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समाचार पत्रों से चयनित अंश

Newspapers Clippings

डीआरडीओ समुदाय को डीआरडीओ प्रौद्योगिकियों, रक्षा प्रौद्योगिकियों, रक्षा नीतियों, अंतर्राष्ट्रीय संबंधों और विज्ञान एवं प्रौद्योगिकी की नूतन जानकारी से अवगत कराने हेतु दैनिक सेवा

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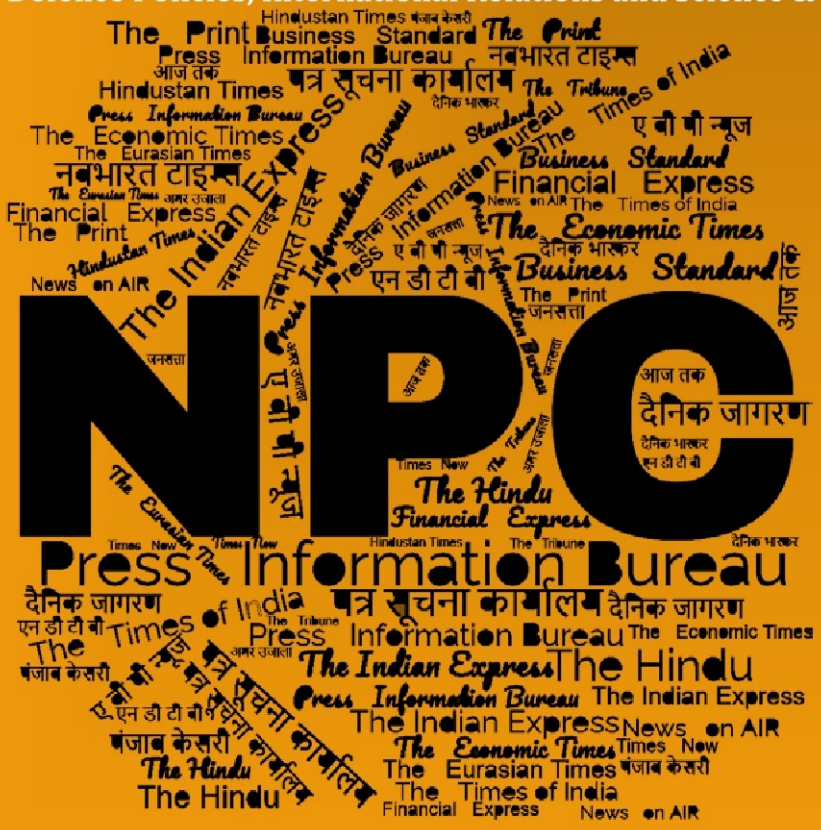

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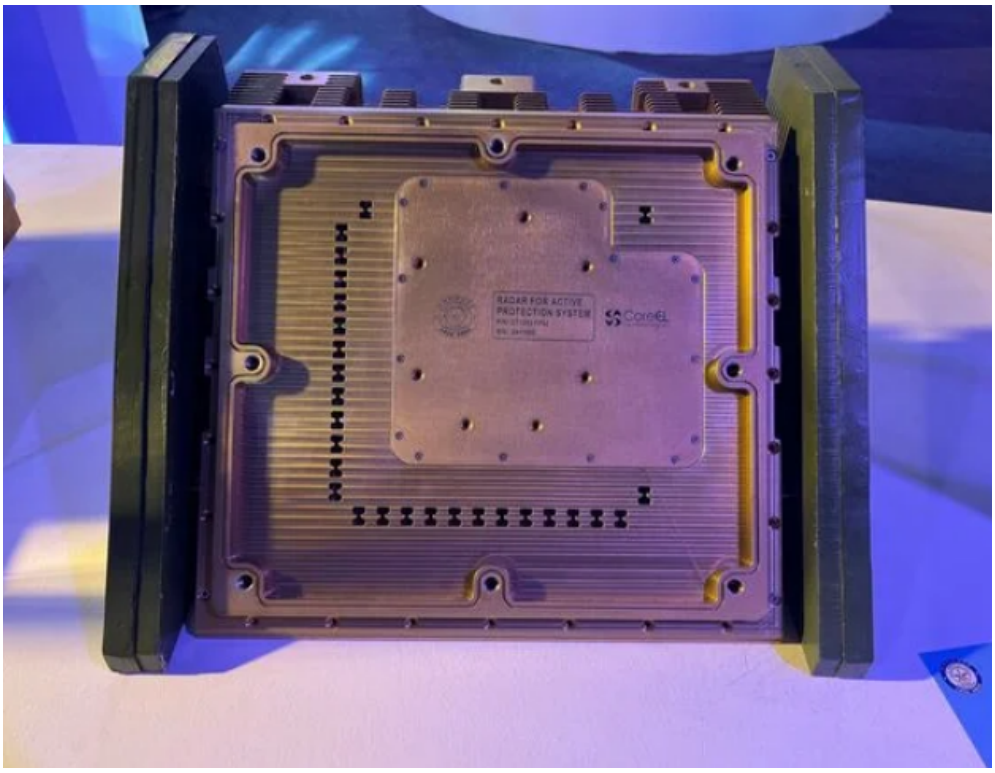
DRDO News

Aero India 2025: DRDO develops hard-kill active protection system

Source: Janes, Dt. 13 Feb 2025,
URL: https://www.janes.com/osint-insights/defence-news/land/aero-india-2025-drdo-develops-hard-kill-active-protection-system



The radar panel of the DRDO's new APS displayed at Aero India 2025

India's Defence Research and Development Organisation (DRDO) is developing a new hard-kill active protection system (APS) for integration onto main battle tanks (MBTs), DRDO officials told Janes at the Aero India 2025 show in Bangalore.

According to the officials, the APS consists of four X-band radars and two traversable effector launchers, each equipped with two anti-threat munitions.

The APS would feature radar panels fitted on each side of the turret to provide 360° coverage. On top of the turret, two tube-based launchers would be mounted, each covering 180°, with a maximum elevation of 90°. The entire system is intended to ensure complete hemispherical coverage.

The APS can detect threats from various types of rounds – including fin-stabilised armour-piercing discarding sabot (FSAPDS), high-explosive anti-tank (HEAT), high-explosive squash head

(HESH), rocket-propelled grenade (RPG), and anti-tank guided missile (ATGM) munitions – and neutralise them using a blast warhead at 20–50 m from the MBT.

The officials also said the system can detect small and micro unmanned aerial vehicles (UAVs) at a range of 2 km.

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Aero India 2025: DRDO develops extended-range PGM

Source: Janes, Dt. 13 Feb 2025,
URL: https://www.janes.com/osint-insights/defence-news/air/aero-india-2025-drdo-develops-extended-range-pgm

DRDO, in association with Adani and BDL, has developed an extended-range variant of ULPGM, known as ULM-ER. A model was unveiled at the Aero India 2025 show

India's state-run Defence Research and Development Organisation (DRDO) has developed an unmanned aerial vehicle (UAV) Launched Missile – Extended Range (ULM-ER) munition for unmanned aerial applications.

Adani Defence and Aerospace showcased a model of the ULM-ER at the Aero India 2025 show held in Bangalore from 10 to 14 February. Speaking to Janes, Adani officials said the company is one of the manufacturing partners of ULM-ER and is currently preparing for initial trials, which are likely to be scheduled for mid-2025.

The ULM-ER, an extended-range variant of DRDO's UAV-Launched Precision Guided Munition (ULPGM) air-to-surface missile, features passive homing with an imaging infrared (IR) seeker for both day and night operations. The 12.5 kg fire-and-forget missile is powered by a small dual-thrust solid propulsion unit, enabling it to achieve a maximum range of 4 km during the day and 2.5 km at night. Communication is facilitated via a two-way datalink. With multiple warhead options, the munition is designed to engage various static and moving targets.

Adani and Bharat Dynamics Limited (BDL) are key manufacturing partners for the ULPGM project, while the DRDO is responsible for the development and testing of the munitions.

There are three known ULPGM variants: ULPGM V1 (baseline), ULPGM V2 (production variant, also known as ULPGM), and ULPGM V3 (extended-range variant, also referred to as ULM-ER).

The primary differences between V1, V2, and V3 lie in enhancements to guidance systems, performance, and range. Adani and DRDO officials declined to provide specific details on the modifications and production timelines.

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Defence News

Defence Strategic: National/International

India expects $200 million missile deal with Philippines this year, sources say

Source: The Economic Times, Dt. 13 Feb 2025,
URL: https://economictimes.indiatimes.com/news/defence/india-expects-200-million-missile-deal-with-philippines-this-year-sources-say/articleshow/118205040.cms

India expects to sell short-range missiles to the Philippines this year in a deal worth more than $200 million, Indian sources told Reuters, for New Delhi's second major defence export contract with Manila as tension grows with China.

The Akash missile system developed by India's defence research body has drawn interest from the Philippines, which has told New Delhi it would make an order in the fiscal year that begins in April, said three sources. All the sources spoke on condition of anonymity as the matter is a sensitive one.

The surface-to-air missile system with a range of up to 25 km (16 miles) was exported to Armenia last year in a $230-million deal, the sources said, adding that the Philippine sale is expected to be bigger than the Armenian deal. However, they did not reveal the number of missiles and accompanying systems, including radars, involved.

India's Bharat Dynamics Ltd, the manufacturer of the missiles, was one of the exhibitors at last year's Asian Defense and Security Exhibition in Manila. The company and India's defence ministry did not immediately respond to requests for comment.

A Philippine defence spokesperson, Arsenio Andolong, declined to comment on the specifics of any deal or on plans for procurement, but said the country's armed forces had "manifested it requires these capabilities".

The expected deal would follow India's $375-million sale of the mid-range BrahMos supersonic cruise missile to the Philippines in 2022. The purchase comes at a time when Manila is building its military strength as tension escalates with Beijing on overlapping claims in the busy waterway of the South China Sea, where the two have clashed in recent years.

