INS Vikrant

- The indigenous aircraft carrier (IAC) that will be christened INS Vikrant, after its decommissioned sibling, can carry a total of 30 aircraft
- Cochin Shipyard Limited, which built the IAC, is expected to fully hand it over to the Indian Navy in 2022
- The shipborne weapons include Barak LR SAM and AK-630, while it has MFSTAR and RAN-40L 3D radars as sensors. The vessel has a Shakti EW Suite.
- As per estimate, India needs three aircraft carriers - one each in Western and Eastern naval commands, while the third can be docked for maintenance, if needed. INS Vikramaditya is operational now, planning to develop the third - INS Vishaal by 2030.

Fighter Aircrafts of the Indian Air Force

Rafale

Type: Twin engine multirole fighter

Origin: France

Mirage-2000

Type: Single seater air defence and multi-role fighter

Origin: France

Mikoyan MiG-21

Type: Multirole fighter/ground attack aircraft

Origin: Russia

HAL Tejas LCA

Type: multirole light fighter

Origin: India

Sukhoi Su-30MKI

Type: Twin seater twin engine multirole fighter

Origin: Russia

Mikoyan MiG-27

Type: Single engine, single seater tactical strike fighter

Origin: Russia

Jaguar

Type:Twin-engine, single seater deep penetration strike aircraft

Origin: UK

Mikoyan MiG-29

Type: Twin engine, single seater air superiority fighter

Origin: Russia

LCA-TEJAS

- Light Combat Aircraft Mk-1A variant is an indigenously designed, developed and manufactured state-of-the-art modern 4+ generation fighter aircraft. This aircraft is equipped with critical operational capabilities of Active Electronically Scanned Array (AESA) Radar, Beyond Visual Range (BVR) Missile, Electronic Warfare (EW) Suite and Air to Air Refuelling (AAR) would be a potent platform to meet the operational requirements of Indian Air Force, IAF.
- It is the first “Buy (Indian-Indigenously Designed, Developed and Manufactured)” category procurement of combat aircrafts with an indigenous content of 50% which will progressively reach 60% by the end of the programme.
- Tejas, India's indigenous Light Combat Aircraft, added the 5th generation Python-5 Air-to-Air Missile (AAM) in its air-to-air weapons capability on April 27, 2021
- Trials were also aimed to validate enhanced capability of already integrated Derby Beyond Visual Range (BVR) AAM on Tejas.

Cruise Missiles

- A cruise missile either locates its target or has a preset target. It navigates using a guidance system — such as inertial or beyond visual range satellite GPS guidance — and comprises a payload and aircraft propulsion system.
- Cruise missiles can be launched from land, sea or air for land attacks and anti-shipping purposes, and can travel at subsonic, supersonic and hypersonic speeds.
- Since they stay relatively close to the surface of the earth, they cannot be detected easily by anti-missile systems, and are designed to carry large payloads with high precision.

