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Enhanced Indo-Pacific capabilities with INS Visakhapatnam Class Destroyers (Project 15B)

The P-15B warships have been designed by the Indian Navy's Design agency and the construction carried out by the Mazagon Dock Limited (MDL) shipyard

By Milind Kulshreshtha

Over the weekend, the Indian Navy received the first of its modern generation Destroyer class warship, christened INS Visakhapatnam, under Project-15B (P-15B). The stealth destroyer is 163 m long, with a displacement of 7400 tonnes and can speed up to 30 knots using the four Gas turbine configuration propulsion system. The P-15B warships have been designed by the Indian Navy's Design agency and the construction carried out by the Mazagon Dock Limited (MDL) shipyard. In 2011, Indian Navy signed this contract for the indigenous construction of four next generation Destroyers under the P-15B project and keel for the ship was laid down in 2013 under the code Y12704.

Indian Navy Destroyers

In the traditional naval terminology, a clear distinction exists between the Frigates (like INS Talwar or Shivalik) and guided missile Destroyers (e.g. INS Mumbai) class of warships. Here, going by the naval role and tonnage of the warships, the Destroyers come next only to an Aircraft Carrier (INS Vikramaditya) in terms of their reach and endurance. Destroyer-class warships like INS Visakhapatnam shall play a crucial role as main surface combatant for any Air, Surface and ASW operations. These warships are highly capable of hunting and killing the enemy submarines in waters farther away from the Indian shores.

The Destroyers have always been the mainstay for the Indian Navy and the finest warships under this category have been fielded by the Indian Navy as their multi-role multi-mission battleships. For example, the Rajput class (Kashin) destroyers of the 1980s era till date participate in the Naval operations and exercises alongside other modern navies of the world. India's indigenous Destroyer construction programme commenced in the late 1990s with the three Delhi class (P-15 class) warships and this was followed by three Kolkata class (P-15A) destroyers commissioned a decade later. Presently, under the P-15B (Visakhapatnam Class), a total of four warships are planned (Visakhapatnam, Mormugao, Imphal, Surat). This line of world-class destroyers aptly showcases the indigenous warship design and weapon system integration capabilities of the Indian Navy and is a reflection of the long and tedious journey towards the goal of self-reliance embarked upon by the Navy.



P-15B Role

The Indian Navy's responsibilities to safeguard a large coastline of 7516 Kms and about 1100 offshore islands along with 2.01 million sq km Exclusive Economic Zone (EEZ) have been

enhanced in the present geopolitical scenario. Destroyers like the P-15B class shall play an important role in the larger oceans of the Indo-Pacific, making the Indian Navy a potent force.

The guided missile Destroyers are deployed for various responsibilities like escort duties with the Carrier Battle Group to protect the Naval fleet against any air, surface and underwater threats. For this role, the P-15B ships have the latest generation complement of sensors (radars, sonars, Electronic Warfare systems). The major weapons fitted on board are SSMs (BrahMos), MR SAMs, Gun mounts (76mm SRGM and AK-630 CIWS). The underwater package of the ship includes the latest generation HUMSA-NG, Active Towed Array Sonars, four deck-fitted Integrated Torpedo Tubes and two sets of underwater Rocket Launchers. An indigenization of up to 75% in terms of not only the hull, but many weapons and sensors has been achieved on board.

These modern warships shall also give an extended Indo-Pacific capability to the Indian Navy against an ever growing fleet of Chinese submarines. Though during hostilities, every submarine is wary of confronting a Destroyer due to the warship's advanced ASW capabilities and longer endurance for continuing the 'cat and mouse' hunt. However, the modern submarines are getting stealthier, possess advanced sonars and carry torpedoes with much longer ranges and this makes the submarine chase ever riskier for any surface warship. On the other hand, an integrated approach with use of maritime surveillance aircrafts like P-8Is shall play a critical role in protecting such a high value target against adversary threats on the high seas.

Series Production of Destroyers

A guided missile Destroyer predominantly forms a part of a larger Fleet level operations as a Flagship or as a support ship in a Carrier Battle Group task force. Though, a one-to-one sea battle between guided missile Destroyers is not being considered here, but the Chinese shipbuilding program for guided missile Destroyers is highly advanced and noticeable. The Destroyers with China's fleet may be considered as an indicator of their growing naval power in the Indo-Pacific region. As per the media reports, China plans to double its existing guided missile Destroyer fleet by 2025. Recently, in April this year, China commissioned Nanning, a modified Type 052D guided missile destroyer which is the third of its class to enter service. Presently 18 Type 052D destroyers are in service with the PLAN, while the first ship of this class was commissioned in 2014, the twenty fifth destroyer of this class was launched last year. Nanning is an improved version of the 7,500-tonne guided-missile destroyer of its class and is the second largest destroyer after the Type 055 destroyers. The Type 055 destroyers are 12,000 tonnes displacement warships, with two of these already commissioned and six more under construction.

For the Indian Navy, the P-15B Destroyers are seen as the follow-on of the three already commissioned P-15A Kolkata Class warships (INS Kolkata, INS Kochi and INS Chennai) so as to leverage the advantage of a series production. The keel for the first of the class P-15B warship was launched in 2013 with a design which was largely aimed towards maintaining the predecessor P-15 (Kolkata class) hull form and propulsion system. The weapons and sensors fitted on board were attempted to be maintained similar to the earlier possible configuration. Warship construction for any nation remains a highly complex activity and every class of ship has its own challenges. It is expected that the next of the P-15B Class ships may have a shorter delivery cycle and would also overcome any of the operational teething issues noticed during the sea exploitation of INS Visakhapatnam. It may be interesting to remark here that a similar approach in the submarine construction programme to garner the advantage of numbers through a series production for specific type and class of submarines (be it previous HDW or present Scorpene class) is yet to be achieved due to various reasons.

Integration of Weapons and Sensors

The Indian Navy has yet again demonstrated its unique capability to successfully integrate weapons and sensors supplied by diversified OEMs, thereby giving a flexibility to choose the best from an indigenous source or from anywhere in the world. This is an important aspect as the warship systems are required to operate in an integrated manner so as to achieve optimum war-fighting efficiency. This is an unavoidable constraint where the war-fighting resources on board the ship are limited due to space, however, these are required to provide a superior engagement

capacity against an adversary. Here, the Combat Management Systems (CMS-15B) with C4I capabilities assist in providing the Common-Operational Picture for an offensive and a defensive role against any emerging Threat in the three dimensions. The Indian Navy too has achieved Fleet Level functionality by integrating the CMS systems of the individual warships through an indigenous Tactical Data Link. Through this Tactical Data Link, not only the warships within the fleet communicate amongst each other but also the aircraft and submarines operating in the close proximity of the Fleet. Thus, the Fleet Commander onboard the Flag-ship retains the Command and Control of the Naval operations at sea. The CMS-15B fitted onboard the Visakhapatnam class warships is yet another testimony to the indigenization of the Combat Management System and the Tactical Data Link capabilities under the technical stewardship of the Naval R&D. India is one of the handful nations which boasts of an indigenous CMS development capability.

Conclusion

The P-15B missile guided destroyers shall be seeing operations with the Indian Navy for the most part of this century. The warships shall undergo regular maintenance cycles as per the laid down engineering practices of the Indian Navy to keep the platform fighting-fit at any given time. An array of modifications and system upgrades are expected to take place throughout its operational life cycle to keep these warships potent and contemporary. The P-15B guided missile Destroyers are going to make a potent difference in the Indo-Pacific and shall be the pride of the Indian Navy, especially during the multinational exercises.

<https://www.financialexpress.com/defence/enhanced-indo-pacific-capabilities-with-ins-visakhapatnam-class-destroyers-project-15b/2360890/>



Tue, 02 Nov 2021

Explained: What is Project 15B and how it brings Aatmanirbhar boost to Indian Navy

The navy has received the first of the Project 15B destroyers that are big on indigenous inputs and have been described as a "shining example" of Make in India

By Kenneth Mohanty

The Indian Navy has received delivery of the first of the Project 15B stealth destroyers that has maximised on indigenous inputs and is said to be “an affirmation of the impetus being given by the Government of India and the Indian Navy towards Aatmanirbhar Bharat as part of 75 years of Indian Independence”. With the eyes of the world on the Indian Ocean and given India’s objective of being a net security provider in the region, the new vessel comes as a shot in the arm for the Navy and “would enhance the maritime prowess of the country in the Indian Ocean Region”.



The indigenous Project 15B stealth guided missile destroyers are being built at Mazagon Docks, Mumbai. (Image: Twitter/Indian Navy)

What Are The Capabilities Of Y12704?

The destroyer, named Y12704 but to be christened the INS Visakhapatnam upon formal induction into the Navy later in November 2021, is the lead ship of the Project 15B stealth guided missile destroyers. Designed by Indian Navy’s “in-house design organisation”, the Directorate of Naval Design, and built by Mazagon Dock Shipbuilders Ltd in Mumbai, it is an inheritor to Project 15 and Project 15A, which gave the Navy, respectively, the advanced Delhi and Kolkata class of destroyers.