India is the world's biggest arms importer but is stepping up domestic production and boosting defence exports to counter China's military strength and influence in its neighbourhood after their troops clashed on the Himalayan border in 2020.

India's exports of defence equipment, including arms and ammunition, have jumped nearly 150% since 2020 to cross $2.40 billion in the fiscal year that ended in March 2024. However, its arms exports are lower than those of nations like Australia and South Korea, and far below those of China, the world's fourth largest arms exporter.

The Philippines' armed forces chief said on Wednesday the country was looking to buy more military hardware to modernise its arsenal, including additional BrahMos missiles from India and at least two submarines.

"We are getting more of this (BrahMos system) this year, and in the coming years," General Romeo Brawner said in a speech to business figures in the Philippines, but did not mention the Akash missile system.

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Donald Trump says US to increase military sales to India, eventually provide F-35 jets

Source: The Economic Times, Dt. 14 Feb 2025,
URL: https://economictimes.indiatimes.com/news/defence/donald-trump-says-us-to-increase-military-sales-to-india-eventually-provide-f-35-jets/articleshow/118229350.cms

In a significant move, US President Donald Trump announced that the United States would be increasing military sales to India by billions of dollars and laying the groundwork for supplying F-35 stealth fighter jets. Speaking at a joint press conference with Indian Prime Minister Narendra Modi, Trump said, "Starting this year, we will be increasing military sales to India by many billions of dollars. We are also paving the way to ultimately provide India with the F-35 stealth fighters."

This marks a major milestone in India-US defence relations, strengthening India's military capabilities and advancing strategic cooperation between the two countries.

F-35 Showcased at Aero India

The Lockheed Martin F-35 Lightning II, the world's most widely deployed fifth-generation fighter jet, made a high-profile appearance at the 15th edition of Aero India, Asia's largest aerospace and defence exhibition, held at Yelahanka Air Force Station in Bengaluru. The aircraft, known for its

advanced stealth, situational awareness, and networked combat capabilities, was showcased to Indian military and industry leaders.

High-Level Talks on Strategic Cooperation

Earlier in the day, US National Security Advisor Michael Waltz met with Prime Minister Modi to discuss ways to deepen the India-US Comprehensive Global Strategic Partnership. Their talks focused on strategic technologies, defence industrial collaboration, civil nuclear energy—particularly small modular reactors—and counterterrorism. Regional and global issues of mutual interest were also on the agenda.

India's Own Stealth Fighter Development

At Aero India, the Defence Research and Development Organisation (DRDO) unveiled a full-scale model of India's first indigenous 5.5-generation stealth fighter, the Advanced Medium Combat Aircraft (AMCA). The project, approved by the Cabinet Committee on Security in March last year, aims to develop a homegrown stealth aircraft with cutting-edge features.

Under this ambitious initiative, DRDO's Aeronautical Development Agency, in collaboration with public and private sector partners, will design and develop the AMCA. The Rs 15,000 crore project includes building five prototypes over the next five years, marking a significant step in India's push for self-reliance in defence manufacturing.

Strengthening Indo-Pacific Security

Trump also underscored the importance of the Quad security alliance—comprising the US, India, Australia, and Japan—in maintaining stability in the Indo-Pacific region. "In 2017, my administration revived the Quad security partnership, and in our meeting today, the PM and I reaffirmed the strong cooperation between the US, India, Australia, and Japan, and it is crucial really to maintain peace, prosperity, tranquillity in the Indo-Pacific," he said.

India's potential acquisition of the F-35 represents a strategic shift in its military procurement, which has historically relied on a mix of Western and Russian equipment. While specific details about the timeline and final agreement remain undisclosed, the announcement reinforces India's role as a key player in regional security and highlights the growing defence collaboration between the US and India.

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Pakistan troops violate ceasefire in J-K, suffer 'heavy casualties' after Indian Army retaliates

Source: The Economic Times, Dt. 13 Feb 2025,
URL: https://economictimes.indiatimes.com/news/defence/pakistan-troops-violate-ceasefire-in-j-k-suffer-heavy-casualties-after-indian-army-retaliates/articleshow/118201498.cms

Pakistani troops on Wednesday violated ceasefire by resorting to unprovoked firing on Indian posts along the Line of Control (LoC) in Poonch district of Jammu and Kashmir, prompting a befitting

response by the Indian Army, security officials said. The extent of damage on the Pakistan side was not known immediately but the officials said the enemy forces suffered "heavy casualties". The Indian Army neither confirmed nor denied the information.

The ceasefire violation by Pakistan in the Krishna Ghati sector came a day after two Indian Army personnel including a captain were killed in an improvised explosive device (IED) explosion triggered by suspected terrorists near the LoC in the Akhnoor sector of Jammu district.

The ceasefire violation along the LoC is very rare ever since India and Pakistan renewed the ceasefire agreement on February 25, 2021.

The officials said Pakistani troops resorted to unprovoked firing on a forward post in the Tarkundi area along the LoC, prompting a strong retaliation by the Indian Army which resulted in "heavy casualties" among the enemy forces.

An undated video of a Pakistani army officer is making rounds on social media paying last respects to killed soldiers.

Meanwhile, the officials said a junior commissioned officer (JCO) of the Indian Army sustained minor injuries when he accidentally stepped over a landmine in the same sector this evening.

The JCO, who is a resident of Mendhar, was part of a patrolling party keeping a close vigil on the LoC to prevent infiltration of terrorists, they said, adding the injured officer was evacuated to the military hospital.

The situation along the LoC is tense following a spurt in hostile activities from across the border over the past week, the officials said.This was the first ceasefire violation this year and a fourth cross-border incident in five days.

On Monday, a soldier was hit by a bullet from across the border while manning a forward post in the Kalal area of the Nowshera sector in Rajouri district while an Army patrol came under terrorist fire from a forest across the LoC in Rajouri's Keri sector on February 8. The terrorists were apparently waiting for an opportunity to sneak into the Indian side.

During the intervening night of February 4 and 5, a land mine explosion reportedly resulted in some casualties to terrorists attempting to infiltrate into the Indian side from across the LoC in the Krishna Ghati sector of Poonch district.

On February 10, General Officer Commanding of the Jammu-based White Knight Corps, Lieutenant General Navin Sachdeva, reviewed "hostile activities" along the LoC in Rajouri district.

"GOC White Knight Corps, along with GOC Ace of Spades and GOC Crossed Swords divisions, visited forward areas of the Rajouri sector for an operational update on the prevailing security situation and the hostile activities," the Army had said in a post on X.

The post, shared by the White Knight Corps on its official social media handles, said the corps commander complimented all ranks for their vigil and relentless operational focus.

He also urged them to remain prepared for all contingencies, the Army said.

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Safran selects TEAL for the production of LEAP engine turbine parts in India

Source: The Economic Times, Dt. 13 Feb 2025,
URL: https://economictimes.indiatimes.com/news/defence/safran-selects-teal-for-the-production-of-leap-engine-turbine-parts-in-india/articleshow/118208343.cms

Safran Aircraft Engines, a French engine manufacturer and Titan Engineering and Automation Limited have signed a contract at the Aero India for the production of parts for the Leading Edge Aviation Propulsion engine's low-pressure turbine. This first partnership between the two companies leverages TEAL's technological expertise and will enhance production capabilities for the LEAP in India. Production of the first parts will start in 2026.

This contract is part of the "Make in India" policy promoted by the Indian government to support the country's aerospace growth, Safran said in a release.

In this context, Safran Aircraft Engines is developing a complete industrial ecosystem in India backed by major Indian partners to support the ramp-up of Leading Edge Aviation Propulsion (LEAP) production as well as the M88 engine powering the Rafale, it said.

"We are proud to collaborate with Safran Aircraft Engines on this strategic project. This partnership reflects our expertise in the production of complex parts, and strengthens our position as a key player in the aerospace supply chain," Sridhar Neelakantan, CEO of TEAL said.

"We look forward to applying our know-how to the production of the LEAP engine and to contributing to its expansion in India," he said.

Dominique Dupuy, Purchasing VP at Safran Aircraft Engines said, "We are delighted by this new partnership with TEAL which marks an important step in our development in India and the setting up of local supply chains."

Safran Aircraft Engines said it is thus strengthening its footprint in India, a key market where the company already has five production sites in Hyderabad, Bengaluru and Goa. A sixth site dedicated to LEAP engine maintenance, repair and overhaul (MRO) activities will open in Hyderabad in 2025, the company added.

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Bharat Forge partners Liebherr-Aerospace & Transportation to set up aerospace plant in Pune

Source: The Economic Times, Dt. 13 Feb 2025,
URL: https://economictimes.indiatimes.com/news/defence/bharat-forge-partners-liebherr-aerospace-transportation-to-set-up-aerospace-plant-in-pune/articleshow/118207234.cms

Bharat Forge on Thursday said it has formed a strategic partnership with French firm Liebherr-Aerospace & Transportation SAS to establish an advanced aerospace manufacturing facility in

Pune to cater to the global industry demand. The proposed facility will feature a ring mill that incorporates advanced forging and machining technologies to produce high-precision components including landing gear components, and is planned to be operational within this year, Bharat Forge said.

"This collaboration with Liebherr is a testament to our shared commitment to innovation and excellence in aerospace manufacturing. Our investments in the ring mill and landing gear machining capabilities highlight our focus on delivering precision-engineered components and creating long-term value for the aerospace industry," said Guru Biswal, Aerospace CEO, Bharat Forge Ltd.

Liebherr-Aerospace & Transportation is one of the 13 product segments of the Liebherr Group and a first-tier provider of on-board solutions in the aerospace and transportation industry. Its aerospace product portfolio offered to civil and defense customers includes environmental control and thermal management systems, flight control and actuation systems, landing gears as well as on-board electronics.

"We have partnered with Bharat Forge in establishing this advanced facility. The integration of these technologies will enable us to meet the exacting standards of the aerospace sector while strengthening our supply chain capabilities," said Alex Vlielander, Chief Customer Officer at Liebherr-Aerospace & Transportation SAS.