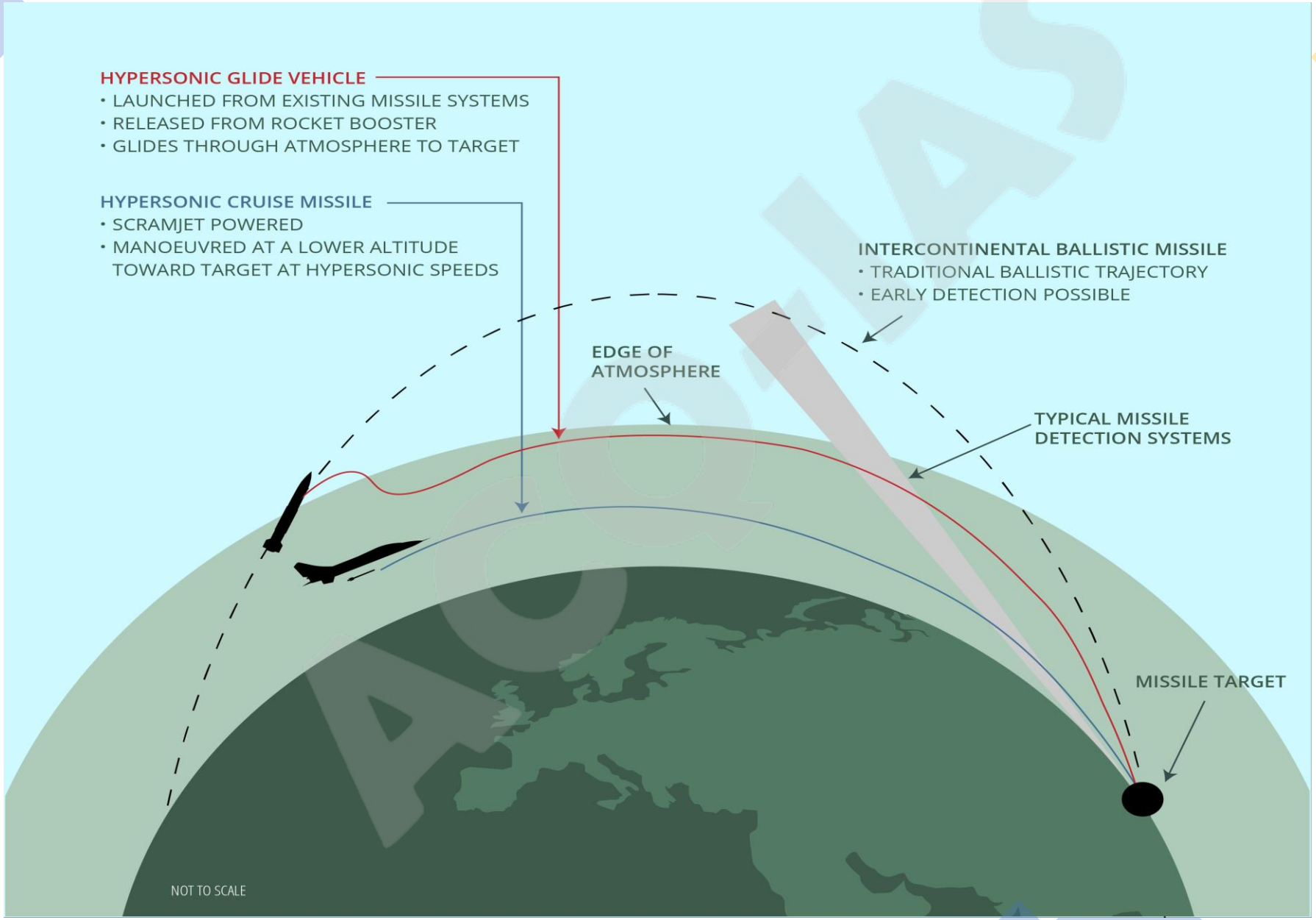
Ballistic Missiles

- Ballistic missiles, meanwhile, are launched directly into the upper layers of the earth's atmosphere. They travel outside the atmosphere, where the warhead detaches from the missile and falls towards a predetermined target. They are rocket-propelled self-guided weapons systems which can carry conventional or nuclear munitions. They can be launched from aircraft, ships and submarines, and land.
- Intercontinental ballistic missiles or ICBMs are guided missiles which can deliver nuclear and other payloads.
- Only a handful of countries, including Russia, United States, China, France, India and North Korea, have ICBM capabilities.
- In 2018, India successfully test-fired nuclear-capable ballistic missile Agni-V, with a strike range of 5,000 km, from the Abdul Kalam Island.

Hypersonic delivery system

- A hypersonic delivery system is essentially a ballistic or cruise missile that can fly for long distances and at speeds higher than 5 Mach at lower altitudes.
- The Defence Research and Development Organisation (DRDO) Monday successfully test-fired the Hypersonic Technology Demonstrator Vehicle (HSTDV), making India the fourth country in the world after the US, China and Russia to develop such technology.
- Apart from being used as a vehicle for hypersonic and long-range cruise missiles, the HSTDV is a dual-use technology that will have multiple civilian applications, including the launch of small satellites at low cost
- This allows it to evade interception from current Ballistic Missile Defence (BMD).
- arms race
- Counter-measures to hypersonics have been envisaged through placement of sensors and interceptors in outer space.
- weaponisation of outer space would, neverthless, be a distinct possibility once hypersonic inductions become the norm.

- Hypersonic missiles travel at speeds faster than 3,800 miles per hour or 6,115 km per hour, much faster than other ballistic and cruise missiles. They can deliver conventional or nuclear payloads within minutes.
- They are highly manoeuvrable and do not follow a predictable arc as they travel. They are said to combine the speed of ballistic missiles with the manoeuvring capabilities of cruise missiles. The speed makes them hard to track compared to traditional missile tech.