The indigenous Project 15B stealth guided missile destroyers are being built at Mazagon Docks, Mumbai. (Image: Twitter/Indian Navy)

The Navy is set to receive a total of four of the Visakhapatnam class of destroyers as part of Project 15B, the deal for which was signed in January 2011. The Defence Ministry said the “project is a follow-on of the Kolkata class (Project 15A) destroyers commissioned in the last decade” and the four ships are to be named after four major cities in the four corners of the country. Thus, apart from Visakhapatnam, the Navy will be inducting the Mormugao, Imphal and Surat, all reportedly over the next few years.

The ministry said that the Visakhapatnam class of destroyers “has largely maintained the hull form, propulsion machinery, many platform equipment and major weapons and sensors as the Kolkata class to benefit from series production”. All the ships of this class are 163 metres long with a full load displacement of 7,400 tonnes and a maximum speed of 30 knots (over 55kmph).

The ministry said that the “overall indigenous content of the project is approximately 75 per cent” and it is fitted with “myriad indigenous equipment” as also major indigenous weapons. The ship is built with DMR-249A grade steel developed by the Defence Metallurgical Research Laboratory (DMRL) under the Defence Research and Development Organisation (DRDO).

What Is The Firepower On Project 15B Vessels?

The Visakhapatnam class warships, among the largest such vessels in the Indian Navy fleet, packs indigenous weaponry like the medium range surface-to-air missiles made by BEL, Bangalore and the BrahMos surface-to-surface missile developed by BrahMos Aerospace, New Delhi. They also come with indigenous torpedo tube launchers (Larsen & Toubro, Mumbai), anti-submarine indigenous rocket launchers (Larsen & Toubro, Mumbai) and 76mm super rapid gun mount (BHEL, Haridwar).

Project 15B ships will be equipped to carry and operate two multiple-role helicopters with the ministry adding that they are also installed with an array of state-of-the-art weapons and sensors, including multi-functional surveillance radars and vertically launched missile system for long distance engagement of shore, sea-based and air targets.

What is Project 15B?

According to the Defence Ministry, Project 15B ships “feature cutting-edge advanced technology and are comparable to the best ships of similar class anywhere in the world”. The ships run on four gas turbines and incorporate new design concepts for “improved survivability, sea keeping, stealth and manoeuvrability”.

The ministry said the ships also feature enhanced stealth features — which make them difficult to detect — that have been achieved through “shaping of hull and use of radar transparent deck fittings”. Reports say that the cumulative cost of building the four destroyers stands at over Rs 35,000 crore.

“With significant indigenous content, these ships are a true hallmark of self-reliance attained by our country in warship design and shipbuilding, and a shining example of the ‘Make in India’ philosophy,” the Defence Ministry has said.

While Project 15B vessels add to India’s strategic muscle, there is China’s superior naval might to contend with in the Indian Ocean Region. China now is said to possess the largest navy in the world and has a combined fleet strength of 777 vessels against 285 vessels at the command of the Indian Navy. When it comes to destroyers, China has 50 of these as compared to 10 in the Indian fleet.

A recent report said that between 2015 and 2019, China built 132 vessels — compared to the 68 built by the US. In the same period, India constructed 48 ships. Chief of Staff of the French Navy, Admiral Pierre Vandier, was quoted by the AFP report as saying that the “historic Chinese naval effort” represented 55 per cent of the country’s defence budget.

<https://www.news18.com/news/explainers/explained-what-is-project-15b-and-how-it-brings-aatmanirbhar-boost-to-indian-navy-4390856.html>

INS Visakhapatnam to be commissioned on Nov 18, followed by INS Vela sub

The Visakhapatnam-class shares several sensor and weapon systems with its preceding design, the Kolkata-class (Project 15A) of destroyers

By Shishir Gupta

New Delhi: With the global focus on Indo-Pacific, defence minister Rajnath Singh is expected to commission guided-missile destroyer, INS Visakhapatnam, the first of the four of its class, on November 18 in Mumbai to add more teeth to the Indian Navy. The stealth P 15B destroyer was delivered to the Indian Navy on October 28 after all sea checks and trials.

It is understood that INS Vela, the fourth out of six INS Kalveri class diesel attack submarines, will also be commissioned before the end of this month most likely by external affairs minister Subrahmanyam Jaishankar or by outgoing Navy Chief Admiral Karambir Singh. Both the vessels have been built by Mazagon Dock Shipbuilders with INS Vela being designed by the French naval group.

According to the Indian Navy, all the four destroyers of the Visakhapatnam class including INS Mormugao, Imphal and Porbandar, will be launched by 2022 with the destroyers adding to the punch of Indian military might and coverage of the Indo-Pacific.

Even though INS Vela is a diesel attack submarine, it will act as sea denial as well as access denial to the adversary. Designed on the Scorpene-class, the Exocet missile-carrying submarine may be fitted with DRDO designed air-independent propulsion technology at a later stage as part of its mid-life refit.

According to the Indian Navy, the P15B destroyers incorporate new design concepts for improved survivability, sea denial, stealth and enhanced manoeuvrability. The stealth features have been achieved through new hull design and the use of radar transparent deck fittings which make these ships difficult to detect. The design around the bridge area appears to be the main design change compared to the preceding Kolkata class of destroyers. P15B ships will be equipped to carry and operate two US MH 60 R multi-role helicopters.

The Visakhapatnam-class shares several sensors and weapon systems with its preceding design, the Kolkata-class (Project 15A) of destroyers: The IAI EL/M-2248 MF-STAR S-band AESA multi-function radar, Thales LW-08 D-band air search radar, BEL HUMSA-NG bow sonar are fitted on both classes. Like Project 15A, Project 15B will be fitted with 32x Barak 8 surface to air missiles (launched from VLS cells) as well as 16 BrahMos anti-ship and land-attack cruise missiles.

<https://www.hindustantimes.com/india-news/ins-visakhapatnam-to-be-commissioned-on-nov-18-followed-by-ins-vela-sub-101635753692980.html>



INS Visakhapatnam has been built by Mazagon Dock Shipbuilders.(File Photo)

India's Tejas Mk2 combat jet on track, officials say

With increase in range and payload capability, the new variant will be much superior to the Tejas Mark-IA

By Dave Makichuk

The Tejas Mk2 has yet to take to the air, but it is being vaunted as the future of the Indian Air Force.

According to a report in Air Power Asia, the 4.5-generation combat jet will probably be flight tested in 2023, but it is already making waves.

New IAF Chief, Air Chief Marshal VR Chaudhari, stated recently that 7 squadrons of Tejas Mk2 are projected for induction in the coming years while discussing the future roadmap of the Indian Air Force's modernization plan.

This is an important announcement not only towards the significant capability enhancement of the IAF, but a move closer to the "Atmanirbhar Bharat" campaign.

The "Self-reliant India" campaign is the vision of new India envisaged by Prime Minister Shri Narendra Modi, outlined by five pillars – Economy, Infrastructure, System, Vibrant Demography and Demand.

With increase in range and payload capability, the new variant will be much superior than Tejas Mark-IA, 73 of which are being procured by the Indian Air Force from the HAL under a ₹48,000 crore deal that was approved by the government on January 13.

The MWF (Medium Weight Fighter) Tejas Mk2 will be a perfect combination of a powerful radar, a powerful engine and much more.

Currently, the fighter jet is in the Critical Design Review phase, which involves a multi-disciplinary technical review to ensure that a system can proceed to fabrication, demonstration and testing to meet desired performance standards.

This stage is expected to be completed by the end of 2021.

The progress made so far includes the completion of cockpit configuration, sensors, antennae, procurement of raw materials and their availability, detailed design of various subsystems and the finalization of SOPs.

The first prototype will roll out by August 2022. Following this, next on the schedule will be the commencement of the flight tests from 2023 onwards.

Production of the high-performance jet is pegged to start around 2025.

Girish S Deodhare, Program Director and Director, was quoted as saying by The Hindu: "The detailed design is complete. In fact, we are in the critical design review stage and metal cutting should start very shortly.

"The rollout of the aircraft (Mk2) is planned for next year and the first flight in early 2023. We are well on track to achieve these goals."

The single-engine, lightweight multirole fighter has the capability to perform all-weather operations, and was specifically designed for air-to-air combat, and fulfilling strike missions.

MWF's are generally considered to be easy to maintain and are unlikely to face any major maintenance issues, making it a cheaper option.



Tejas MK2 is mainly designed to replace aircraft like the MiG-29, Jaguars and Mirage 2000, and will complement Sukhoi and Rafale in the future. Credit: Artist's rendering/Handout.

Among the key features of the Tejas Mk2 is its fuselage, which is comprised of 90% (by surface area) carbon-fibre composites along with metallic components forming complex geometries utilizing titanium and aluminum.

It retains the iconic double delta main wing, featuring a lower sweep angle for the inboard section which helps bring down static instability.

The changes in the Mk2 version include an elongated and flattened front fuselage, the addition of a nose plug, and an optimized canopy shape and rear fuselage which will lead to improved transonic and supersonic performance.

Close coupled canards provide additional lift, improves wing lift, reduces trim drag, transonic and supersonic drag, and can be used as air brakes during landing.