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Aero India 2025: Cingularity Aerospace progresses X-61 ISR UAV

Source: Janes, Dt. 13 Feb 2025,
URL: https://www.janes.com/osint-insights/defence-news/air/aero-india-2025-cingularity-aerospace-progresses-x-61-isr-uav

Bangalore-based Cingularity Aerospace has revealed details about its new X-61 intelligence, surveillance, and reconnaissance (ISR) small unmanned aerial vehicle (UAV).Speaking to Janes at the Aero India 2025 show, Vishal Markanday, the CEO of Cingularity Aerospace, said the X-61 is being jointly developed by the company in partnership with the Indian Navy's Weapons and Electronics Systems Engineering Establishment (WESEE).

The X-61 features delta-wings, forward canards, and a vertical tail. The UAV has a fixed tricycle-type landing gear and is powered by Cingularity Aerospace's 550i, a 550 cc internal combustion piston engine. The UAV measures 2.9 m in length, 1.4 m in height, and has a wingspan of 2.4 m with an all-up weight of 51 kg.

It has a maximum operating range of 250 km and a service ceiling of 6,000 ft. The payload bay can be modified to accommodate role-specific payloads. During flight trials, the X-61 displayed a stable cruising speed of 38 m/s and a stall speed of 22 m/s.

The X-61 has a maximum operating range of 250 km

In its most recent test flights conducted on 16 January 2025 at the Aeronautical Test Range (ATR) in Chitradurga, Karnataka, the X-61 was tested for autonomous take-off and landing (ATOL) and return to launch (RTL).

According to Markanday, the first deck trials for the UAV are expected to be conducted at INS Hansa, a naval airbase in Goa, in collaboration with the Indian Navy's Naval Flight Test Squadron (NFTS).

Markanday said that Cingularity Aerospace is “building multiple iterations of the X-61”. He added that the “one undergoing flight trials right now is the smallest version”, with other versions increasing in weight to 110 kg.

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Aero India 2025: BDL, Rafael sign Ice Breaker agreement

Source: Janes, Dt. 13 Feb 2025,
URL: https://www.janes.com/osint-insights/defence-news/industry/aero-india-2025-bdl-rafael-sign-ice-breaker-agreement

India's Bharat Dynamics Limited (BDL) has signed a memorandum of understanding (MOU) with Rafael Advanced Defense Systems to support the production of the Israeli company's Ice Breaker stand-off air-to-surface missile in India.

Speaking at Aero India 2025 on 11 February, a Rafael official told Janes that through the MOU the companies aim to locally manufacture the Ice Breaker missile and offer it to the Indian Armed Forces.

On announcing the agreement, Rafael and BDL said in a statement that with the production of the Ice Breaker missile, “the Indian Armed Forces can readily benefit from a next-generation weapon system tailored to their unique operational needs”. The partnership emphasises local manufacturing and transfer of “critical technologies”, it added.

Guy Gishri, marketing manager and business development – Land & Naval Systems Division at Rafael, said that feasibility studies have confirmed the potential to integrate the Ice Breaker missile onto India's fixed- and rotary-wing platforms with only minor modifications.

A model of the Ice Breaker missile at the Aero India 2025 show. BDL and Rafael sign an MOU to locally produce and offer within India

The Ice Breaker missile is compatible with the outer mold of the Spice 1000 munition. Platforms that can carry the Spice 1000 can integrate the Ice Breaker with minor modifications to avionics and stores certification.

Fixed-wing platforms such as the Light Combat Aircraft (LCA) and MiG-29K can carry up to four missiles, while the Light Combat Helicopter (LCH) can carry a maximum of two missiles, Gishri added.

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Aero India 2025: Zen Technologies displays new RCWSs

Source: Janes, Dt. 13 Feb 2025,
URL: https://www.janes.com/osint-insights/defence-news/weapons/aero-india-2025-zen-technologies-displays-new-rcwss

Hyderabad-based Zen Technologies displayed new remote-controlled weapon stations (RCWSs) for armoured fighting vehicles (AFVs) at the Aero India 2025 show in Bangalore. The company showcased two variants. One RCWS, called Fanish, is armed with a 12.7 mm NSVT heavy machine gun (HMG), and the other, named Parashu, is armed with a 7.62 mm medium machine gun (MMG). According to Zen Technologies, Fanish is a tank-mounted RCWS. It has a cooled thermal camera and is integrated with Fiber Optic Gyro (FOG) stabilisation. The weapon has an elevation of -7º to 70º and a detection range of 14 km.

Zen Technologies' Parashu RCWS is seen displayed at Aero India 2025

Parashu is termed a lightweight RCWS, developed for light armoured vehicles and naval vessels, and can also operate as a static weapon station. The system's 7.62 mm MMG can be switched to a 5.56 mm light machine gun (LMG). The weapon has an elevation of -40º to 60º and a detection range of 14 km. The RCWS is equipped with an auto-tracking capability, enabling counter-unmanned aircraft system (C-UAS) operations.

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Aero India 2025: BEL secures IAF contract for stand-off glide munitions

Source: Janes, Dt. 14 Feb 2025,
URL: https://www.janes.com/osint-insights/defence-news/weapons/aero-india-2025-bel-secures-iaf-contract-for-stand-off-glide-munitions

India's Bharat Electronics Limited (BEL) has secured an order from the Indian Air Force (IAF) to supply an unspecified number of Khagantak-243 munitions, a 300 kg-class airborne stand-off precision-guided glide bomb, the company told Janes on 11 February.

Speaking at the Aero India 2025 show in Bangalore, a BEL official confirmed that the Khagantak-243 munition, which has been in development for more than a decade, is now complete and has recently secured a prototype and production contract. However, the value of the deal is undisclosed.

Preparations are under way for initial flight tests, set to begin in mid-2025, followed by series production. The Khagantak-243 is initially scheduled to be tested on the IAF's Su-30MKI fighter aircraft, with potential future tests on other platforms, including the MiG-29K.

BEL to supply Khagantak-243 stand-off glide munition to the IAF. A model showcased at Aero India 2025

The Khagantak-243 is a stand-off glide munition developed collaboratively by JSR Dynamics and BEL. JSR Dynamics provides the body and control systems, while BEL supplies all electronics and guidance subsystems.

The munition features a cylindrical body with swivel-type mid-body glide wings and five aft control surfaces, enabling a range of more than 140 km when launched from an altitude of 12,000 m. It is equipped with a Mk 81 general purpose blast-fragmentation warhead, containing 125 kg of explosive fill.

BEL signed a memorandum of understanding (MOU) with JSR Dynamics at Aero India 2019 for the development, production, and sales of weapons under the Indian government's ‘Make in India' initiative.

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India on Verge of Revolutionising Fighter Jet Modernisation Amid America’s F-35 and Russia’s Su-57 Offers

Source: Republic World, Dt. 14 Feb 2025,
URL: https://www.republicworld.com/defence/india-on-verge-of-revolutionising-fighter-jet-modernisation-amid-americas-f-35-and-russias-su-57-offers

India is advancing swiftly in its efforts to modernise fighter jets, with the United States proposing sales of its F-35 fighter jets, and Russia’s state-owned defence exports company discussing collaboration with India on the Su-57E, a Russian fifth-generation fighter aircraft. The ongoing Aero India 2025 event in Bengaluru has become a focal point for showcasing these state-of-the-art fifth-generation aircraft, offering a unique platform to assess and compare Eastern and Western technological capabilities.

The Su-57, featuring advanced avionics, supercruise capability, and stealth technology, debuted alongside the F-35 at Aero India 2025, underscoring India's pivotal role as a hub for global defence and aerospace collaboration. This event, billed as Asia's largest air show, celebrated its 15th edition at Air Force Station, Yelahanka in Bengaluru from February 10-14.

It represents a significant milestone in global defence cooperation and technological advancement, positioning India on the brink of revolutionising its fighter jet modernisation efforts. During a bilateral meeting with Prime Minister Narendra Modi at the White House, US President Donald Trump announced that the United States plans to enhance military sales to India from 2025 onwards, with the eventual provision of F-35 fighter jets.

Trump stated that this decision would enable India to join the exclusive group of nations equipped with advanced stealth aircraft. US President Donald Trump says, "Starting this year, we will be increasing military sales to India by many billions of dollars. We are also paving the way to ultimately provide India with the F35, Stealth fighters...".

Trump did not specify a timeline, but foreign military sales, especially for advanced technology such as the stealthy F-35 jet, usually require several years to finalise.

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Aero India 2025: German defence firm Hensoldt signs MoUs for indigenous production of radars, sensors

Source: The New Indian Express, Dt. 13 Feb 2025,
URL: https://www.newindianexpress.com/nation/2025/Feb/13/aero-india-2025-german-defence-firm-hensoldt-signs-mous-for-indigenous-production-of-radars-sensors

German defence electronics leader Hensoldt has reinforced its strategic commitment to India, signing two major agreements with Indian firms at Aero India 2025 for localised production of sensor and radar technology. This is among Berlin's initiatives to deepen defence cooperation with New Delhi. The MoUs were signed with Samtel Avionics and Raphe mPhibr amid a shift from direct sales to industrial partnerships, aligning with India's Make in India and Atmanirbhar Bharat goals. The German government holds a 25.1% stake in Hensoldt.

MoU with Samtel Avionics: Advancing indigenous avionics

Hensoldt's agreement with Samtel Avionics, a leading Indian defence manufacturer, will establish a co-production facility for airborne sensor solutions in India. The collaboration will focus on developing and manufacturing Cavi Sight, a visual landing aid and video-switching system for UAVs and helicopters that enables precise landings in complex environments.

Additionally, the agreement includes the production of Cavi Connect, a secure data exchange system linking airborne platforms with ground forces via LTE (4G), and LCR 100, a lightweight flight recorder integrating voice, data, and video acquisition.

MoU with Raphe mPhibr: Co-Developing MIMO radar

Hensoldt has also signed an MoU with Raphe mPhibr, producing Unmanned Aerial Vehicles (UAV), to co-develop an advanced landing aid radar based on Multiple-Input Multiple-Output (MIMO) technology. MIMO radar enhances situational awareness, improving navigation and precision landing for aerial platforms.

