Theatre Commands

- Integrated Theatre Commands is a unified command under which all the resources of the Army, the Navy and the Air Force are pooled, depending on the threat perception.
- These commands could be geographical (like looking at a border with a country) or thematic (like a command for all maritime threats).
- A model with 4 to 5 tri-Services integrated theatre commands is under discussion, with each command headed by a **three-star officer**.
- The **Theatre Commander** will report to the Chiefs of Staff Committee (COSC), which includes the three Service chiefs. The COSC is headed by the Chief of Defence Staff (CDS) as its permanent chairman.
- The Service chiefs currently have all the operational control over their forces; operational powers will now move to the COSC.
- The proposed commands are,
    - **Maritime Theatre Command** - To take care of all the maritime security needs of India on both the eastern and western seaboards, and will include air strike assets and amphibian forces of the Army.

    - **Air Defence Command** - To be mandated with air defence across the country and beyond. The fighter jets will have reconnaissance and surveillance assets as well.
    - **Two or three land-based commands** - There will be one command each for India's borders with China and Pakistan.
- But there is a proposal to have another command looking at India's borders with Pakistan and China in Jammu and Kashmir, and Ladakh.
- Apart from these theatre commands, there will be two functional tri-Services commands as well.
    - **Logistics Command**, which will have the logistics of all the Services under one person.
    - **Training and Doctrine Command** to make all Services work under a common doctrine and have some basic common training.
- The proposal is to have a theatre commander who will have operational control of the assets under his command, thus enhancing jointness among the forces, and also reducing duplication of resources.

Current Tri-Service Commands

- As of now, the three forces have 17 commands between them. Each command is headed by a 4-star rank military officer.
- Seven Army commands - Northern, Eastern, Southern, Western, Central, South-western and Army Training Command (ARTRAC).
- Seven Air Force commands - Western, Eastern, Southern, Southwestern, Central, Training, and Maintenance commands.
- Three Navy commands - Western, Eastern and Southern, of which Southern is largely about training.
- Even if these commands operate in same region, they aren't co-located, and their areas of operational responsibility aren't necessarily the same.
- There are two existing tri-Service commands as well,
    - The Andaman and Nicobar Command (ANC), which is headed by rotation by officers from three Services. It is the first Tri-Service theatre command of the Indian Armed Forces created in 2001.
    - The Strategic Force Command, which is responsible for the delivery and operational control of India's nuclear assets.

Delta Plus Variant

- India found 40 cases of Delta variant carrying a mutation that appears to make it more transmissible and advised states to increase testing.
- This Variant is called Delta Plus, which is a sub-lineage of the Delta variant first detected in India.
- It has acquired the spike protein mutation called K417N which is also found

in the Beta variant (B.1.351 lineage) first identified in South Africa. This Beta variant was reported to have immune evasion property.
- The K417N mutation, coupled with other existing features of the Delta variant, could make it more transmissible. It is known to reduce the effectiveness of a cocktail of therapeutic monoclonal antibodies.
- There are worries Delta Plus would inflict another wave of infections on India after it emerged from the world's worst surge in cases recently.
- Regions where the Delta Plus variant has been found may need to enhance their public health response by focusing on surveillance, enhanced testing, quick contact-tracing and priority vaccination.

Doppler Radars

- The India Meteorological Department (IMD) will install seven new doppler radars in Maharashtra.
- Doppler radars of varying frequencies are used by the IMD to detect and track the movement of weather systems, cloud bands and gauge rainfall over an area of 500 km, with effective range of up to 250 km.
- With the radar observations, updated every 10 minutes, forecasters can follow the development of weather systems as well as their varying intensities, and accordingly predict weather events and their impact.
- There are different types of Doppler Radars, which vary with frequencies in which they operate - S-band, C-band and X-band.
    - X-band radar - It is used to detect thunderstorms and lightning as it is more sensitive and can detect smaller particles.
    - C-band radars - The signal is more easily attenuated, so this type of radar is best used for short range weather observation. It guides at the time of cyclone tracking.
    - S band radars - Because of the wavelength and frequency, S band radars are not easily attenuated. So, they are useful for near and far range weather observation.
- The Doppler radars are operational at eight locations in India's east coast (which is frequently affected by the cyclones formed in the Bay of Bengal), four locations in the west coast as well as in other locations.

Doppler Effect

- Doppler Effect (or Doppler shift) is the difference between the observed frequency and the emitted frequency of a wave for an observer moving relative to the source of the waves.
- It was proposed by Austrian physicist Christian Doppler in 1842.
- It says, "When the source and the signal are in relative motion to each other

there is a change in the frequency observed by the observer. If they are moving closer, frequency increases and vice versa."

RADAR

- Radio Detection and Ranging (Radar) is a detection system that uses radio waves to determine the distance (range), angle, or velocity of objects. A radar system consists of,
  - A transmitter producing electromagnetic waves in the radio or microwaves domain(pulsed or continuous),
  - A transmitting antenna and a receiving antenna and
  - A receiver and processor to determine properties of the object(s).
- Radio waves from the transmitter reflect off the object and return to the receiver, giving information about the object's location and speed.
- RADAR can be used to detect aircraft, ships, spacecraft, guided missiles, motor vehicles, weather formations, and terrain.

Doppler RADAR

- It is a specialized radar that uses the Doppler Effect to produce velocity data about objects at a distance.
- It does this by bouncing a microwave signal off a desired target and analyzing how the object's motion has altered the frequency of the returned signal.
- This variation gives direct and highly accurate measurements of the radial component of a target's velocity relative to the radar.

New Electrocatalyst for Metal-Air Batteries

- International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) has developed a non-precious metal-based bi-functional electro-catalyst (that can catalyze two types of reactions).
- [ARCI is an autonomous R&D Centre of Department of Science and Technology (DST), Govt. of India]
- It has developed the cost-effective electrocatalyst by anchoring transition metal ions into the sulphur-doped carbon framework via carbonization of a polymer called sPEEK (sulphonated polyether ether ketone).
- This catalyst synthesis method can also be used to recycle used ionomers (polymer composed of both neutral repeating units and ionized units).
- An ion-exchange strategy is used to position the metal ions in the carbon framework homogeneously. This will limit the particle size and offers control on composition and size at a very low loading of transition metal.
- A bi-functional catalyst works for oxygen reduction while discharging the

battery and the same catalyst helps in oxygen evolution reaction during the charging cycle.

- **Importance** - These electro-catalysts can decrease cost and increase the efficiency of metal air batteries, like the Zn-air batteries.
- Most of the conventional catalysts consist of noble metals in their composition, making the batteries costly.
- Cost-effectiveness is achieved by low loading of **transition metal**, high activity, and high cycling stability compared to many usual catalysts.
- The catalyst also leads to reduced voltage polarization, enabling higher energy efficiency and a stable charge-discharge characteristic.

Source: PIB, The Indian Express, Down To Earth

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