HYPERSONIC GLIDE VEHICLE
• LAUNCHED FROM EXISTING MISSILE SYSTEMS
• RELEASED FROM ROCKET BOOSTER
• GLIDES THROUGH ATMOSPHERE TO TARGET
HYPERSONIC CRUISE MISSILE
• SCRAMJET POWERED
• MANOEUVRED AT A LOWER ALTITUDE TOWARD TARGET AT HYPERSONIC SPEEDS
INTERCONTINENTAL BALLISTIC MISSILE
• TRADITIONAL BALLISTIC TRAJECTORY
• EARLY DETECTION POSSIBLE
EDGE OF ATMOSPHERE
TYPICAL MISSILE DETECTION SYSTEMS
MISSILE TARGET
NOT TO SCALE

Anti-satellite missiles

- Anti-satellite missiles (ASAT) can incapacitate or destroy satellites for strategic military purposes. Several nations possess operational ASAT systems.
- Other anti-satellite weapons include ground-based jammers to disrupt the signal from navigation and communications satellites.
- The United States, Russia, and China are among countries pursuing anti-satellite weapons.
- India had successfully test fired an ASAT knocking off one of its own satellites 300 km in space. Mission Shakti

Anti Radiation Missile (RUDRAM)

- The RUDRAM is first indigenous anti-radiation missile of the country for Indian Air Force (IAF), being developed by Defence Research and Development Organisation (DRDO).
- The missile is integrated on SU-30 MKI fighter aircraft as the launch platform, having capability of varying ranges based on launch conditions.
- With this, the country has established indigenous capability to develop long range air launched anti-radiation missiles for neutralising enemy Radars, communication sites and other RF emitting targets.


DRDO
DRDO

NATGRID,CMS, NETRA

- India’s three main surveillance systems — National Intelligence Grid (NATGRID), Central Monitoring System (CMS) and Network Traffic Analysis (NETRA).
- NATGRID allows investigation and law enforcement agencies to access real-time information from data stored within agencies like the Income Tax Department, banks, insurance companies, the Indian Railways, and other offices. There are a total of 21 categories of data that NATGRID has access to.
- Where the NATGRID has access to real-time data, CMS is centralised telephone interception provisioning system. . It can bypass the middleman — the telecom companies — to directly monitor text messages, social media posts and phone calls.

- NETRA is the third leg of India’s security infrastructure. While the CMS is tapping into your phone’s network, NETRA is watching everything you do online — not just on social media.
- It can monitor any text-based messages containing direct messages on Facebook, within your personal emails or online blogs. Using filters and keywords, it can identify words even in encrypted messages.
- The underlying logic for developing CMS and NETRA was to monitor terrorist activities mainly after the terrorist bomb attack in Mumbai on November 26, 2008.With both of them, the problem again boils down to a lack of transparency in the absence of data protection laws.
- CMS and NETRA allow for mass surveillance with the potential to target large groups of people without a valid reason.

Project Seabird

- **INS Kadamba** is an Indian Navy base located near Karwar in **Karnataka.**
- The **first phase** of construction of the base, **code-named Project Seabird**, was completed in 2005.
- Development of Phase II commenced in 2011.
- INS Kadamba is **currently the third largest Indian naval base**.
- Development of Phase II commenced in 2011.
- INS Kadamba is **currently the third largest Indian naval base**.
- **After the completion of Phase II-B** of the project, INS Kadamba **will be the biggest naval base east of the Suez canal.**

Project 75 India (P75I)

- Envisages the construction of six conventional submarines
- India's current arsenal consists of 14 conventional submarines and two nuclear-powered submarines.
- Under the strategic partnership model, an Indian shipyard will be selected by the government, which will also nominate the foreign original equipment manufacturer (OEM) under the overall arch of 'Make in India'.
- P75I was first cleared in 2007, but lay dormant until now after undergoing numerous changes.

- The P75I project is part of a 30-year submarine building plan that ends in 2030. As part of this plan, India was to build 24 submarines — 18 conventional submarines and six nuclear-powered submarines (SSNs) — as an effective deterrent against China and Pakistan.
- Of the 14 conventional submarines India currently possesses, including the Scorpene, only half are operational at any given point of time. India also has two nuclear-powered submarines — INS Arihant (SSBN, a ballistic missile submarine) and INS Chakra (SSN, a nuclear-powered one) leased from Russia.
- state-run Mazagon Dockyard Limited (MDL), which manufactures the Scorpene submarines, is likely to bag the deal.