The system will be jointly developed in India, integrating Raphe's rapid R&D expertise with Hensoldt's advanced sensor capabilities. A second agreement with Raphe focuses on the localised production of Hensoldt's advanced sensor payloads, further strengthening India's defence electronics supply chain.

Germany's expanding role in India's defence industry

Hensoldt's expanded presence in India reflects a broader Indo-German defence shift, with Germany increasing its military-industrial cooperation in Asia. The 2024 India-Germany Defence Dialogue outlined joint projects in radar, electronic warfare and naval defence. For the first time, as TNIE reported in August 2024, Germany participated in Exercise Tarang Shakti 2024, an aerial exercise on Indian soil and its Eurofighter Typhoon carried out air manoeuvres.

The two countries have been seeking to strengthen bilateral defence ties. In an important step towards the construction of six conventional submarines, a joint bid of the Indian Mazagon Dockyard Limited (MDL) and Germany's TKMS (Thyssenkrupp Marine Systems) was accepted by the Indian Ministry of Defence in January.

In addition to the private sector, Hensoldt is also involved in manufacturing in India with defence public sector undertakings (DPSUs) such as Hindustan Aeronautics Limited (HAL), Bharat Electronics Limited (BEL), and the Defence Research and Development Organisation (DRDO).

Hensoldt describes itself as a leading company in the European defence industry with a global reach. "Based in Taufkirchen near Munich, the company develops sensor solutions for defence and security applications. As a system integrator, Hensoldt offers platform-independent, networked sensors. At the same time, the company is driving forward the development of defence electronics and optronics as a technology leader and investing in new solutions based on software-defined defence," says Hensoldt.

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Defence to energy, deepening of India-France ties amid geopolitical shifts

Source: The Indian Express, Dt. 14 Feb 2025,
URL: https://indianexpress.com/article/explained/explained-global/defence-to-energy-deepening-of-india-france-ties-amid-geopolitical-shifts-9835094/

Prime Minister Narendra Modi visited France from February 10 to 12 at the invitation of French President Emmanuel Macron. It was a very significant visit — this is why.

Trump factor, global shifts

The PM's visit had two key dimensions: the AI Action Summit which he co-chaired with President Macron, and consolidating India-France ties, which were elevated to the strategic partnership level in 1998. The two countries also reviewed the 'Horizon 2047' Roadmap agreed two years ago.

However, the next leg of the PM's trip, to the United States, also influenced the visit. While France and other European nations have spent months preparing to navigate the "Trump factor", the shocks already appear far greater than anticipated. US President Donald Trump's phone call with Russia's President Vladimir Putin has rattled European capitals that have strongly opposed the Russian invasion of Ukraine. Trump's action spotlights the inherent risks of Europe's strategic dependence on the US.

National identity and strategic independence are at the heart of French foreign policy. The Russian aggression against Ukraine, however, pushed such ideas to the background. Finland and Sweden joined the North Atlantic Treaty Organisation (NATO) following the invasion of Ukraine. But with Trump in the White House, EU nations may be forced to reassess their strategic autonomy and defence preparedness.

French views have traditionally converged with the Indian preference for a multipolar world, making India a reliable partner for France. Additionally, the two countries share a strong commitment to addressing climate change. With Trump having announced the withdrawal of the US from the Paris Agreement, France could look to India for even closer collaboration in this area.

Defence and connectivity

Unlike commercial exchanges, defence ties between countries carry a political dimension, and reflect an understanding of their respective geopolitical landscapes. Over the years, alongside Russia, France has been a key and reliable source of defence equipment for India. Such supplies also provide the exporting country with a degree of political leverage and directly impact the importing nation's defence preparedness.

For New Delhi, trust also stems from the fact that France was among the few Western nations that refrained from imposing sanctions on India following the Pokhran-II nuclear tests of 1998. Since then, the two countries have collaborated closely at nearly all multilateral forums, including the UN Security Council. There has also been convergence in security and economic interests in the Indo-Pacific.

According to the Stockholm International Peace Research Institute, France was among the top three global arms exporters between 2019 and 2023. Following the Ukraine war, France also figured in the list of the top three destinations for Indian defence exports in 2023-24. Last year, India and France also agreed on a Defence Industrial Roadmap to deepen cooperation. The Scorpene submarine project, additional purchases of Rafale jets and helicopters, as well as efforts toward indigenous production are ongoing under this framework. The indigenisation process is crucial for India's defence modernisation and diversification of supplies. India has offered France the Defence Research and Development Organisation's Pinaka multi-barrel rocket launcher during this visit.

According to the joint statement, the two leaders agreed to work together more closely on implementing the India-Middle East-Europe Economic Corridor that was first discussed on the

sidelines of the G20 Summit in New Delhi in 2023. It has been planned to include an Eastern Corridor connecting India to the Gulf region, and a Northern Corridor connecting the Gulf region to Europe. It will comprise a railway, a ship-rail transit network, and supplementing road transport routes.

The IMEC aims to provide India with an alternative route to Europe. Despite the challenging security situation in the Middle East, several European nations are eager to position themselves as key connectors. During the visit, France proposed Marseille, located on the Mediterranean Sea, as a strategic hub for the project. Though multimodal transport corridors face greater logistical challenges than direct shipping routes, prevailing geopolitical uncertainties mean that India and most European nations will likely continue favouring multiple connectivity options, making IMEC an attractive option.

Nuclear energy, roadblocks

France is a pioneer in civil nuclear energy, with around 70% of its electricity being derived from nuclear power. Both leaders stressed that nuclear energy is an “essential part of the energy mix” to enhance energy security and transition towards a low-carbon economy. France has offered to build nuclear power reactors in Jaitapur, Maharashtra. However, these projects have faced challenges such as high costs and unresolved technical and legal issues. Under India’s Civil Liability for Nuclear Damages Act, 2010, a mechanism was laid down for compensating victims for damage caused by a potential nuclear accident, and ascertaining liability. Foreign players have cited this as a roadblock to their entry.

With the Indian government now planning amendments to both the 2010 Act and the Atomic Energy Act, 1962, the interest among French nuclear power companies could be renewed. However, the focus is now shifting to Small Modular Reactor (SMR) and Advanced Modular Reactor (AMR) technologies. These smaller reactors have important advantages, requiring lesser physical space and lower capital investment. In the Union Budget presented on February 1, a Nuclear Energy Mission worth Rs 20,000 crore was announced for the research and development of SMRs. India and France have signed a letter of intent over cooperation on AMRs and SMRs during the visit.

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अमेरिका में पीएम मोदी कौन सी डील करने वाले हैं? तीन 'हथियारों' की खबर से ही पाकिस्तान में खलबली

Source: Zee News, Dt. 13 Feb 2025,
URL: https://zeenews.india.com/hindi/world/pm-modi-donald-trump-defense-deal-striker-fighter-jet-engine/2644146

रधानमंत्री नरेंद्र मोदी अमेरिका दौरे पर हैं. वे अमेरिकी राष्ट्रपति डोनाल्ड ट्रंप से मिलेंगे. इसी बीच पीएम की अमेरिका यात्रा को लेकर कई अहम रक्षा सौदों की चर्चा जोरों पर है. मोदी और अमेरिकी राष्ट्रपति डोनाल्ड ट्रंप की मुलाकात के दौरान भारत और अमेरिका के बीच महत्वपूर्ण रक्षा समझौतों पर हस्ताक्षर हो सकते हैं.

इस यात्रा के दौरान भारत और अमेरिका के बीच स्ट्राइकर कॉम्बैट व्हीकल और फाइटर जेट इंजन के सह–उत्पादन को लेकर बड़ी डील हो सकती है. इसके अलावा भारत अमेरिका से माउंटेड एंटी–टैंक गाइडेड मिसाइल सिस्टम और सैकड़ों स्ट्राइकर व्हीकल्स खरीदने की योजना भी बना रहा है. इन सौदों को लेकर पाकिस्तान में भी खलबली मच गई है. एक्सपर्ट्स का मानना है कि ये समझौते भारत की सैन्य ताकत को और मजबूत करेंगे.

ट्रंप ने पहले ही संकेत दिए थे..

असल में भारत और अमेरिका के बीच रक्षा क्षेत्र में सहयोग लगातार बढ़ता जा रहा है. अमेरिकी राष्ट्रपति ट्रंप ने पहले ही संकेत दिए थे कि भारत अमेरिका से और अधिक सैन्य उपकरण खरीदेगा. इसी कड़ी में भारत ने इंफेंट्री कॉम्बैट व्हीकल स्ट्राइकर के सह–उत्पादन में रुचि व्यक्त की है. बताया जा रहा है कि भारतीय सेना ने उच्च–ऊंचाई वाले क्षेत्रों में स्ट्राइकर व्हीकल का परीक्षण किया है और अब इस पर आगे की बातचीत हो रही है.

इसके अलावा भारत में जनरल इलेक्ट्रिक एफ–414 जेट इंजन के लाइसेंस निर्माण के सौदे पर भी चर्चा होगी. भारत के लाइट कॉम्बैट एयरक्राफ्ट (LCA) एमके1 ए के लिए एफ–404 इंजन की डिलीवरी में देरी को लेकर भी दोनों देशों के बीच बातचीत होने की उम्मीद है.

रक्षा उत्पादन में सहयोग बढ़ाने के लिए..

मीडिया रिपोर्ट्स के मुताबिक लंबे समय से भारत और अमेरिका के बीच रक्षा उत्पादन में सहयोग बढ़ाने के लिए कई उच्च स्तरीय बैठकें हो रही हैं. सूत्रों की मानें तो भारतीय सरकार की स्वामित्व वाली हिंदुस्तान एयरोनॉटिक्स लिमिटेड (HAL) के अधिकारी जल्द ही अमेरिकी अधिकारियों और जनरल इलेक्ट्रिक की एयरोस्पेस यूनिट के साथ बैठक करेंगे.