The Tejas Mk2 is going to be equipped with an AESA (Active Electronically Scanned Array) radar, which would be indigenous Uttam AESA radar which is a scaleable radar.

Scaleable radar means that the TRM (Transmitter Receiver Module) of the radar could be adjusted according to the power provided by the aircraft,

Indigenous Infrared Search and Track systems for passive target acquisition will also be featured along with an indigenous Radar Warning Receiver, along with a software based defined radio based tactical data link for secured communication.

It will also sport an integral Unified Electronic Warfare Suite and a dual colour Missile Approach Warning System developed by DARE (Defence Avionics Research Establishment).

The cockpit will feature a state of the art Large Area Display with side-mounted HOTAS (Hand on Throttle and Stick) throttle for better operational viewing and pilot ergonomics.

In the area of armaments, the aircraft comprises 11 hard points where the weapons, drop tanks and low band jammer can be mounted.

It is stated to carry a variety of BVRAAMS (Beyond Visual Range Air to Air Missiles) like R73 and R77 from Russia, ASRAAM & Meteor from European consortium MBDA, Python 5 & i-Derby from Israel, and the Astra family of missiles.

It can also carry a variety of weapons, such as the anti-radiation Rudram missile, the Brahmos NG supersonic cruise missile, the Sudarshan laser guided bomb, Smart Anti Airfield Weapons and swarm drones.

Currently feasibility studies to integrate indigenous missiles such as the Brahmos NG and Astra Mk2 missile is ongoing.

The heart of any aircraft is the engine — while Tejas Mk-1A is powered by 1 × General Electric 404F2/J-IN20 turbofan engine, producing a dry thrust of 53.9 kN, and a thrust of 90 kN with afterburners, Tejas Mk-2 is going to be powered with a more powerful 1 × GE F414-GE-INS6, estimated at about 120 kN.

Though not designed for stealth aspect, Tejas Mk2 does possess semi stealth characteristics for a reduced Radar Cross Section rendering it less detectable to radars.

Tejas Mk2 is expected to add more teeth to the IAF inventory and will replace the aging fleets of Jaguar, MiG-29, and Mirage 2000.

The cost of MRFA is estimated at a whopping \$25-30 billion.

<https://asiatimes.com/2021/11/indias-tejas-mk2-fighter-jet-on-track-officials-say/>

DRDO's missile test range plays a perfect host to avian guests from far and wide

Even as the area has not been declared as a bird sanctuary, every year local forest officials carry out a census of migratory birds

By Hemant Kumar Rout

Drbhubaneswar: Come winter, the periphery of one of India's most prohibited zones - the Integrated Test Range (ITR) at Chandipur-on-sea comes alive with the cacophony of migratory birds. The wetlands inside the test range of the Defence Research and Development Organisation (DRDO) where trials of sophisticated weapon systems of the country are conducted regularly become the second home for the avian guests for around four months. Even as the entire range remains out of bound for outsiders, both domestic and migratory birds find it a safe haven. The frequent testing of arms and ammunition notwithstanding. Thanks to the sustained efforts of a group of defence scientists, who despite their busy schedule devote time for the conservation of the wetlands that have developed into a bird sanctuary over the years.



Migratory birds at ITR's 'Nisarg' Express

A provision for fresh water supply has been made for the birds at the facility. During summer, the water is drained out and the pond beds cleaned. Scientists, technical officers and other officials regularly visit the site to inspect and ensure proper upkeep of the water bodies. During winter when the migratory birds arrive in huge numbers, vehicular movement is restricted in order to provide a peaceful environment for the avian guests.

Located along the beach front of Bay of Bengal, the bird sanctuary spread over 1,200 hectare offers conducive conditions for the migratory birds. The species include flamingo, stork, northern pin-tail, shoveler, greylag geese, purple moorhen, herons, spot-billed duck and tufted duck. Most of the birds come from Siberia, Central, Southeast Asia, Caspian Sea, Ladakh and Himalayas.

ITR Director Harekrishna Ratha said several marshy areas on the campus were developed and thousands of trees planted around the water bodies to host thousands of migratory birds arriving from far off places during winter. "The sanctuary called 'Nisarg', meaning nature, is born out of the love of former President Dr A P J Abdul Kalam for nature. When he was the Director of ITR that came into existence in 1982, he had emphasised on establishing the test facility while protecting and preserving the environmental assets. A team of scientists and other employees take care of the wetland and birds. Proper provisions have been made so that no outsider can enter and disturb them," he said.

Urging people to remain sensitive towards wildlife and environment, Secretary of Department of Defence R&D and DRDO Chairman Dr G Sathesh Reddy said the sighting of various breeds of birds always has a soothing effect on one's mind and soul. "We not only make missiles, many of our scientists have a special interest for conserving environment. We plant trees, protect water bodies and animals in the areas of our facilities. The bird sanctuary is a testimony to it. We have planted huge number of plants and maintained good arboriculture at various facilities winning many awards," he said.

Even as the area has not been declared as a bird sanctuary, every year local forest officials carry out a census of migratory birds. Retired forest official Sukumar Das said the sanctuary is visited by around 6,000 to 8,000 migratory birds and also has a wide variety of aquatic fauna. The Ministry of

Defence establishment also has a deer park populated by over 100 deer, Das, who served as the Chandipur forest ranger added.

<https://www.newindianexpress.com/states/odisha/2021/nov/01/drdo-missile-test-range-plays-a-perfect-host-to-avian-guests-from-far-and-wide-2378264.html>

Bestgamingpro

Tue, 02 Nov 2021

Anti-drone systems can foil Jammu attack

By Catherine A. Leal

On June 27, one of India's most sensitive military bases, the high-security Air Force Station in Jammu, was targeted by a "novel" weaponized drone assault.

The attack was initiated in its kind, and it has been seen as a sign of things to come. On June 27, terrorists in Shakargarh Sector planned and carried out twin drone assaults on air traffic control facilities, radars, and parked helicopters.

Drones have been increasingly recognized as a serious security concern. Weaponized drones, for example, can drop bombs, fire missiles, and smash armed UAVs into the target.

The market for Unmanned Aerial Systems (UAS) in India is valued at \$866 million, with worldwide sales estimated at \$21.47 billion. With improved payload technology and decreased elements size among other things, the danger level is high and the job is difficult.



The sheer number of UAVs, their various sizes, flight characteristics, capabilities, performance metrics, mission, and vulnerabilities make it difficult for India to address this problem.

Since the Coronavirus outbreak at the end of 2019, Indian troops have detected close to a hundred sightings on India's western border – from Jammu and Kashmir to Gujarat. These drones have been observed in the eastern area beset by Maoist extremism, which makes matters worse.

Is India's anti-rogue drone infrastructure combat-ready?

The assault has focused attention on India's porous borders. To secure border regions and foil any terrorist attempts, the Defence Research and Development Organisation (DRDO) is working on anti-drone 'Swadeshi' technology.

While the national security council secretariat (NSC), which advises the Prime Minister's Office on national security and strategic interests, has been aware of the danger posed by terrorist drones to Indian security for a long time, obtaining technologies to combat it is time-consuming and inefficient.

Only a request for information (RFI) has been proposed for anti-drone technology acquisition to date.

India only has a small number of anti-drone technology developers, including DRDO and Bharat Electronics Ltd as government-funded organizations, with Zen Technologies and ACSG Corp among the private firms.

According to several experts, a large-scale, multi-stakeholder collaboration should be pursued.

The private sector has plenty of room to grow.

The BSF has launched the BSF Hi-tech Undertaking for Maximizing Innovation (BHUMI) in response to the Jammu BSF base being bombed in early July.

With assistance from Indian businesses, the force is seeking innovative technologies to detect and destroy drones and tunnels.

Right now, the BSF is investigating a pool of 500 private Indian companies for possible answers. The objective of Atmanirbhar Bharat is one aspect of this project.

Zen Technologies' Anti-Drone System detects, classifies, and tracks drones on passive surveillance cameras, sensor technology, and neutralization of the danger through jamming.

ACSG Corp., a critical infrastructure protection firm, is also developing targeted technology.

The company claims that its high-powered jammers can tackle multiple layers of security simultaneously.

These businesses will also assist in the development of communication solutions at locations without a network, as well as detecting unauthorized communications in dead zones.

What's next? – Indigenous or foreign technology?

The existing counter-drone technology is limited, and it largely comes from developed countries. This is due in part to the fact that there is little confidence in Indian innovation.

India has traditionally relied on Israel and the United States to meet its needs. But this pattern is changing, as it should, with the Government placing a premium on technology produced by Indians.

There's plenty of material and more potential at home, which explains why the government is starting to pay attention to it.

Isn't it a case in point? The Indian armed forces have already signed deals with Indian firms worth more than Rs 300 crore to manufacture anti-drone platforms.

Will India be able to become a counter-drone technology export center? The answer is straightforward. Yes, but only if more private businesses join the effort.

<https://bestgamingpro.com/anti-drone-systems-can-foil-jammu-attack/>



Tue, 02 Nov 2021

China's growing defence exports in Asia: A challenge for "Make in India"

By Air Marshal Anil Chopra

India's defence export strategy would have to balance China in the Indian Ocean Region. China has the economic might to sell arms cheaper. Their production scales would have to be matched. India has the advantage of endearing the smaller nations with a 'no strings attached' approach. India being a democracy makes it easier to deal with. Over dependence on China could be detrimental to smaller Asian nations and India must use this to her advantage.