P-8I

- American maritime patrol aircraft developed and produced by Boeing
- P-8I is a long-range, multimission maritime patrol aircraft offered by Boeing for the Indian Navy. P-8I replaced the ageing fleet of the Indian Navy's Tupolev Tu-142 aircraft
- The P-8 is designed to conduct long-range anti-submarine warfare, anti-surface warfare, and intelligence, surveillance and reconnaissance missions. It has a bomb bay that can drop sonobuoys and torpedoes, as well as hardpoints on its wings for anti-ship missiles.
- The Indian navy has also used the aircraft to conduct search and rescue missions, including dropping a survival kit and inflatable life raft from the jet.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SARAS

- India's indigenous light transport aircraft SARAS
- The design and development of the aircraft is being done by CSIR-National Aerospace Laboratories, NAL
- SARAS will be 20-25% cheaper than any imported aircraft in the same category. The improved version will be a 19-seater aircraft instead of 14-seater.
- Hindustan Aeronautics Limited, HAL has been identified as the production agency for the military version of SARAS, while the production of civil version will be given to identified private industries.
- Will be ideal for commuter connectivity under Government of India's UDAAN Scheme for variety of applications like air taxi, aerial search/survey, executive transport, disaster management, border patrol, coast guard, ambulance and other community services,"


SARAS
CSIR – National Aerospace Laboratories

Programme SAMUDRIKA

- Programme SAMUDRIKA aims at the design and indigenous development of a family of Seven Electronic Warfare Systems meeting the requirements of Navy for different platforms viz., Ships, Helicopters and Aircrafts, with a firm commitment from Navy for quantity production and induction of these Systems.
- Seven EW/ESM systems are grouped under two projects namely Ship-Borne projects & Air-Borne Projects. Ship-borne systems are SHAKTI, NAYAN and TUSHAR. Air-Borne systems are SARANG, SARAKSHI, SARVADHARI and NIKASH.
- Integrated Radar EW System – SHAKTI Shakti is an Integrated Radar EW System for Capital ships with Electronic Support (ES) System and integrated Radar Finger Printing System (RFPS) covering B to K frequency band and Electronic Counter Measure (ECM) System covering H to K frequency band.

Advanced Chaff Technology by DRDO for Naval Safety

- DRDO has developed an Advanced Chaff Technology to safeguard the naval ships against enemy missile attack.
- Chaff is a passive expendable electronic countermeasure technology used worldwide to protect naval ships from enemy's radar and Radio Frequency (RF) missile seekers.
- The importance of this development is that very less quantity of chaff material deployed in the air acts as decoy to deflect enemy's missiles for safety of the ships.


RAFALE'S GAME CHANGING WEAPONRY
SCALP
Stealthy Deep Strike Cruise Missile
1300kg
5.1m
METEOR
Unrivalled Beyond Visual Range Air-to-Air Missile
190kg
3.7m
MICA
Multi-Mission Air-to-Air Missile
112kg
3.1m
MBDA

BrahMos

- The BrahMos (designated PJ-10)is a medium-range ramjet supersonic cruise missile that can be launched from submarine, ships, aircraft, or land.
- It is the fastest supersonic cruise missile in the world. It is a joint venture between the Russian Federation's NPO Mashinostroyeniya and India's Defence Research and Development Organisation (DRDO), who together have formed BrahMos Aerospace
- The name BrahMos is a portmanteau formed from the names of two rivers, the Brahmaputra of India and the Moskva of Russia.

- It is the world's fastest anti-ship cruise missile in operation.
- The land-launched and ship-launched versions are already in service
- An air-launched variant of BrahMos appeared in 2012 and entered service in 2019
- hypersonic version of the missile, BrahMos-II, is also presently under development with a speed of Mach 7–8 to boost aerial fast strike capability. It was expected to be ready for testing by 2024

- In 2016, as India became a member of the Missile Technology Control Regime (MTCR), India and Russia are now planning to jointly develop a new generation of Brahmos missiles with 800 km-plus range and an ability to hit protected targets with pinpoint accuracy.
- In 2019, India upgraded the missile with a new range of 650 km with plans to eventually upgrade all missiles to a range of 1500 km.