इस बैठक में GE–414 इंजन की निर्माण प्रक्रिया को मार्च तक फाइनल करने पर चर्चा होगी. वहीं स्ट्राइकर व्हीकल्स के सह–उत्पादन को लेकर भारत और अमेरिका के बीच पहले से बातचीत चल रही है और इस यात्रा के दौरान इस पर भी महत्वपूर्ण निर्णय लिए जा सकते हैं.

भारत की रक्षा तैयारियों को मजबूती..

एक अन्य रिपोर्ट के मुताबिक रक्षा उत्पादन सचिव संजीव कुमार ने भी इस मामले में प्रतिक्रिया देते हुए कहा कि भारत अमेरिका के साथ जो लेन–देन करना चाहता है उस पर तेजी से काम कर रहा है. हालांकि उन्होंने इससे ज्यादा जानकारी साझा नहीं की. विशेषज्ञों का मानना है कि इन सौदों से भारत की रक्षा तैयारियों को मजबूती मिलेगी और यह क्षेत्रीय सुरक्षा संतुलन में अहम भूमिका निभाएगा.

उधर अमेरिका के साथ भारत के बढ़ते व्यापारिक संबंधों का असर केवल रक्षा क्षेत्र तक सीमित नहीं है. दोनों देशों के बीच एक बड़े व्यापार समझौते की संभावना भी जताई जा रही है. अमेरिका और भारत के बीच 2024 में द्विपक्षीय व्यापार 129.2 बिलियन डॉलर तक पहुंच चुका है.

हालांकि ट्रंप प्रशासन की व्यापार नीतियों और टैरिफ को लेकर अस्थिरता बनी हुई है जिससे वार्ता जटिल हो सकती है. विशेषज्ञों का मानना है कि दोनों देश एक बड़े व्यापार समझौते पर सहमत हो सकते हैं.

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Diwar: The wall that IAF's built to counter drones

Source: The Times of India, Dt. 13 Feb 2025,
URL: https://timesofindia.indiatimes.com/city/bengaluru/diwar-the-wall-that-iafs-built-to-counter-drones/articleshow/118220283.cms

The Indian Air Force (IAF) has developed an innovative defence system to counter drone threats at vital military establishments across the country. The system, dubbed 'Diwar', functions as a drone interception wall and repulsion mechanism, designed to disrupt drone connections within a 500-metre radius of defence establishments.

During a demonstration at Aero India, project director Group Captain KDA Rajesh told TOI: "It will act as a virtual wall to protect critical areas within the establishment. The system prevents unauthorised drones from entering designated areas. Our in-house testing has demonstrated its effectiveness against various drone types."

The IAF has already deployed Diwar at several locations, including the Maintenance Command headquarters in Nagpur. "We have received enquiries from the Western Air Command, and implementation is under way," Rajesh said. He noted that air bases currently lack dedicated drone countermeasures, adding, "This threat became imminent in recent years."

The system operates by jamming frequency bands to disrupt drone communication systems. "It can be fitted to existing pole structures or perimeter walls of defence establishments and operated remotely," he added.

For effective coverage of one air base, approximately 15 units are required. The system, priced at Rs 65,000, has garnered international attention, with the Nigerian defence force expressing interest during their visit. The development comes amid increasing drone-related security concerns. "We have observed regular drone incidents in the Northern border regions, including an attack on the Jammu air base. Diwar can serve a crucial role for operational units," Rajesh said.

"Having proven its operational efficacy, we are now focusing on scaling up to cover greater aerial distances," he added.

Separately, the IAF's 11 Base Repair Depot has developed the Z1 Tester, a system for analysing weapon release mechanisms on Sukhoi aircraft. This indigenous development replaces previously imported Russian equipment, offering a cost-effective solution for Sukhoi fighter squadrons.

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Indian Navy shows off its air power at Aero India

Source: The New Indian Express, Dt. 14 Feb 2025,
URL: https://www.newindianexpress.com/states/karnataka/2025/Feb/14/indian-navy-shows-off-its-air-power-at-aero-india

While Aero India 2025 is hosting a range of aircraft from different countries, and the Indian Air Force is bedazzling spectators on the ground at Yelahanka Air Force Station, with breathtaking

aerial displays, the Naval Air Arm is offering a rare peek into its air power that supports the Indian Navy in protecting the country's vast coastline and beyond.

A MiG-29K fighter jet, with its wings folded, on static display at Aero India 2025 at Yelahanka Air Force Station in Bengaluru

The Naval Air Arm is the aviation branch and a combat arm of the Indian Navy, tasked with providing aircraft carrier-based strike capability, fleet air defence, maritime reconnaissance, and anti-submarine warfare. The blue-water Indian Navy operates significantly in the Persian Gulf Region, the Horn of Africa, the Strait of Malacca, and routinely conducts anti-piracy operations and partners with other navies, along with joint exercises, ably supported by its fleet of fixed-wing aircraft and helicopters.

Accordingly, at Aero India, the Navy has put on static display, a considerable chunk of its aircraft. The Kamov KM-31, a Russian-origin all-weather, day-night, deck operation-capable helicopter, is known for its contra rotating-blades with no tail rotor.

Its primary role involves air early warning, and fleet air defence of the Navy's fleet at sea. Another all-weather helicopter, with multi-role functions, including anti-surface and anti-submarine warfare, search and rescue, is the Sea King 42B, sharing space with the newer US-origin MH-60 R Seahawk, a helicopter carrying out a variety of operations at sea.

It is equipped with "... multi-spectral targeting system, multi-mode radar, integrated self-defence (chaff and flares)... for air superiority, fleet air defence, anti-ship strike, and land attack", a factsheet read. For these purposes, the Seahawk can be armed with Mk 54 torpedoes, hellfire missiles, Advanced Precision Kill Weapon System (APKWS), cabin-mounted gun, and depth charges.

Representing the Navy's fixed-wing inventory, is its workhorse -- the carrier-borne interceptor, MiG-29K -- operating from both INS Vikrant and INS Vikramaditya. Unlike its sibling MiG-29, the MiG-29K is specially adapted for carrier-based missions, and is composed of folding wings, an arrestor hook, and catapult attachments.

The Navy has also displayed the Light Combat Aircraft (Navy) in the exhibition area. “The aircraft is designed by ADA and manufactured by HAL. Successful landing of the LCA (Navy) onboard INS Vikrant has propelled India into the league of a few nations with the capability of designing, developing, testing and manufacturing a deck-borne fighter aircraft,” a statement said.

“The idea behind the static display is to showcase the Indian Navy’s air combat capabilities and strengths,” a Naval ground staffer deployed at Aero India told TNIE.

Today, the Naval Air Arm is composed of around 300 aircraft, which also include helicopters HAL Dhruv, Kamov Ka-27, and HAL Chetak; maritime patrol aircraft Boeing P-8I and Dornier 228; trainers and UAVs. In future, the Navy plans to induct technologically-advanced aircraft platforms, in a bid to operate an Atmanirbhar fleet.

“Enhancing operational capabilities of Naval aviation through modernisation of platforms, acquisition of advanced aircraft, and incorporation of cutting-edge technology, including unmanned systems through indigenous means, is the focus area for the next two decades,” said a report from the Indian Navy. In that context, the future would see more deck-based fighters, maritime-reconnaissance aircraft, carrier-borne airborne early warning and control (AEW&C) aircraft, air-to-air refuellers (AAR), helicopters, and even amphibious aircraft protecting our seas.

Look...! A plane...!

The static display at Aero India 2025 has more surprises for the military and aviation enthusiasts alike. The massive presence of Airbus A330 MRTT, the aerial refuelling and military transport aircraft based on the civilian A330; Airbus A400M Atlas, the four-engine turboprop military transporter; Embraer C-390 Millennium, the medium-size, twin-engine, jet-powered military transporter; and Lockheed Martin C-130J Super Hercules tactical transport aircraft dominate the tarmac from a distance.

And then, there is the more recently-inducted C-295 MW medium-lift transporter, EMB-145 (AEW&C), Mi-17 V5 helicopter gunship, and Jaguar ground attack jet, with Darin-III avionics, all depicting the scale of IAF’s air power. Russia’s Sukhoi Su-57 sharing space with the US’ Lockheed Martin F-35 Lightning II, along with a couple of F-16s, is another highlight. In the sky, catching the chance flyby of a Boeing KC-135 Stratotanker and Rockwell B-1 Lancer adds to the excitement.

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Indian Army must adopt subterranean warfare to counter China. Learn from military history

-by Lt Gen H S Panag (retd)

Source: The Print, Dt. 14 Feb 2025,
URL: https://theprint.in/opinion/indian-army-adopt-underground-warfare-counter-china-learn-israel-hamas-war/2491538/

On 30 January, the UK’s Financial Times reported that China is building the world’s largest military command centre in Beijing. Spanning 1,500 acres—at least 10 times the size of the

Pentagon—the underground complex is designed to protect China's military leadership, including President Xi Jinping, who also chairs the Central Military Commission, during conflicts, including nuclear war.

The command centre is in tune with the People's Liberation Army's (PLA) doctrine of subterranean warfare, which prioritises underground protection for vital command, operational, and logistical installations. It goes without saying that these installations will also be protected with anti aircraft, missile, drone, electronic warfare and cyber warfare shields.

The hostage-prisoner exchange following the 15 January ceasefire agreement between Israel and Hamas once again highlighted the advantages of subterranean warfare against a technologically superior adversary. Israel, with its unlimited supply of precision-guided munitions (PGMs) and conventional munitions delivered by aircraft, missiles, drones and ground operations, could not destroy or defeat the Hamas fighting from its network of underground tunnels. In footage from the exchanges, substantial number of Hamas fighters dressed in immaculate battle gear were seen orchestrating (for propaganda purposes) the handover of small groups of hostages to the international Red Cross.

Defence analysts have assessed that from October 2023 to October 2024, Israel dropped 85,000 tonnes of bombs on Gaza. More than the combined explosive power of the two atomic bombs – 36-kilo tonne – dropped on Hiroshima and Nagasaki, and the devastating bombing of Dresden in World War II. Yet, as evident from videos, a large number of Hamas fighters not only survived but also managed to keep most hostages alive within Gaza's vast subterranean tunnel network. I predicted this outcome in my article dated 2 November 2023.