China has emerged as supplier of weapon platforms to over 50 countries. Three of the world's top ten arms companies are Chinese making China the world's fifth largest weapons exporter. Its main customers are relatively poor countries in South and



China's Growing Defence Exports in Asia: A Challenge for "Make in India"

South-East Asia, Africa and Latin America. In each case, sales are linked to lower costs, sometimes cheap loans and even political leveraging. The intention is to initially establish a foothold in the local defence market. China is launching home-designed aircraft carriers and conducting research in quantum-technology communications. Chinese Unmanned Aerial Vehicles (UAVs) or drones are being used extensively in conflicts in both Libya and Yemen. Yet, lack of transparency and state-controlled media hype continue to confuse facts. Chinese arms companies

are also benefiting from military modernisation programmes for the People's Liberation Army (PLA).

Chinese Arms Industry

As per a Stockholm International Peace Research Institute (SIPRI) report of 2019, the top 25 global arms companies included four Chinese companies. Three in the top ten are the Aviation Industry Corporation of China (AVIC; ranked sixth), China Electronics Technology Group Corporation (CETC; ranked eighth) and China North Industries Group Corporation (NORINCO; ranked ninth). The fourth is China South Industries Group Corporation (CSGC; ranked 24th). These four have a combined estimated arms sales of \$54.1 billion.

AVIC, the largest, mostly produces aircraft and avionics, with arms sales of \$20.1 billion. NORINCO, with sales of \$17.2 billion, is in fact the world's largest producer of land systems. After the United States (US), China accounted for the second largest share of 2019 arms sales by the top 25 arms companies, at 16 percent. The six West European companies together accounted for 18 percent. Yet, the top five global arms companies are all based in the US – Lockheed Martin, Boeing, Northrop Grumman, Raytheon and General Dynamics. These five together registered \$166 billion in annual arms sales. In total, 12 US companies appear in the top 25 for 2019, accounting for 61 percent of the combined arms sales of the top 25.

China Emerges as a Significant Arms Exporter

Beijing has not only become a major defence spender, but is also turning into a top arms exporter. Besides armed drones, China is exporting fighter aircraft, missiles, small arms, and ships and submarines. SIPRI data shows that China was the world's fifth largest arms exporter in 2016-20 accounting for 5.2 percent of the total global arms exports. The lion's share of these exports, around 75 percent – went to Asia. 20 percent flowed into Africa. Pakistan, Bangladesh and Algeria were the largest recipients. The overall value of its trade still pales in comparison to the US whose exports averaged over \$9 billion annually during the last ten years. Pakistan is the destination for over 50 percent of Chinese exports. Defence exports to Bangladesh, Myanmar and Sri Lanka are also of concern to India.

Filling the Gap Left by USA

Beijing has also been quick to concentrate on emerging technologies. This has enabled it to fill the void left by other suppliers. The US has put restrictions on sale of several high technology equipment including UAVs. China has made its UAVs available to countries such as the Pakistan, the UAE, Saudi Arabia and Egypt, among others. Serbia's acquisition of the CASC CH-92 Wing Loong-armed drones made it the first European state to deploy Chinese combat drones, reflecting Belgrade's deepening relationship with Beijing. Chinese weapons have also found their way into various conflict zones.

Chinese Arms Cheap and Cost-effective

Although Chinese arms are often less advanced than those sold by other countries, the US Department of Defence has noted that "Chinese arms are less expensive than those offered by the top international arms suppliers; but still have advanced capabilities." China has historically supplied weapons to countries that are in the bad books of the United Nation. These include rogue states such as North Korea and Iran. China's leap forward came when Venezuelan President, the late Hugo Chavez, went to China to diversify arms imports because of an uncomfortable relationship with the US. Venezuela bought the K-8 trainers and air search radars in 2008. They later bought transport aircraft, armoured personnel carriers and self-propelled artillery. China's ability and willingness to supply modern military gear at highly competitive prices, makes purchases from it very appealing. The ideal targets for China are countries such as Venezuela and Bolivia that have been abandoned by the US for political reasons.

Chinese Arms Exports – Africa

The increasing Chinese arms sales throughout Africa are in sync with its ever-increasing number of peacekeepers deployed in Africa. China is now the largest single contributor of personnel to UN peacekeeping. It is also building infrastructure in Africa at knock-down prices.

The Chinese-Pakistani made K-8 Karakorum jet trainer is now in service with Egypt, Ghana, Zambia, Zimbabwe, Namibia and Sudan. China claims with pride that K-8s comprise 80 percent of the jet trainer aircraft in Africa. The K-8 is particularly notable due to the ease with which it can be converted for light-attack role aircraft for counter-insurgency operations. China is actively working to strengthen its foothold in certain markets such as Algeria. The sales include C-28A frigates. China has sold offshore patrol vessels and other complex naval vessels to nations including Algeria, Nigeria, Angola, Ghana and Cameroon. Nigeria has just received the initial three JF-17 fighter jets.

Chinese arms have been used during conflicts in the Democratic Republic of Congo, Côte d'Ivoire, Sudan and Somalia. In July 2014, NORINCO delivered 100 guided missile systems, over 9,000 automatic rifles and 24 million rounds of ammunition to the South Sudanese government, whose actions have been widely criticised by the international community. To complement its sales of advanced arms, China has already built a large maintenance base in Africa with more under development. A naval base in Djibouti will soon be joined by aircraft maintenance and training facilities in Tanzania and the Republic of Congo. From modest duplicates of small weapons to complex maritime vessels, 66 percent of African nations currently utilise arms made by China.

Chinese Arms Imports from Europe

More than 99 percent of China's total arms imports (\$14.4 billion) come from Europe, while it exports back an insignificant \$17 million of its own weapons. This trend is driven mostly by Russia, which supplies China with 68 percent of its foreign arms. France and Ukraine collectively supply an additional 20 percent of these imports. Aircraft engines are the main import. China has not yet been successful in producing aircraft engines. Between 2012 and 2019, China purchased over 420 aircraft engines from Russia and just 24 Sukhoi Su-35 fighter aircraft. Ukraine also provides China with propulsion systems. In 2011, Beijing acquired 250 Ukrainian turboprops for trainer and combat aircraft, along with 50 diesel-powered tank engines and three refurbished IL-78 air-refuelling planes. A sizable portion of China's orders from France are also for engines. China has sourced French-built diesel engines for outfitting its naval vessels. There are indications that China has acquired helicopter engines from France. Russian arms sales to China which averaged \$2.6 billion through the 2000s, reaching a peak of \$3.2 billion in 2005. This figure dropped significantly, averaging \$816 million between 2010 and 2018. As a result, China's share of Russian arms imports declined from 47.7 percent of total sales in 2006 to 13.7 percent in 2018.

Arms Sales in Asia

82.8 percent of Chinese arms were sold to countries across Asia. 61.3 percent of China's conventional weapons sales since 2008 have been to Pakistan, Bangladesh and Myanmar. Chinese arms sales across South and South-East Asia are still insignificant compared to the US. Close military ties have paved the way for China to supply Pakistan with more arms than any other country. These exchanges are often tied to political objectives. Since 2009, sales to Pakistan have averaged \$584 million. The co-developed JF-17 aircraft and China's ongoing construction of the Type 054AP class warship for the Pakistani Navy are significant. China will supply eight Hangor-class submarines; of these, four submarines will be constructed in China while the other four will be built in Pakistan.

Between 2008 and 2018, China sold \$1.93 billion of weapons to Bangladesh. This constitutes 71.8 percent of Bangladesh's military acquisitions over this period, making China the biggest supplier of arms to Dhaka. China supports these procurements by offering generous loans. Bangladesh's entire tank fleet is of Chinese origin although 44 of these tanks were supplied through Pakistan. Similarly, small arms, artillery and air defence weapons are sourced from China. Again, a reasonable number of naval equipment including submarines is sourced from China. Discounted acquisitions included the 2013 transfer of two used Type-035G Ming-class submarines for Bangladesh.

Myanmar is the third largest market for Chinese arms exports in Asia. Major equipment includes an assortment of Chinese origin small weapons, tanks, artillery, and air defence guns.

Lately, it has acquired 17 JF-17 Chinese origin aircraft from Pakistan along with 12 Rainbow UAVs, two Type 43 frigates and 76 Type-92 armoured vehicles.

Sri Lanka operates Chinese tanks, Armoured Personal Carriers (APC), artillery and air defence equipment for its Army. Its Navy operates a frigate and Shanghai class naval vessels. Its air force still operates vintage Chinese origin combat and trainer aircraft. Currently, Nepal operates limited Chinese origin military equipment comprising a few APCs and rifles. But increasing proximity to China may entail induction of a fair share of weapons and equipment in future.