BrahMos-A

The air-launched version of BrahMos

Will arm Su-30MKI of IAF as a standoff weapon

25 June 2016:

Successful demonstration flight carried out at HAL Nashik

22 November 2017

Specially modified Su-30 MKI of IAF test fired the Brahmos A missile on a ship stationed 280 km away in the Bay of Bengal

India became a part of elite group of nations who have capability to launch air launched cruise missile

PTI GRAPHICS *Source: Wikipedia*

Specifications

Missiles per aircraft	One
Length	8550 mm
Diameter	648 mm
Weight	2550 kg
Range	up to 290 km
Velocity	up to 2.8 Mach
Ground Clearance	-1000 mm
Release Height	500 m-9000 m
Release Speed	0.55-0.8 Mach
Free fall	100-150 m
Altitude-cruise phase	up to 14000 m

Project 28

- INS Kavaratti, the last of the four indigenously built Anti-Submarine Warfare (ASW) stealth corvettes built under Project 28 (Kamorta class), by Garden Reach Shipbuilders & Engineers (GRSE), Kolkata, was formally inducted into the Indian Navy
- It joins three other ships of the same class INS Kamorta, INS Kadmatt and INS Kiltan
- induction of the ASW corvettes will be a game changer in the eastern seaboard, especially with the Chinese submarines trying to make sorties in the Indian Ocean.
- The ship has high indigenous content with the state-of-the-art equipment and systems to fight in Nuclear, Biological and Chemical (NBC) warfare conditions.


भा.नौ.पो.कवरत्ती
INS KAVARATTI
कवरत्ती
KAVARATTI

Operation ‘Sunrise’

- The armies of India and Myanmar carried out a coordinated operation from in their respective border areas, targeting several militant groups operating in Manipur, Nagaland and Assam
- Besides the Indian Army, troops from the Assam Rifles were also a part of the operation.
- In the first phase of “Operation Sunrise”, the Indian Army targeted members of the Arakan Army, an insurgent group in Myanmar, who were opposed to the Kaladan multi-modal transit transport project. The project is viewed as India’s gateway to Southeast Asia.

INDIAN NAVY

- Operation Sankalp. Amidst the increasing US – Iran tensions in the Gulf region, since June 2019, IN has been undertaking Maritime Security Operation code-named Op SANKALP in the Gulf Region to ensure safe passage of Indian Flag Merchant Vessels (IFMVs) transiting through the Strait of Hormuz
- Operation Samudra Setu. IN ships Jalashwa, Shardul, Airavat and Magar were deployed from May – July 2020 for Operation Samudra Setu to undertake repatriation of stranded Indian Nationals in the wake of COVID-19, from Iran, Maldives and Sri Lanka

- Mission SAGAR and SAGAR-II. INS Kesari was deployed to the Southern IOR Island nations as part of 'Mission SAGAR' for rendering COVID-19 related assistance from May-June2020.During deployment, the ship provided medicine stores &medical kits to Maldives, Mauritius, Madagascar, Comoros and Seychelles.
- IN Medical Teams embarked onboard the ships also provided medical assistance to Mauritius and Comoros.
- As part of the follow up humanitarian outreach mission by India, Mission SAGAR II, INS Airavat was deployed to deliver 270 MT of humanitarian aid stores to Djibouti, Massawa (Eritrea), Port Sudan and Mombasa, Kenya (for South Sudan) from October-November 2020.

EXERCISES WITH FOREIGN NAVIES

- Naseem-Al-Bahr 2020. IN and Royal Navy of Oman (RNO) bilateral exercise Naseem-Al-Bahr was conducted at/ off Goa from January 07-10 October 2020.
- INDRA NAVY 2020. IN and Russian Federation Navy (RuFN) bilateral exercise Indra Navy was conducted in Bay of Bengal from 04-05 September 2020.
- JIMEX 2020. IN and JMSDF (Japan Maritime Self Defence Force) bilateral exercise JIMEX 2020 was conducted in the Arabian Sea from 26-28 September 2020.

- BONGO SAGAR 2020. IN and Bangladesh Navy (BN) bilateral exercise Bongosagar 2020 was conducted in North Bay of Bengal from 03-04 October 2020.
- SLINEX 2020. IN and Sri Lanka Navy (SLN) bilateral exercise SLINEX 2020 was conducted in the Bay of Bengal from 19-21 October 2020
- MALABAR 2020. Multi-lateral exercise between IN and US Navy (USN), Japanese Maritime Self Defence Force (JMSDF) ships and Royal Australian Navy (RAN) was conducted in the IOR from 03-06 and 17 November 2020.