The Indian Army should adopt subterranean (underground) warfare in mountainous and high-altitude terrain to neutralise the PLA's overwhelming superiority in aircraft, missile and drone-delivered PGMs.

PGMs dominate the transparent battlefield

Over the past 25 years, battlefield has become increasingly transparent. Satellite, aircraft, drone, and radar-based surveillance and reconnaissance, combined with electromagnetic and cyber interception, can pinpoint all targets on the battlefield. These targets are then hit with over 90 per cent accuracy by air – and ground-based PGMs. In addition, electronic and cyber jamming neutralises the command and control systems, fire control means, and guided munitions. The US has successfully used strategic drone warfare to locate and target adversary and terrorist leaderships in Pakistan, Yemen, Iraq, Afghanistan, Somalia, and Syria.

The ongoing Russia-Ukraine war and the Israel-Hamas/Hezbollah/Iran conflicts are a good example of the modern technological battlefield. However, the issue is relative, as active and passive countermeasures are available to counter the various threats.

Advanced militaries, such as those of the US and Israel, rely predominantly on anti aircraft, missile and drone defence, as well as anti-electronic and cyber warfare shields, in combination with passive measures. In contrast, relatively weaker militaries and non-state actors use subterranean protection, dispersion, and mobility alongside their limited active defence measures. Ukraine is a

good example of this approach, while Hamas is the best example of complete reliance on subterranean protection.

Despite China rapidly advancing its active countermeasures to rival those of the US, it continues to utilise subterranean protection as a force multiplier—similar to weaker forces but on a far larger strategic scale.

A case for adoption of subterranean warfare

The military differential between India and China is predominantly in the domains of electronic and cyber warfare, and in the quality and quantity of aircraft and ground-launched PGMs. While nuclear weapons safeguard India from a decisive defeat or substantial loss of territory, in a limited war or in operations below this threshold, such a differential can prove to be decisive.

Standoff aircraft or ground-launched PGMs and drone strikes, as well as electronic and cyber attacks can be utilised to destroy our defences, along with command and control and logistics installations, without the adversary having to resort to physical attacks. Currently, India's anti-aircraft/missile/drone and electronic/cyber warfare retaliatory capacity against standoff attacks, in terms of both quantity and quality, is at least a decade behind China.

Our mountainous and high-altitude area defences are designed to withstand the suppressive fire from small arms and non-PGM artillery and air attacks. The effectiveness of unguided firepower is further reduced due to reverse slope defences, problems of crest clearance, and ever-changing meteorological data. A company defended locality has approximately 50 bunkers. In the Kargil War, 5,000 to 10,000 rounds of artillery were used for one company defended locality along with some first generation aircraft delivered PGMs. Yet in almost all cases, the enemy survived to fight at close quarters. Defences in mountains and high-altitude areas on dominating heights can withstand conventional firepower, and the defender has a distinct advantage over the attacker, who is exposed and forced to attack uphill in a rarefied atmosphere.

Each bunker or pillbox is a dug out four to five feet deep with RCC walls or reinforced with steel sheets, with loopholes for firing about one foot above the ground. The roof is either made using RCC or troughed steel sheets supported by metal girders, or wood poles. Three feet of earth is then piled up on top to absorb the blast effect. The design of these defences, which stand out like sore thumbs on hill tops devoid of tree cover or vegetation, has largely remained unchanged for over a century.

The PLA will neutralise the 'predominance of the defence' in high-altitude terrain by not getting involved in "close combat" over unfavourable terrain. Classic close combat is passé. Its pattern of attack will be driven by the overwhelming use of PGMs, drones, and cyber/electronic warfare. Once the defences are destroyed, close combat will only be in the nature of mopping up. Standalone destruction of posts and logistical installations may also be undertaken as punitive measures without resorting to physical attacks. Headquarters and logistics installations in the open are also sitting ducks for PGMs. The only way to protect permanent defences and installations is to adopt subterranean warfare or in simpler words tunnel warfare.

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Aero India: Already making in India: US firm Lockheed Martin

Source: The Tribune, Dt. 14 Feb 2025,
URL: https://www.tribuneindia.com/news/india/aero-india-already-making-in-india-us-firm-lockheed-martin/

William Blair, Regional Chief Executive for India and Asia at Lockheed Martin, told The Tribune that the company is actively participating in global tenders to manufacture 114 fighter jets and 80 transport aircraft for the Indian Air Force (IAF), with a significant portion of components sourced from Indian vendors.

The 114-jet programme is distinct from existing orders placed by the Ministry of Defence with Hindustan Aeronautics Limited (HAL).

Addressing Lockheed Martin's plans for fighter jet production in India, Blair highlighted the company's existing operations.

"We already 'Make in India.' The wings of the F-16, which belongs to the same family as the F-21, are being manufactured at the Tata-Lockheed Martin facility in Hyderabad," he said. Lockheed Martin has offered the F-21 jet to India as part of its bid for the 114-fighter tender.

On the company's offer of the C-130J Medium Transport Aircraft for the IAF, Blair pointed out that Lockheed Martin is already producing empennages (tail sections) for the aircraft in India for global supply. He also revealed that a maintenance, repair and overhaul (MRO) facility for the C-130J is being set up in Bengaluru.

"When you look at the requirement for 80 transport planes, we are committed to leaning into this opportunity and producing in India," he added.

Lockheed Martin, which sold the first batch of C-130J aircraft to the IAF more than a decade ago, is now competing with Airbus and Brazilian manufacturer Embraer for the new 80-plane tender.

On the subject of Javelin anti-tank missiles, Blair noted that Lockheed Martin had successfully demonstrated the missile's capabilities in high-altitude regions. "We are collaborating with Bharat Dynamics Limited and working on a comprehensive supply chain in India to meet the 'Make in India' requirements," he said.

When asked whether Lockheed Martin's F-35 fifth-generation stealth fighter would be offered to India, Blair deferred the decision to policymakers. "That is for the government to discuss. We are supporting a tremendous international programme across the world," he said.

The F-35 and Russia's Sukhoi Su-57, both cutting-edge fifth-generation fighter jets, have been among the star attractions at Aero India, drawing significant attention from defence officials and aviation enthusiasts alike.

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Rafale-M deal to be inked in couple of months, delivery to start after four years

Source: The Hindu, Dt. 13 Feb 2025,
URL: https://www.thehindu.com/news/national/rafale-m-deal-to-be-inked-in-couple-of-months-delivery-to-start-after-four-years/article69216330.ece

Deliveries of the Rafale-M for the Indian Navy would begin in four years once the contract is signed, which is set to be done in the next couple of months when the French Defence Minister visits India, according to official sources. This also means that in 2029 the Indian Navy would begin receiving both the Rafale-M jets and also the MQ-9B armed high altitude long endurance Unmanned Aerial Vehicles (UAV) contracted from the U.S. last year.

The deal is wrapped up in all manners and is now a matter of when it is signed, a source in the know said. Deliveries will begin 48 months from contract date and will be completed in two years from that, sources added.

The Navy is keen that the deal be inked in this financial year ending March 31. To this sources said that this is a government-to-government deal and funds can be blocked even if the deal is signed in April.The dates for the French Minister's visit are still not finalised, either in March or April, sources added.

There are two mega-defence deals in the pipeline between India and France, the Rafael-M jets manufactured by Dassault Aviation and three additional Scorpene-class conventional submarines by Naval Group, together worth over $10 billion.

In December, in response to a question from The Hindu at the annual press conference Navy Chief Admiral Dinesh K. Tripathi stated that both the deals are in the final steps and one step short of clearance from Cabinet Committee on Security. "It is just matter of completing the formalities of the acquisition process and we expect that if not this month, next month, hopefully, this [Scorpène submarines] and Rafale-M deals should be signed," he had stated.

On July 13, 2023, as Prime Minister Narendra Modi was enroute to Paris, the Defence Acquisition Council (DAC) chaired by Defence Minister Rajnath Singh accorded Acceptance of Necessity (AoN) for the procurement of 26 Rafale-M fighters and three additional Scorpene-class diesel-electric submarines. The 26 Rafale deal includes 22 single seater Rafale-M and four twin-seater Rafale trainers (which are not carrier compatible). The 26 jets are meant to fill the gap in numbers till the under development indigenous Twin Engine Deck-Based Fighter (TEDBF) is inducted into service. The Navy currently operates two aircraft carriers - INS Vikramaditya procured from Russia and the indigenously built INS Vikrant which was commissioned in September 2022 both of which operate the MIG-29K jets in service.

Last October, India signed a nearly $3.5 billion contract for 31 MQ-9B - 15 Sea Guardians for the Indian Navy and 16 Sky Guardians, eight each for the Army and Air Force - under the Foreign Military Sales (FMS) programme of the US Government. The French Defence Minister is scheduled to visit India in the next two months when the deal is expected to be signed.

The joint statement issued after Mr. Modi and French President Emmanuel Macron two days back said that the two leaders discussed ongoing discussions in missiles, helicopter and jet engines, with French company Safran, collaborating with Indian Hindustan Aeronautics Limited to develop engines for next-generation copters and jets.

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Rajnath Singh holds series of bilateral meets on Aero India sidelines

Source: The Times of India, Dt. 14 Feb 2025,
URL: https://timesofindia.indiatimes.com/india/rajnath-singh-holds-series-of-bilateral-meets-on-aero-india-sidelines/articleshow/118226236.cms

Defence minister Rajnath Singh held a series of bilateral meetings with defence ministers of Tanzania, Zambia, Algeria, Zimbabwe, Yemen, Ethiopia, Gambia, and Gabon during the first three days of Aero India 2025, aside from holding the defence ministers' conclave.

Zimbabwe defence minister Oppah Muchinguri Kashiri and Singh reviewed existing bilateral defence cooperation and discussed avenues for further collaboration in areas such as military training, courses, and capacity building for the Zimbabwean armed forces. They signed an MoU on defence cooperation, expressing confidence that it would strengthen ties.