China's Modus Operandi for Arms Sales to India's Neighbours

Growing Chinese influence in the South Asia region could pose a challenge for India. China has reportedly committed around \$100 billion in the economies of Afghanistan, Bangladesh, the Maldives, Pakistan, Nepal and Sri Lanka. China is now the largest overseas investor in the Maldives, Pakistan and Sri Lanka. Chinese investment is concentrated in hard infrastructure related to power, roads, railways, bridges, ports and airports. Beijing has taken stakes in the Dhaka and Karachi stock exchanges and cultivated trade in Yuan between China and Pakistan. China is accused of extending excessive credit with the intention of extracting economic or political concessions when countries cannot honour their debts particularly through the Belt and Road Initiative (BRI). This increased backdoor influence could be a strategic disadvantage for India.

Such fears were amplified after Sri Lanka had to lease out its Hambantota Port to China for 99 years, after being unable to service its debt. Similarly, Pakistan has leased the Gwadar port to China. Strategic experts warn of a Chinese hand behind the strain in India-Nepal ties. Several South Asian countries seem enamoured by China's "generosity" which India is unable to match. By 2018, China's total trade with Maldives slightly exceeded that of India. China's trade with Bangladesh is now about twice that of India. China's trade with Nepal and Sri Lanka still behind lags India's trade with those countries, but the gap has shrunk. Beijing is helping strengthen the Navies of Pakistan, Bangladesh and Sri Lanka in order to enhance its footprint in the Bay of Bengal and the Indian Ocean Region. Other than Pakistan that is leaning on China as a low-cost option to neutralise a more powerful India, most other countries are learning to play India and China against each other which gives them greater leverage.

Chinese Arms in Pakistan's Inventory

Pakistan Army's almost entire armoured fleet consists of Al Khalid, Al Zarar, T-85 and T-69 series of Chinese manufactured tanks. Pakistan Heavy Industries Taxila (HIT) has set up a production line in collaboration with China's NORINCO to manufacture the Al Khalid tank which has also been exported to Bangladesh. The artillery weapons with Pakistan Army include towed 122 mm howitzer, 130 Type 59 guns which are supported by 122 mm MBRL and A100 MLRS 300 mm rockets, all made in China. The Pakistan Air Defence artillery has deployed Chinese LY-80 Low to Medium Altitude Air Defence System (LOMADS), FM 90 and FN 6 MANPAD missile system besides 12.7 and 14.5 mm Air Defence guns.

In 2007, as a part of a joint-venture project, China rolled-out a 'designed for Pakistan' Fighter JF-17 'Thunder'. Currently, the Pakistan Air Force (PAF) has around 120 JF-17 aircraft and the numbers are slated to increase to 300 later. Six ZDK-03 Chinese Airborne Warning and Control System (AWACS) aircraft have been inducted. 60 Chinese designed K-8 Karakorum intermediate jet trainers are currently in service and more are under production. The PAF has also received four CH-4 Recce-cum-strike drones which can carry up to four PGMs and reportedly have an endurance of 30 hours. The PAF has bought Chinese SD-10 (ShanDian-10) radar-guided, mid-range homing air-to-air missiles to equip the JF-17 fighters. China has transferred 34 M-11, road-mobile, Short Range Ballistic Missiles (SRBM) with related technology and manufacturing capability to Pakistan.

Despite Chinese pledges to the contrary, it has continued to provide Pakistan with specialty steels, guidance systems and technical expertise in the latter's effort to develop long-range ballistic missiles. The Hatf, Shaheen and Anza series of missiles have been built using Chinese assistance. China helped Pakistan develop nuclear warheads that have directly contributed to Pakistan having

nearly 150 nuclear warheads as on date. China has supplied Burraq and Shahpar series UAVs to Pakistan and plans to allow license production of Wing Loong UAVs. Chinese J-7 and J-17 Thunder fighter aircraft continue as front line platforms of the PAF. On the naval front, the platforms in the pipeline are Type 054A/Jiangkai II-class frigates, Yuan class submarines and anti-ship cruise missiles.

Make in India Initiatives

India is among the top five countries in military spending; it has the second-largest standing army in the world. As per the Union Budget for the financial year 2021-2022, the total allocation for Defence is around Rs 4.78 lakh crore (\$65.45 billion). Currently, the Indian Capital budget is 28 percent of the total defence budget. Modern armed forces spend close to 50 percent. Even manpower-intensive China spends close to 35 percent of the budget on Capital acquisitions. India's defence exports in 2020-2021 were Rs 5,711.30 crore (\$770 million). India's requirements on defence are met largely through imports. The opening of the defence sector for private sector participation will help foreign Original Equipment Manufacturers (OEMs) to enter into strategic partnerships with Indian companies. This will enable them to leverage the domestic markets as well as aim at global markets. Besides helping in building domestic capabilities, it will also bolster exports in the long term.

Between 2014 and 2019, the Ministry of Defence signed more than 180 contracts with the Indian industry. These contracts were valued over \$25.8 billion. Favourable government policies can promote self-reliance, indigenisation and technology up gradation. Economies of scale will help exports. In a big push towards defence indigenisation, India recently placed restrictions on the import of an additional 108 military weapons and systems such as next-generation corvettes, airborne early warning systems, tank engines and radars under a staggered timeline of four-and-half years. The early negative list for defence imports comprising 101 items had included towed artillery guns, short-range surface-to-air missiles, cruise missiles and offshore patrol vessels, among others.

The new Defence Acquisition Procedure (DAP 2020) gives high preference to indigenisation and 'Buy Indian – Indigenously Designed, Developed and Manufactured (IDDM)'. Certainly, at least 'Buy and Make (Indian)'. The 'Make' Procedure has been simplified with provisions for funding of 90 percent of development cost by the Government to the Indian industry. There are provisions for Maintenance Transfer of Technology (MTOT) to Indian partners and to allow foreign OEMs to select Indian Production Agency. FDI in the defence sector is allowed up to 100 percent under the Government route. The initial validity period of industrial licenses has increased from three years to 15 years. The 'Make' Procedure aims to achieve the objective of self-reliance by involving greater participation of Indian industries including the private sector. The Ministry provides financial support up to 70 percent of prototype development cost or a maximum Rs 250 crore per Development Agency.

Key Achievements so far include indigenous defence products like Akash Surface-to-Air Missile System, Dhanush Artillery Gun system, the Advanced Light Helicopter (ALH) variants and Light Combat Aircraft (LCA). Surface radars are another area of India's success. Defence Research and Development Organisation (DRDO) achieved a major milestone with the launch of Medium Range Surface-to-Air Missile (MRSAM). The Strategic Partnership Model encourages the participation of the private sector in the manufacture of equipment such as aircraft, submarines, helicopters and armoured vehicles. A Defence Investor Cell is also functional in the Department of Defence Production. Self Reliant Initiatives through Joint Action (SRIJAN) is a web portal aimed at promoting indigenous production of defence goods imported by DPSUs, OFBs and SHQs.

India's Aviation Defence Export Potential

To begin with, the two major platforms, LCA and ALH variants that India has succeeded in, the production and further development, must be ramped up and aggressively marketed abroad. There is a great market for Unmanned Aerial Systems (UAS). India must put manpower and funding resources in a big way into UAS. We already have joint ventures with some Israeli firms for UAS. There is a great market for a light commuter aircraft of NAL's Saras class. Further development

should be with a private sector partner. Once inducted in India, it will have export potential. India has a successful missile programme. Many countries have shown interest in the BrahMos cruise missiles. The Akash air defence system is another contender. Light arms also have a huge market that India can exploit.

While state-owned enterprises are leading defence manufacturing in India, there have been attempts to set up defence industrial parks, Micro, Small and Medium Enterprise (MSME) defence clusters and concerted technology creation hubs. The 'Make in India' theme is now for import substitution, sustained domestic demand, and for global exports. Many European countries have defence technologies, but no markets. India could join up with some for scaling up production. Some of these could also support marketing. West Asia is another region for India to seek cooperation and market. India's private sector is exporting a large number of smaller defence components and defence-related software solutions. This gives great hope for India to develop Artificial Intelligence (AI) solutions.

India's defence export strategy would have to balance China in the Indian Ocean Region. China has the economic might to sell arms cheaper. Their production scales would have to be matched. India has the advantage of endearing the smaller nations with a 'no strings attached' approach. India being a democracy makes it easier to deal with. Over dependence on China could be detrimental to smaller Asian nations and India must use this to her advantage.

To Summarise – Time to Act India

While the success of Chinese arms industry is commendable, it is also of concern to the world due to change in status quo that it brings with it. The deteriorating ties between the US and Pakistan, stemming from the perception that Islamabad is not doing enough to combat terrorism in Afghanistan, resulted in a sharp decline in US arms supplies, but has also pushed Pakistan into China's lap. Pakistan is the key to success of Chinese BRI and a way for China to boost its military presence. In some ways, it is a project to colonise – the 21st century version of the East India Company.

The changed South Asian dynamics with China rapidly expanding its footprint necessitates action by India to be considered on an urgent basis. India has to get its defence production act of Atmanirbharta right quickly. It has to be a national effort between government, military and industry. India needs to focus on low-hanging fruits and force multipliers first and has to improve its project management approach. As China uses arms sales along with BRI as another tool to encircle and weaken India, it is wake up call for India, lest it becomes too late.