- SITMEX 2020. Multi-lateral exercise between IN, Republic of Singapore Navy (RSN) and Royal Thailand Navy (RTN) was conducted the Eastern IOR from 21-22 November 2020.
- SIMBEX 2020. IN and Republic of Singapore Navy (RSN) bilateral exercise SIMBEX 2020 was conducted in Eastern IOR from 23-25 Nov 2020.

PASSEX.

- The Indian Navy undertakes Passage Exercise (PASSEX) with friendly foreign navy units on opportune occasions to enhance inter-operability and imbibe best practices. Following PASSEXs were undertaken in 2020:-

- PASSEX with French Navy. PASSEX was conducted between French Naval Ships Mistral and Geupratte and IN Ships Talwar and Trikand from 23–24 May 2020 in Gulf of Aden.
- (b) PASSEX with Japanese Maritime Self Defence Force (JMSDF). PASSEX was conducted between JMSDF training ships Kashima and Shimayuki and IN ships Rana, Kulish on 27 June 2020 in Eastern IOR.

- (c) PASSEX with United States Navy (USN). PASSEX was conducted between USN ships Nimitz, Princeton, Ralph Johnson, Sterett and IN Ships Rana, Sahyadri, Shivalik, Kamorta from 20-21 July 2020 in the Bay of Bengal.

- (d) PASSEX with Australian Navy. PASSEX was conducted between Australian ship HMAS Toowoomba and IN Ship Kochi on January 24, 2020. Another PASSEX was conducted between Australian ship HMAS Hobart and IN ships Sahyadri and Karmuk from 24-25 September 2020 in Eastern IOR.

Air Defence Fire Control Radar (ADFCR)

ATULYA

Specifications

Search Radar

- Detection Range: 40/20 Km for 1/0.1 sqm Target
- Azimuth Coverage: 360° @ 20 RPM
- Elevation Coverage: -5° to +50°
- Height Coverage: 30m to 10Km
- Accuracy: Range 60m, Az 0.5° and El 2°

IFF Mark XII / XII(S)

Track Radar

- Detection Range: 20/10 Km for 1/0.1 sqm Target

ADFCR in conjunction with Anti-Aircraft Guns forms a Ground Based Air Defence system whose main purpose is effective point defence against all air threats at short and very short ranges during day and night under all weather conditions and also in the presence of enemy jamming (Electronic Counter Measures).

The system primarily comprises of a state of the art X-Band Active Array Antenna based 3D-Search Radar, Ka-Band parabolic reflector monopulse Antenna based dedicated Single Target Tracking Radar, Electro-Optical Sensors (CCD & TI cameras) for

- Air Defence Fire Control Radar (ADFCR) in conjunction with Anti- Aircraft Guns forms a Ground Based Air Defence System whose main purpose is effective point defence against all air threats at short and very short ranges during day and night under all weather conditions and also in the presence of enemy jamming. The radar has been developed as an indigenous solution against DAC approval for large quantity required for Indian Army.

Anti-Tank Guided Missiles

- The Defence Research and Development Organisation (DRDO) successfully carried out joint user trials of indigenously developed Helina and Dhruvastra Anti-Tank Guided Missiles (ATGM) from the Advanced Light Helicopter (ALH) in the desert.
- Helina is the Army variant and Dhruvastra is the Air Force variant of the ALH.
- The Helina and Dhruvastra are third generation, Lock-on-Before-Launch (LOBL) fire and forget ATGMs that can engage targets both in direct hit mode as well as top attack mode. The system has all-weather day-and-night capability and can defeat battle tanks with conventional armour as well as with explosive reactive armour

Active Electronically Scanned Array Radar (AESAR) ‘Uttam’

- Active Electronically Scanned Array Radar (AESAR), UTTAM is a multimode, solid-state active phased array fire control radar with scalable architecture that can be adapted for various types of fighter class of aircraft.
- It is capable of tracking multiple targets with high accuracy suitable for firing missiles with interleaved Air to Air, Air to Ground and Air to Sea modes for all terrain operation.