During his meeting with Ethiopia's defence minister, Aisha Mohammed, both sides expressed satisfaction with the growing bilateral relations.The leaders signed an MoU to formalise the ongoing collaboration, with a focus on military training, peacekeeping, and capacity building for the Ethiopian Armed Forces.

They also discussed ways to enhance cooperation in defence industry initiatives, particularly India's emerging private sector, while Singh's talks with Yemen defence minister, Lt Gen Mohsen Mohammed Hussein Al Daeri, saw discussions furthering defence engagements, particularly in military training, courses, and capacity building.

'Nothing Less Than Best'

In a declaration that signals India's rise in global defence manufacturing, Singh announced at the valedictory that the country is "going through a revolutionary phase of transformation" towards becoming a world leader in defence innovation and aerospace technology.

"Nothing less than the best can be allowed when it comes to national security," Singh said, underscoring the nation's commitment to excellence in defence manufacturing. From importing nearly 70% of its defence equipment a decade ago, India now manufactures the same percentage domestically - a seismic shift that has caught global attention, Singh said.

His call for private industry to "take a lead in the defence manufacturing sector" signals a new chapter in India's defence industrialisation, supported by policy reforms and initiatives such as Innovations for Defence Excellence and the Technology Development Fund.

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Why Indonesia is holding up Brahmos deal

-by Maj Gen Ashok K Mehta (retd)

Source: The Tribune, Dt. 14 Feb 2025,
URL: https://www.tribuneindia.com/news/comment/why-indonesia-is-holding-up-brahmos-deal/

The President of Indonesia, Probowo Subianto, seems quick to strike but afraid to wound. This repudiates his derring-do image as the special forces commando who rose to be a General and married former President Suharto's daughter. But prevarication has trumped patience in clinching the long-awaited deal on the Indo-Russian Brahmos missile.

In the 55-para joint statement after his state visit to India as the Chief Guest of the 76th Republic Day, the word Brahmos was conspicuously missing. Also, during the briefing by MEA officials, questions by journalists on Brahmos were sidestepped.

But PM Narendra Modi introduced the CEO of Brahmos, Jaiteerth Joshi, to Subianto and a presentation on the $450-million Brahmos system was also made. Neither the Sabang port project in Indonesia nor the Aceh-Andamans connect has crystallised. Come to think of it, despite all the pomp and panoply accompanying the visit, there was no spectacular agreement, either economic or strategic.

In contrast, after becoming President last year, Subianto's first visit was to China, where deals worth $10.6 billion were realised even as Jakarta maintains an ambiguous policy towards it.

The Indonesian archipelago occupies strategic geography in the Indo-Pacific, especially the South China Sea stretching east to west 5,150 km with 1,780 islands. It enjoys commanding heights along with littoral states Malaysia and Singapore in conducting the collective Malacca Strait patrol — a passage critical for China. And, in case it is blocked, Jakarta enjoys exclusive rights to alternative routes along the Sunda and Lombok Straits.

Although it has expressed neutrality in South China Sea disputes and made no claims there, China has clashed with it over the Natuna Islands in its EEZ (exclusive economic zone), which overlaps the Chinese nine-dash line.

In 2020, it was Defence Minister Subianto who prevented Chinese incursions in the Natuna island. So, the MoU on joint development in disputed waters of the South China Sea around Natuna was both surprising and risky, though later, Jakarta clarified that the MoU did not amount to recognition of the Chinese maritime claims.

This is where the famed Brahmos missile comes in. In 2023, the Philippines was the first and, so far, the only country to buy Brahmos. It is deployed in Luzon, facing the Filipino Sea, to deter Chinese vessels from entering it.

The US Typhon missile system has terrified the Chinese Coast Guard and fishing vessels though the Chinese Coast Guard ships have seriously jittered the movement of Philippines naval and fishing vessels from resupplying its disputed Scarborough shoal in its EEZ, which China claims

falls within its nine-dash line. Last month, Manila said it would dismantle the US Typhon missile system if China stopped its bullying tactics in its waters.

Before Subianto's arrival in India, huge excitement prevailed over the Brahmos deal. Reuters had reported that Jakarta had decided to sign the Brahmos deal. Jakarta said it was thinking 'positively', while most Indian newspapers reported categorically that Brahmos was a done deal.

The Indian optimism was not misplaced. In December 2024, the Navy Chief, Admiral Dinesh Tripathi, had visited Indonesia and Brahmos was widely discussed. In January, the Indonesian Navy Chief, Adm Muhammad Ali, was in Delhi and Brahmos topped the agenda of defence issues. He toured various Brahmos production facilities, raising expectations.

Subianto is known to be a hands-on foreign and security policy President. He believes military strength is integral to national security and economic prosperity. In 2021, as Defence Minister, he had obtained $10.6 billion for defence, with focus on navy modernisation. He secured another $46.6 billion for modernisation in the 2024-29 period, when the defence budget rose from 0.7 to 1.5 per cent of the GDP.

So, Jakarta, which runs a trade surplus with India is not short on funds and Delhi is ready to provide a letter of credit (LOC) for it.

Jakarta has no enemies, internal or external, though, at one time, Australia used to fear it. In the 1965 war, Indonesia supported Pakistan and was its staunch partner in the Organisation of Islamic Cooperation (OIC) on Kashmir. In 1987, when India was spending nearly 3.5 per cent GDP on defence and was considering reviving a World War II airbase in the Andamans near Indira Point, which is just 90 nautical miles from Indonesia, it protested strongly.

But, it is bonhomie now. So, what is holding back Subianto from acquiring the Brahmos? The will is there, but a way has not been found to overcome the bureaucratic hurdles.

The fear of annoying China and the reluctance to become a countervailing force (to China) in Asean is evident. Although China has laid claim in the Natuna Sea, Indonesia does not want to antagonise Beijing as it receives plentiful economic assistance and waits patiently for the Chinese code of conduct in the South China Sea. Like India, it is non-aligned (its constitution bars military alliance) and covets its strategic autonomy.

A second problem is the equipment acquisition process which is more complicated than India's Defence Procurement Procedure 2020. The bureaucracy is the bane. Circumventing it is not easy, not even for Subianto.

Third is the question of agents, who are a normal in Indonesia but banned in India following defence scandals two decades ago.

Fourth, Jakarta is unfamiliar with the use of the LOC and is loath to provide sovereign guarantees. It prefers commercial loans, like the ones Chinese provide.

Lastly, it fears attracting CAATSA (the Countering America's Adversaries Through Sanctions Act) ever more, now that Trump is back. Sources in the Indian Embassy in Jakarta say hesitation in decision-making has not diminished.

But Admiral Tripathi seems convinced that sooner than later, the Brahmos deal will be done. For the present, an Indonesian naval officer will be posted at the Maritime Information Fusion Centre in Gurugram.

After 15 years of coordinated patrolling in the Andaman Sea, will Subianto invite India to join the strategic trilateral Indonesia-Malaysia-Singapore Malacca Strait patrol, while it keeps Brahmos pending?

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Science & Technology News

Controlling transport of particles near absolute zero temperature, key ingredients for designing smart materials

Source: Press Information Bureau, Dt. 13 Feb 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2102761

Researchers have observed the distinct transport properties of ultra-cold atoms in a quantum system and studied their behaviour upon sudden exposure to light pulse. This understanding holds potential towards the design and development of smart & high conducting materials, including components for the next-generation batteries. Cold atoms, or atoms that have been cooled to extremely low temperatures near to absolute zero, are excellent candidates for performing precision measurements. Quantum transport includes the study of the charge and energy flow within systems where quantum effects dominate. Relevant phenomena include quantum tunneling that is vital in flash memory devices; quantized conductance which is critical for designing nanoscale electronic devices and quantum point contacts.

In a classical charge transport, as in case of present-day batteries, it is a straightforward flow of electrons. What distinguishes quantum charge transport from classical charge transport is that the former directly incorporates quantum statistical principles. That is why, the understanding of the transport and diffusion properties of these trapped ultra-cold atoms, when they are subjected to externally-controlled laser tuning, is vital. In order to conduct the experiment, the atoms have to be trapped, else they will wander off according to their kinetic energy. Furthermore, it could potentially help in designing smart materials that are efficient, customisable and ones that offer high conductivity.

A team from the Raman Research Institute, an autonomous institute funded by the Department of Science and Technology (DST), Government of India, attempted to decode the quantum transport properties of neutral potassium atoms at ultra-low temperatures. The experiment was performed in two separate sequences and two different settings with the 3D trapping beams kept switched on throughout the experiment. In the first setting, laser-cooled potassium atoms, confined within a Magneto-Optical Trap (MOT), were exposed only to a driving laser beam. The MOT uses laser cooling and a spatially varying magnetic field to trap and cool neutral atoms to extremely low

temperatures. In the second setting, along with the driving beam, another laser beam was shone on the atoms. In both the scenarios, the behaviour of sodium atoms were tracked.