<https://www.thenorthlines.com/chinas-growing-defence-exports-in-asia-a-challenge-for-make-in-india/>

THE ECONOMIC TIMES

Tue, 02 Nov 2021

Facing up to China's hypersonic missiles

Synopsis

India has been working on hypersonic missiles as well. Their purpose is to beat normal anti-missile systems, since the gap between detection and needed defensive action would be too short for missile defence systems to be effective. However, space-based monitoring systems would be able to spot hypersonic gliders and missiles.

It is good news that India has added an indigenously built destroyer to its naval fleet. Good is not the same as adequate, however. China has been expanding its fleet systematically and probably has quantitative superiority over even the US. Even as destroyers acquire the capacity to carry copters and specially built aircraft, aircraft carriers are at risk from hypersonic gliders and missiles.

China has been testing such advanced gliders (they glide, without propulsion, but can still manoeuvre) since 2014 and is believed to have demonstrated success this August. Their speed - 5-20 times the speed of sound - and ability to fly at relatively low altitudes, as compared to a ballistic missile, make them hard to detect using ground-based radar. India faces a complex technological, fiscal and political challenge in this new arms race it is being dragged into.

India has been working on hypersonic missiles as well. Their purpose is to beat normal anti-missile systems, since the gap between detection and needed defensive action would be too short for missile defence systems to be effective. However, space-based monitoring systems would be able to spot hypersonic gliders and missiles.

The thousands of satellites in low-Earth orbits that competing space-based broadband providers are deploying could, perhaps, also be used to watch out for hypersonic missiles. Advanced technological capability calls for research and funds. Since there are competing claims for scarce budgetary resources, defence outlays would need to be rationalised.

Defence pensions should shift to defined contribution plus a possible top-up, and working age-spanning careers in the armed forces should be restricted to officers, while ordinary soldiers serve short periods at peak vigour and build careers outside the military after discharge.

Unified command, in its true sense, would economise on manpower as well. But such changes call for tough political will, to overcome resistance from the armed forces and the bureaucracy. China does not leave us many options.

<https://economictimes.indiatimes.com/opinion/et-editorial/facing-up-to-chinas-hypersonic-missiles/articleshow/87472643.cms>



Message to China: Army, IAF launch major exercise in eastern Ladakh

By Rajat Pandit

New Delhi: The Army and IAF on Monday kicked off a major “airborne insertion and combat” exercise along the frontier with China in eastern Ladakh, which will see paratroopers practice capturing territory “behind enemy lines” and then “link up” with their advancing tanks while attack helicopters destroy hostile mechanized forces.

The three-day exercise, with hundreds of pre-acclimatized troops and heavy weapon systems at an altitude of over 14,000-feet and minus 20 degree Celsius temperatures, is meant to convey yet another “clear message” to China after the Agni-V missile test last week to “desist from any misadventures along the northern borders”, said sources.



The combat manoeuvres come amid the continuing deadlock in the 18-month-long military confrontation in eastern Ladakh, with China refusing to even complete the stalled troop disengagement at Patrolling Point-15 in the Hot Springs-Gogra-Kongka La area in the 13th round of corps commander-level talks on October 10.

With any de-escalation in the much more intractable face-offs at Charding Ninglung Nallah (CNN) track junction at Demchok and the strategically-located Depsang Plains also not on the horizon, India and China are set to keep their 50,000 troops each along with tanks, howitzers and surface-to-air missile systems forward deployed for the second consecutive winter in the harsh high-altitude area.

“If they (People’s Liberation Army) are there to stay, we are there to stay too,” Army chief General M M Naravane had recently said. The PLA has also been flexing its muscles, with stepped-up patrolling along the 3,488-km LAC stretching from eastern Ladakh to Arunachal Pradesh as well as conducting integrated joint operations exercises in the Tibetan Autonomous Region.

The Indian exercise began on Monday with over 200 Para-Special Forces soldiers from the Agra-based Shatrueet Brigade, along with specialist vehicles, missile detachments and other heavy loads, being inserted into the “drop zone” in eastern Ladakh by C-130J Super Hercules and AN-32 aircraft from five different “mounting bases” in the country.

“The aim was to validate rapid response capabilities, inter-theatre move, precision stand-off drops, rapid grouping and capture of designated objectives with speed and surprise. The air-drop was particularly challenging due to the sub-zero temperatures and rarefied atmosphere in the super high-altitude terrain,” said a source.

Over the next two days, the paratroopers will “hold” the captured territory in the simulated exercise, while enemy tanks are neutralized by attack helicopters like the newly-inducted Apaches. “Friendly” main-battle tanks and infantry combat vehicles, in turn, will move forward to link up with the paratroopers holding ground to complete the combat manoeuvres.

“The exercise involves conduct of oxygenated combat free-fall jumps and integrated battle drills by airborne forces, mechanised columns and attack helicopters with seamless integration,” said the source.

India has forward deployed a wide array of weapon systems — ranging from the Bofors, M-777 and K-9 Vajra artillery guns to T-90S and T-72 main-battle tanks, Smerch and Pinaka multiple-

launch rocket systems, and BrahMos supersonic cruise missiles — along the LAC since the confrontation erupted in April-May last year.

Similarly, the IAF too has deployed Sukhoi-30MKI, Mirage-2000, MiG-29 and Jaguar fighters as well Apache attack and Chinook heavy-lift helicopters in Ladakh and elsewhere along the LAC.

Though India lags behind China in development of border infrastructure and last-mile troop connectivity, the construction of additional roads, ammunition shelters, bridges and tunnels in forward areas has also been a top priority area for the Border Roads Organization during the crisis.

<https://timesofindia.indiatimes.com/india/in-message-to-china-india-conducts-high-altitude-combat-exercise-in-ladakh/articleshow/87472262.cms>

नवभारत टाइम्स

Tue, 02 Nov 2021

चीन को पटखनी देने के लिए भारतीय सेना तैयार, 14,000 फीट ऊंचाई पर हो रहा अभ्यास

By शोफाली श्रीवास्तव

चीन के साथ सीमा विवाद के बीच भारतीय सेना अपनी तैयारियों को और पुख्ता कर रही है। सेना की शत्रुजीत ब्रिगेड अपनी रैपिड रिस्पॉन्स क्षमताओं की समीक्षा के लिए पूर्वी लद्दाख में उत्तरी सीमाओं पर हवाई अभ्यास कर रही है।

5000 फीट लद्दाख में चीन को करारा जवाब देने के लिए भारतीय सेना पूरी तरह तैयार है। भारतीय सेना की शत्रुजीत ब्रिगेड पूर्वी लद्दाख में एक अभ्यास के जरिए अपनी रैपिड रिस्पॉन्स क्षमता को परख रही है। इसके तहत उत्तरी सीमा में भारतीय सेना ने हवा से सैनिकों को एक जगह पर उतारने का परीक्षण किया। इसके साथ ही लड़ाकू क्षमता (कॉम्बेट कैपिबिलिटी) का अंदाजा लगाया गया।



14 हजार फीट की ऊंचाई पर अभ्यास

सोमवार को सैनिकों को 14 हजार फीट की ऊंचाई पर एक इलाके में एयर ड्रॉप किया गया। ये सैनिक पहले से ही हाई एल्टीट्यूट के लिए अभ्यस्त थे। सी-130 और एएन-32 ट्रांसपोर्ट एयरक्राफ्ट के जरिए सैनिकों के साथ, खास वीडकल और मिसाइल डिटेचमेंट को पांच अलग-अलग माउंटेन बेस पर ड्रॉप किया गया।

दुश्मन को चकमा देते हुए कब्जा करने की रणनीति

इस अभ्यास में देखा गया कि किस तरह सटीक जगह पर ड्रॉप किया जा सकता है। साथ ही कोई तय जगह को किस तरह सरप्राइज देते हुए कब्जे में किया जा सकता है। यह ड्रॉप इसलिए चुनौतीपूर्ण रहा क्योंकि तापमान बेहद कम था और इलाका मुश्किल था।

माइनस 20 डिग्री सेल्सियस तापमान में दिखाया जज्बा

एक्सरसाइज में ऑक्सिजन कॉम्बेट फ्री फॉल जंप, इंटीग्रेटेड बैटल ड्रिल भी की गई। एक्सरसाइज अभी जारी है। सूत्रों के अनुसार, शून्य से 20 डिग्री सेल्सियस नीचे तक के तापमान और अत्यधिक ऊंचाई वाले दुर्गम क्षेत्र में सैनिकों को पहचाना चुनौतीपूर्ण था।

पिछले साल से जारी है गतिरोध

भारतीय और चीनी सेनाओं के बीच मई 2020 से ही गतिरोध कायम है जब पूर्वी लद्दाख में पैंगोंग झील क्षेत्र में हिंसक झड़प हुई थी। इसके बाद गलवान घाटी में दोनों सेनाएं आमने-सामने आई थीं जिसमें भारतीय सेना के 20 जवान शहीद हुए थे।