Pinaka

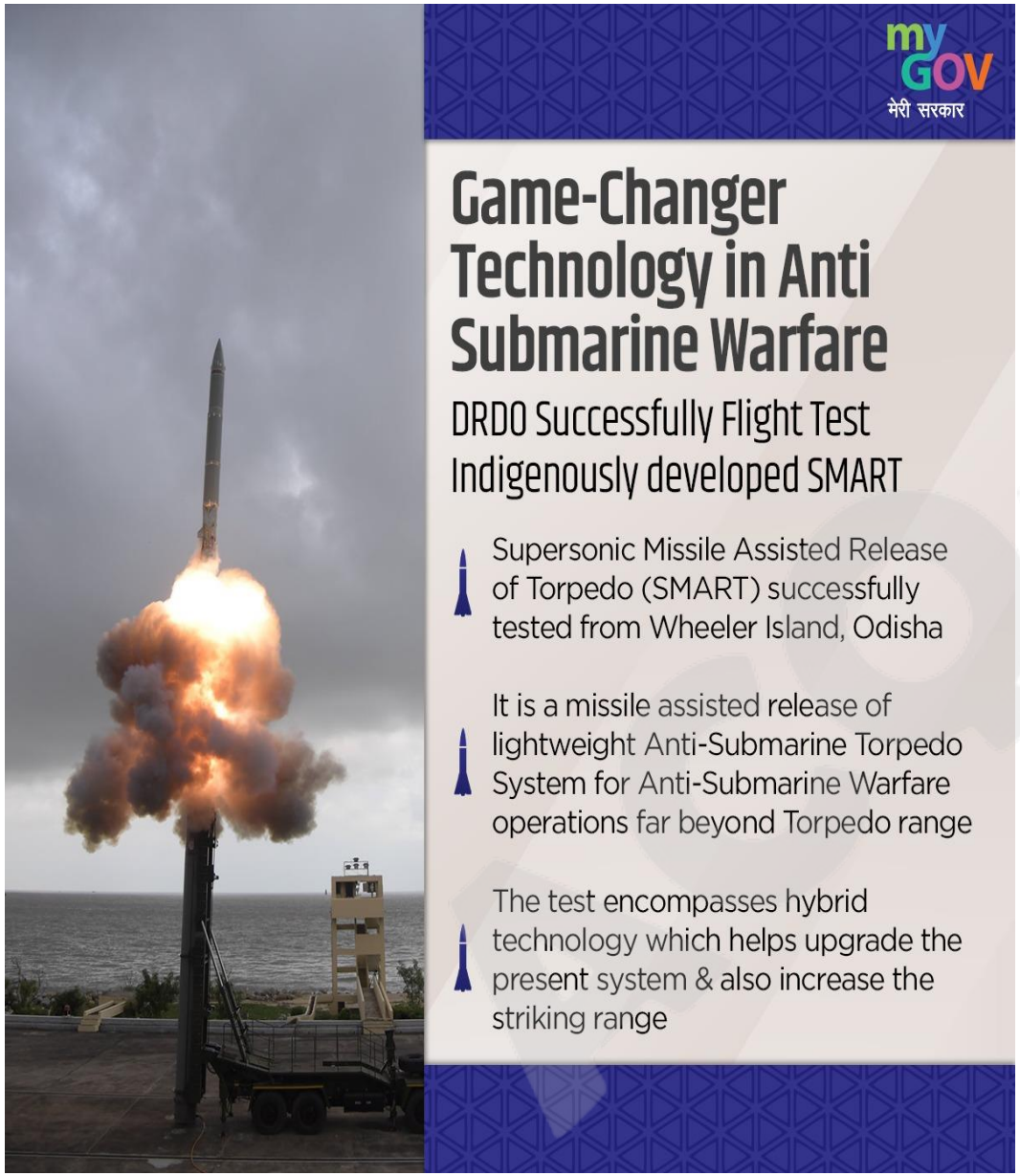
- Pinaka is a multibarrel rocket launch (MBRL) system used by the Indian Army. Developed by the Defence Research and Development Organisation (DRDO), Pinaka integrates state-of-the-art technologies for delivering superior combat performance.

- Pinaka is produced at an average rate of 1,000 rockets a year at the Ordnance Factory in Chanda, Maharashtra. The Ministry of Defence increased the output of the rocket by commencing production at the Ordnance Factory in Badmal, Orissa.