LAC पर तैनात हैं दोनों देशों के सैनिक

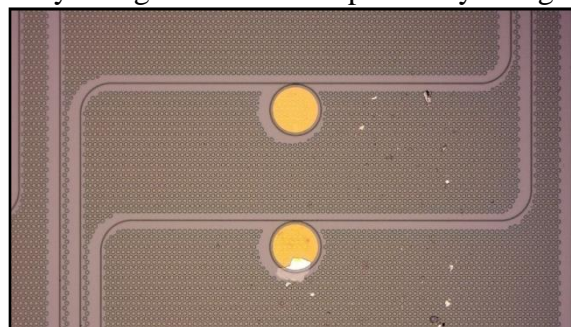
सैन्य और राजनयिक वार्ताओं की एक श्रृंखला के बाद भारत और चीन ने अगस्त 2020 में गोगरा क्षेत्र में और फरवरी 2021 में पैंगोंग झील से सैनिकों की वापसी की प्रक्रिया पूरी की थी। संवेदनशील क्षेत्र में LAC पर अभी दोनों देशों के लगभग 50,000 से 60,000 सैनिक तैनात हैं।

<https://navbharattimes.indiatimes.com/india/shatrujeet-brigade-of-indian-army-testing-its-combat-capability-at-eastern-ladakh/articleshow/87471625.cms?story=5>

Researchers move closer to controlling two-dimensional graphene

The device you are currently reading this article on was born from the silicon revolution. To build modern electrical circuits, researchers control silicon's current-conducting capabilities via doping, which is a process that introduces either negatively charged electrons or positively charged "holes" where electrons used to be. This allows the flow of electricity to be controlled and for silicon involves injecting other atomic elements that can adjust electrons—known as dopants—into its three-dimensional (3D) atomic lattice.

Silicon's 3D lattice, however, is too big for next-generation electronics, which include ultra-thin transistors, new devices for optical communication, and flexible bio-sensors that can be worn or implanted in the human body. To slim things down, researchers are experimenting with materials no thicker than a single sheet of atoms, such as graphene. But the tried-and-true method for doping 3D silicon doesn't work with 2D graphene, which consists of a single layer of carbon atoms that doesn't normally conduct a current.



The TOS-doped graphene is highly conductive but absorbs very little of the infrared light in the resonator—a combination of properties that makes this material unique and promising for opto-electronic applications. Credit: Ipshta Datta, Lipson Nanophotonics Group, Columbia University

Rather than injecting dopants, researchers have tried layering on a "charge-transfer layer" intended to add or pull away electrons from the graphene. However, previous methods used "dirty" materials in their charge-transfer layers; impurities in these would leave the graphene unevenly doped and impede its ability to conduct electricity.

Now, a new study in *Nature Electronics* proposes a better way. An interdisciplinary team of researchers, led by James Hone and James Teherani at Columbia University, and Won Jong Yoo at Sungkyungwan University in Korea, describe a clean technique to dope graphene via a charge-transfer layer made of low-impurity tungsten oxyselenide (TOS).

The team generated the new "clean" layer by oxidizing a single atomic layer of another 2D material, tungsten selenide. When TOS was layered on top of graphene, they found that it left the graphene riddled with electricity-conducting holes. Those holes could be fine-tuned to better control the materials' electricity-conducting properties by adding a few atomic layers of tungsten selenide in between the TOS and the graphene.

The researchers found that graphene's electrical mobility, or how easily charges move through it, was higher with their new doping method than previous attempts. Adding tungsten selenide spacers further increased the mobility to the point where the effect of the TOS becomes negligible, leaving mobility to be determined by the intrinsic properties of graphene itself. This combination of high doping and high mobility gives graphene greater electrical conductivity than that of highly conductive metals like copper and gold.

As the doped graphene got better at conducting electricity, it also became more transparent, the researchers said. This is due to Pauli blocking, a phenomenon where charges manipulated by doping block the material from absorbing light. At the infrared wavelengths used in

telecommunications, the graphene became more than 99 percent transparent. Achieving a high rate of transparency and conductivity is crucial to moving information through light-based photonic devices. If too much light is absorbed, information gets lost. The team found a much smaller loss for TOS-doped graphene than for other conductors, suggesting that this method could hold potential for next-generation ultra-efficient photonic devices.

"This is a new way to tailor the properties of graphene on demand," Hone said. "We have just begun to explore the possibilities of this new technique."

One promising direction is to alter graphene's electronic and optical properties by changing the pattern of the TOS, and to imprint electrical circuits directly on the graphene itself. The team is also working to integrate the doped material into novel photonic devices, with potential applications in transparent electronics, telecommunications systems, and quantum computers.

More information: Min Sup Choi et al, High carrier mobility in graphene doped using a monolayer of tungsten oxyselenide, *Nature Electronics* (2021). DOI: [10.1038/s41928-021-00657-y](https://doi.org/10.1038/s41928-021-00657-y)

Journal information: [Nature Electronics](https://www.nature.com/electronics)
<https://phys.org/news/2021-11-closer-two-dimensional-graphene.html>

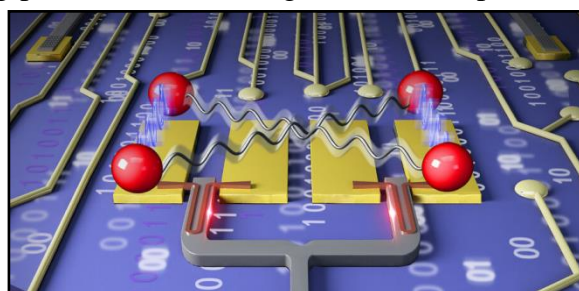


Tue, 02 Nov 2021

A superconducting silicon-photonic chip for quantum communication

Integrated quantum photonics (IQP) is a promising platform for realizing scalable and practical quantum information processing. Up to now, most of the demonstrations with IQP focus on improving the stability, quality, and complexity of experiments for traditional platforms based on bulk and fiber optical elements. A more demanding question is: "Are there experiments possible with IQP that are impossible with traditional technology?"

This question is answered affirmatively by a team led jointly by Xiao-Song Ma and Labao Zhang from Nanjing University, and Xinlun Cai from Sun Yat-sen University, China. As reported in *Advanced Photonics*, the team realizes quantum communication using a chip based on silicon photonics with a superconducting nanowire single-photon detector (SNSPD). The excellent performance of this chip allows them to realize optimal time-bin Bell state measurement and to significantly enhance the key rate in quantum communication.



A superconducting silicon chip is used as an untrusted relay server for secure quantum communication. By harnessing the unique low-dead-time feature of the waveguide integrated superconducting single-photon detectors (red wires with hairpin shape in the middle), optimal time-bin encoded Bell-state measurements (shown in blue and grey wave-like curves between four photons, indicated as red balls) are realized. These in turn enhance secure key rate of quantum communication. Credit: MaLab, Nanjing University

The single photon detector is a key element for quantum key distribution (QKD) and highly desirable for photonic chip integration to realize practical and scalable quantum networks. By harnessing the unique high-speed feature of the optical waveguide-integrated SNSPD, the dead time of single-photon detection is reduced by more than an order of magnitude compared to the traditional normal-incidence SNSPD. This in turn allows the team to resolve one of the long-standing challenges in quantum optics: Optimal Bell-state measurement of time-bin encoded qubits.

This advance is important not only to the field of quantum optics from a fundamental perspective, but also to quantum communications from the application perspective. The team employs the unique advantages of the heterogeneously integrated, superconducting silicon-photonic platform to realize a server for measurement-device-independent quantum key distribution (MDI-QKD). This effectively removes all possible detector side-channel attacks and thus significantly enhances the security of quantum cryptography. Combined with a time multiplex technique, the method obtains an order-of-magnitude increase in MDI-QKD key rate.

By harnessing the advantages of this heterogeneously integrated system, the team obtains a high secure key rate with a 125 MHz clock rate, which is comparable to the state-of-the-art MDI-QKD experimental results with GHz clock rate. "In contrast with GHz clock rate MDI-QKD experiments, our system doesn't require a complicated injection locking technique, which significantly reduces the complexity of the transmitter," says Xiaodong Zheng, a Ph.D. student in Ma's group and first author of the *Advanced Photonics* paper.

"This work shows that integrated quantum-photonic chips provide not only a route to miniaturization, but also significantly enhance the system performance compared to traditional platforms. Combined with integrated QKD transmitters, a fully chip-based, scalable, and high-key-rate metropolitan quantum network should be realized in the near future," says Ma.

More information: Xiaodong Zheng et al, Heterogeneously integrated, superconducting silicon-photonic platform for measurement-device-independent quantum key distribution, *Advanced Photonics* (2021). DOI: [10.1117/1.AP.3.5.055002](https://doi.org/10.1117/1.AP.3.5.055002)

<https://phys.org/news/2021-11-superconducting-silicon-photonic-chip-quantum.html>

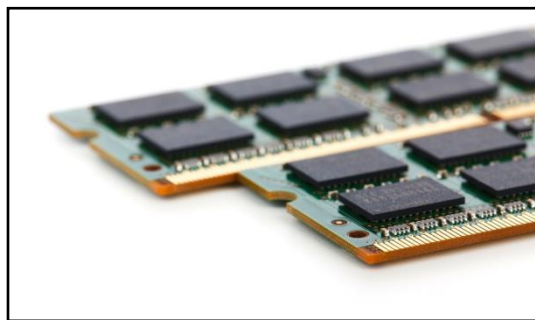


Tue, 02 Nov 2021

Researchers discover predictable behavior in promising material for computer memory

In the last few years, a class of materials called antiferroelectrics has been increasingly studied for its potential applications in modern computer memory devices. Research has shown that antiferroelectric-based memories might have greater energy efficiency and faster read and write speeds than conventional memories, among other appealing attributes. Further, the same compounds that can exhibit antiferroelectric behavior are already integrated into existing semiconductor chip manufacturing processes.

Now, a team led by Georgia Tech researchers has discovered unexpectedly familiar behavior in the antiferroelectric material known as zirconium dioxide, or zirconia. They show that as the microstructure of the material is reduced in size, it behaves similarly to much better understood materials known as ferroelectrics. The findings were recently published in the journal *Advanced Electronic Materials*.



Credit: CC0 Public Domain

Miniaturization of circuits has played a key role in improving memory performance over the last fifty years. Knowing how the properties of an antiferroelectric change with shrinking size should enable the design of more effective memory components.

The researchers also note that the findings should have implications in many other areas besides memory.

"Antiferroelectrics have a range of unique properties like high reliability, high voltage endurance, and broad operating temperatures that makes them useful in a wealth of different devices, including high-energy-density capacitors, transducers, and electro-optics circuits." said Nazanin Bassiri-Gharb, coauthor of the paper and professor in the Woodruff School of Mechanical Engineering and the School of Materials Science and Engineering at Georgia Tech. "But size scaling effects had gone largely under the radar for a long time."

"You can design your device and make it smaller knowing exactly how the material is going to perform," said Asif Khan, coauthor of the paper and assistant professor in the School of Electrical and Computer Engineering and the School of Materials Science and Engineering at Georgia Tech. "From our standpoint, it opens really a new field of research."

Lasting Fields

The defining feature of an antiferroelectric material is the peculiar way it responds to an external electric field. This response combines features of non-ferroelectric and ferroelectric materials, which have been much more intensively studied in physics and materials science.

For ferroelectrics, exposure to an external electric field of sufficient strength makes the material become strongly polarized, which is a state where the material exhibits its own internal electric field. Even when the external electric field is removed, this polarization persists, similar to how an iron nail can become permanently magnetized.

The behavior of a ferroelectric material also depends on its size. As a sample of material is made thinner, a stronger electric field is required to create a permanent polarization, in accordance with a precise and predictable law called the Janovec–Kay–Dunn (JKD) law.

By contrast, application of an external electric field to an antiferroelectric does not cause the material to become polarized—at first. However, as the strength of the external field is increased, an antiferroelectric material eventually switches to a ferroelectric phase, where polarization abruptly sets in. The electric field needed to switch the antiferroelectric to a ferroelectric phase is called the critical field.

Size Scaling

In the new work, the researchers discovered that zirconia antiferroelectrics also obey something like a JKD law. However, unlike for ferroelectrics, the microstructure of the material plays a key role. The strength of the critical field scales in the JKD pattern specifically with respect to the size of structures known as crystallites within the material. For a smaller crystallite size, it takes a stronger critical field to switch an antiferroelectric material into its ferroelectric phase, even if the thinness of the sample remains the same.

"There had not been a predictive law that dictates how the switching voltage will change as one miniaturizes these antiferroelectric oxide devices," said Khan. "We've found a new twist on an old law."

Formerly, thin antiferroelectrics had been difficult to produce in comparable sizes as ferroelectrics, the researchers said. Nujhat Tasneem, the doctoral student leading the research, spent "day and night" in the lab according to Khan to process and produce leakage-free antiferroelectric zirconium oxide films of single nanometers in size. The next step, according to Khan, is for researchers to figure out exactly how to control the crystallite size, thereby tailoring the properties of the material for its use in circuits.

The researcher also collaborated with researchers from the Charles University in Czech Republic and the Universidad Andres Bello in Chile for X-ray diffraction characterization and first-principles based calculations, respectively.

"It was truly a collaborative effort, spanning multiple continents," said Tasneem.

The results should also speak to fundamental physics questions, according to Bassiri-Gharb. In recent years, something of a mystery has arisen in the study of antiferroelectrics, with the way that microscopic crystalline structures cause a macroscopic polarization being called into question.

"Finding two very different types of materials—ferroelectric and antiferroelectrics with different atomic structures—to follow similar behaviors and laws is particularly exciting," said Bassiri-Gharb. "It opens doors for searching for more similarities and transferring more of our knowledge across the fields."

More information: DOI: 202100485 Nujhat Tasneem et al, A Janovec-Kay-Dunn-Like Behavior at Thickness Scaling in Ultra-Thin Antiferroelectric ZrO₂ Films, *Advanced Electronic Materials* (2021). DOI: [10.1002/aelm.202100485](https://doi.org/10.1002/aelm.202100485)
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COVID-19 Research News

mint

Tue, 02 Nov 2021

Booster vaccine dose effective in reducing severe covid-19-related outcomes: Lancet study

By Neetu Chandra Sharma

- *Some states in India have been urging the central government to consider a third booster dose for healthcare and frontline workers, but the union health ministry has so far not taken any decision on it, citing the WHO's recommendations against a booster shot*

New Delhi: A booster dose of vaccine is more effective in reducing severe covid-19-related outcomes in individuals compared to two shots received at least five months ago, as per a study published in *The Lancet*.

The study, conducted in Israel, claims to provide the largest peer-reviewed evaluation of the effectiveness of a third "booster" dose of a covid-19 vaccine in a nationwide mass-vaccination setting. The Clalit Research Institute, in collaboration with researchers from Harvard University, analysed integrated health record databases to examine the effectiveness of the third dose of the Pfizer vaccine against the Delta variant of SARS-CoV-2.

The study took place from 30 July through 23 September. Researchers reviewed data from 728,321 individuals aged 12 or above who had received the third dose of the Pfizer vaccine. These individuals were carefully matched 1:1 with 7,28,321 individuals who had received only two shots of the BNT162b2 vaccine at least five months prior.

The matching was based on an extensive set of demographic, geographic and health-related attributes associated with risk of infection, risk of severe disease, health status and health-seeking behaviour. Individuals were assigned to each group dynamically based on their changing vaccination status (1,98,476 individuals moved from the unvaccinated cohort into the vaccinated cohort during the study).

Multiple analyses were conducted to ensure that the estimated vaccine effectiveness was robust to potential biases.

The results, researchers said, show that, compared with individuals who received only two doses five months prior, to those who received three doses of the vaccine (7 days or more after the third dose) had 93% lower risk of covid-19-related hospitalization, 92% lower risk of severe covid-19

Booster vaccine dose effective in reducing severe covid-19-related outcomes: Lancet study



India has so far administered 106 crore covid-19 vaccine doses. (File Photo: Reuters)

disease, and 81% lower risk of covid-19-related death. Vaccine effectiveness was found to be similar for different sexes, age groups (ages 40-69 and 70+) and number of comorbidities, the research showed.

The researchers have indicated that several countries are currently experiencing a resurgence of SARS-CoV-2 infections despite hitherto successful vaccination campaigns, may be due to the greater infectiousness of the delta (B.1.617.2) variant of SARS-CoV-2, and to waning immunity of vaccines administered months earlier.

The study also included a population-level analysis which found that infection rates began to drop for each age group 7-10 days after that age group became eligible for the third dose. The research was conducted by Dr Noam Barda, Dr. Noa Dagan, Professor Cyrille Cohen, and Professor Ran Balicer from the Clalit Research Institute, as well as Professor Miguel Hernán and Professor Marc Lipsitch of the Harvard T.H. Chan School of Public Health, Professor Isaac S. Kohane of Harvard Medical School, and Professor Ben Reis of Boston Children's Hospital and Harvard Medical School.

"These results show convincingly that the third dose of the vaccine is highly effective against severe covid-19-related outcomes in different age groups and population subgroups, one week after the third dose. These data should facilitate informed policy decision-making," said Ran Balicer, senior author of the study, Director of the Clalit Research Institute and Chief Innovation Officer for Clalit.

The research was funded in part by the newly announced Ivan and Francesca Berkowitz Family Living Laboratory Collaboration at Harvard Medical School and Clalit Research Institute.

Some states in India have been urging the central government to consider a third booster dose for healthcare and frontline workers, but the union health ministry has so far not taken any decision on it, citing the World Health Organization's (WHO) recommendations.

India has so far administered 106 crore vaccine doses. Over the past 24 hours, the country recorded 12,514 fresh infections pushing the active caseload to 1,58,817 - the lowest in 248 days. The weekly positivity rate is at 1.17% and has remained below 2% for the last 38 days now. The daily positivity rate is at 1.42%.

Union health minister Mansukh Mandaviya on Twitter said, "India has administered 1st #COVID19 vaccine dose to 78% of the eligible population and 2nd dose to 35% of the eligible people. Congratulations to all as we rapidly progress on our path to defeat the virus!"

<https://www.livemint.com/science/health/booster-vaccine-dose-effective-in-reducing-severe-covid-19-related-outcomes-11635762205538.html>