पिनाका 214 एम एम मल्टी बैरल
रॉकेट लान्चर सिस्टम
PINAKA 214 MM MULTI BARREL
ROCKET LAUNCHER SYSTEM
bemL
TATRA
356

SMART

- SMART is a missile-assisted release of lightweight Anti-Submarine Torpedo System for Anti-Submarine Warfare (ASW) operations far beyond torpedo range.
- Most of its flight in the air is covered at lower altitudes with two-way data link from the warship or an airborne submarine target detection system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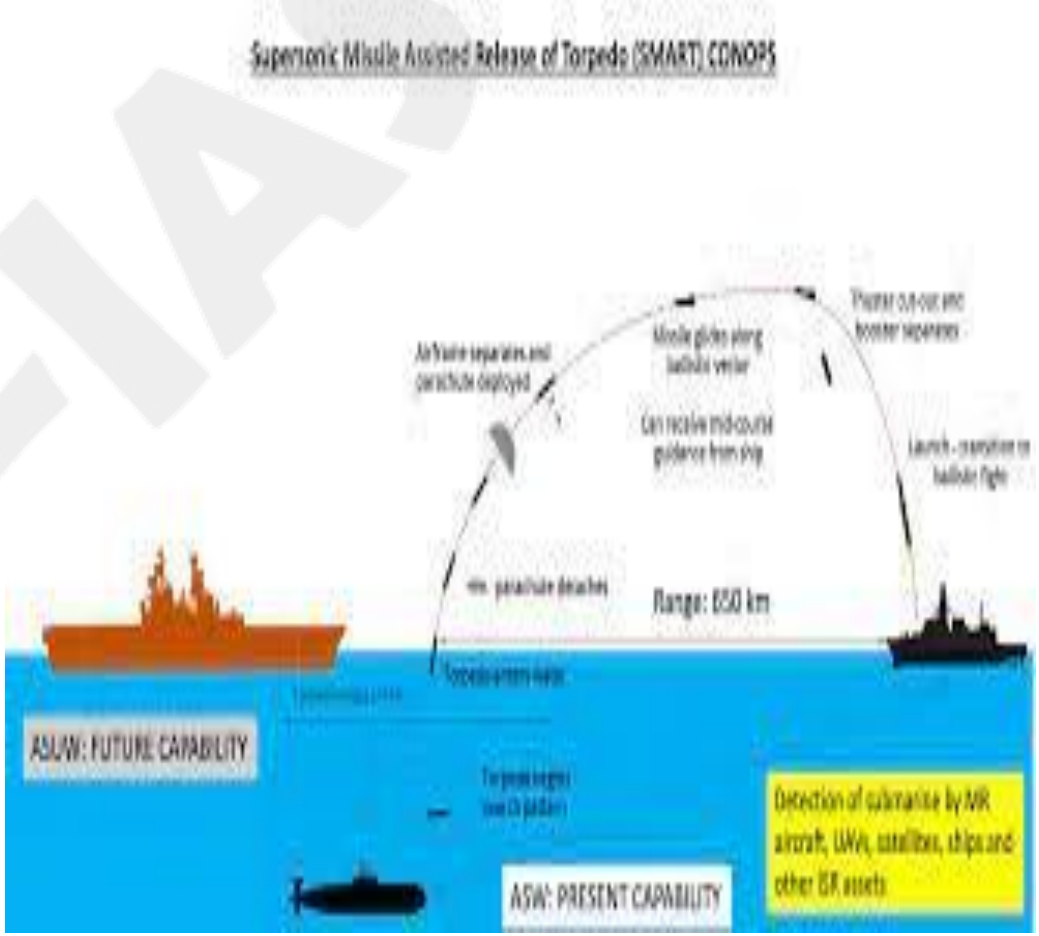
मेरी सरकार
Game-Changer Technology in Anti Submarine Warfare
DRDO Successfully Flight Test Indigenously developed SMART
Supersonic Missile Assisted Release of Torpedo (SMART) successfully tested from Wheeler Island, Odisha
It is a missile assisted release of lightweight Anti-Submarine Torpedo System for Anti-Submarine Warfare operations far beyond Torpedo range
The test encompasses hybrid technology which helps upgrade the present system & also increase the striking range


Supersonic Missile Assisted Release of Torpedo (SMART) CONOPS
Range: 650 km
ASUW: FUTURE CAPABILITY
ASW: PRESENT CAPABILITY