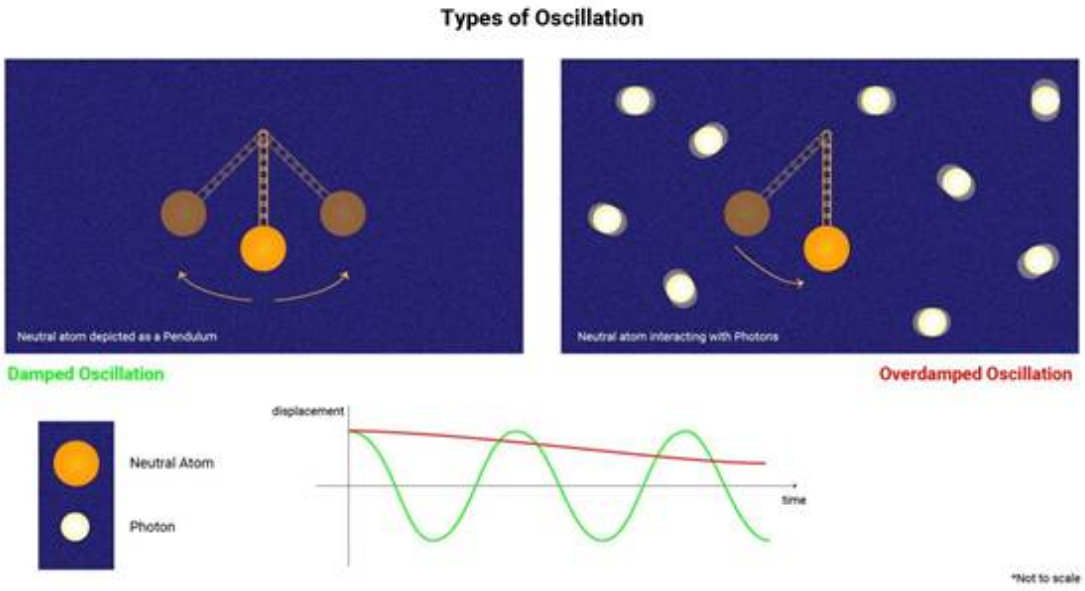

Fig 1. Types of oscillations experienced by trapped ultra-cold neutral atoms

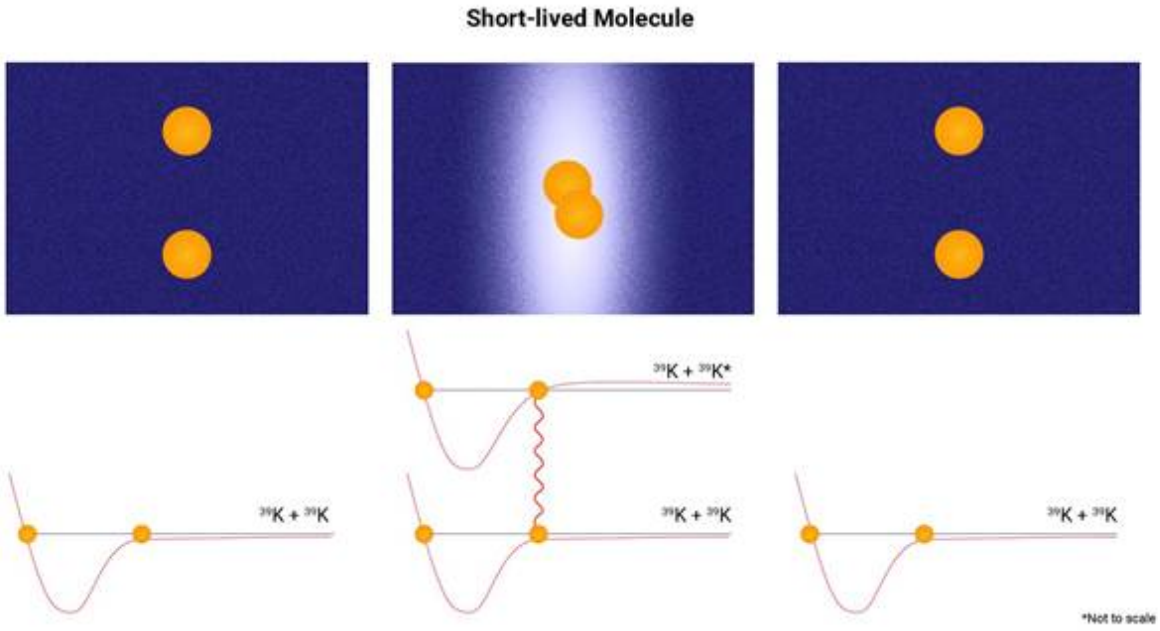

Fig 2. Short-lived molecule formed in the presence of PA beam

"In our experiment, the role of the electrons in a conducting metal is played by neutral atoms that are laser cooled to micro-kelvin (near absolute zero) temperature. By observing their transport

properties and responses to an externally tunable inter-atomic interaction, we noticed that transport properties got fundamentally modified," said Saptarishi Chaudhuri, head, Quantum Mixtures (QuMIX) lab at RRI.

Typically, under such a scenario, the atoms are expected to oscillate just like a pendulum.

"Instead, we noted a dramatic change in the motion, from an overdamped oscillation to an underdamped oscillation. This was possible due to the interactions between the atoms and the photons" he said.

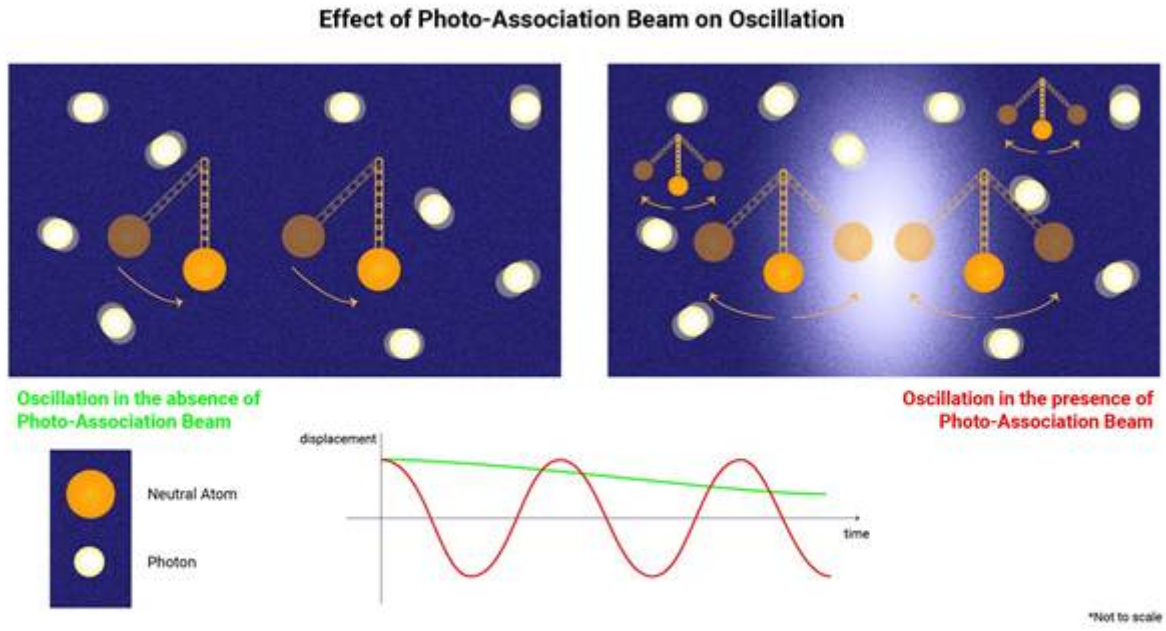

Fig 3. Effect on oscillation in absence (L) and in presence (R) of PA beam

This is because when the driving laser beam was momentarily applied on the trapped atoms, it could displace the cloud of cold atoms. Soon after, it mimicked the dynamics of a damped harmonic oscillator due to increase in oscillation frequency. Subsequently, the atoms were also subjected to another intense laser light near a photoassociation (PA) resonance -- known to modify the interatomic interactions.

"When a sudden displacement was applied to the atomic cloud, we observed that it underwent collective oscillations in the presence of these interactions -- an outcome that was both surprising and at first counter-intuitive," said Anirban Misra, PhD students and lead author of the paper published in the journal Optics Letters.

Photoassociation, they said, is a process through which the atoms combine to form a short lived molecule leading to trap loss and recapture of the involved atoms. "Tuning interatomic interactions in cold atoms enables us to explore exotic quantum dynamics," said Sanjukta Roy, another co-author of the study.

A comprehensive theoretical model developed by Supurna Sinha and Urbashi Satpathy, also collaborating authors of this work, has taken into account the photoassociation resonance

significantly enhances the interaction strength among the atoms, thereby allowing them to introduce a novel method for detecting molecular resonances.

Depending on the control parameters of the experiment, that is, the power of the various laser lights and the strength of the magnetic field gradient in the MOT, it was possible to tune the dynamics as per required, the experimentalists said.

With more detailed studies, one could get better insights into transport properties of any quantum systems in response to tunable interactions, the RRI researchers said.

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India raises budget for Gaganyaan human spaceflight mission to $2.32 billion

Source: The Economic Times, Dt. 13 Feb 2025,
URL: https://economictimes.indiatimes.com/news/science/india-raises-budget-for-gaganyaan-human-spaceflight-mission-to-2-32-billion/articleshow/118215449.cms

India has expanded its Gaganyaan human spaceflight mission to include building and operating a national space station, planning two crewed and six uncrewed missions by 2028, a minister said on Thursday.

Gaganyaan, meaning "sky craft" in Hindi, is India's first human spaceflight mission. It aims to launch a habitable space capsule into a 400 km (250-mile) orbit and safely return it with a splashdown in the Indian Ocean.

The mission will demonstrate India's capability to send astronauts into space and bring them back, a milestone achieved so far only by the U.S., Russia, and China. The nation announced its plan for a space station last year.

Outlining the Gaganyaan mission's expanded tasks, deputy minister Jitendra Singh told parliament the mission's budget had risen to 201.93 billion rupees ($2.32 billion). It had earlier received budget approval of about $1.1 billion, and was originally planned as a project with one crewed and two uncrewed missions.Various test flights and assemblies are under way.

The ambitious mission, which was originally announced in 2019 with a target to send Indian astronauts into space by 2022, has faced delays, primarily due to the COVID-19 pandemic, supply chain disruptions, and additional safety measures.

The delay has also been caused by a global shortage in the supply of electronic components, equipment suitable for use in space, extra test missions, safety checks for astronauts, and a change in the spacecraft's design to keep its weight within the carrying capacity of the rocket, Singh said in a written answer to questions raised in parliament.

The development of India's own life support system crucial for sustaining astronauts in space is also taking longer because it is a new technology and could not be sourced from abroad as planned, he added.

The country is aiming to have an operational Bharatiya Antariksh Station by 2035 and sending an Indian crewed mission to the Moon by 2040.

One of the Gaganyaan crew members, Group Captain Shubhanshu Shukla, is also part of the crew for Houston-based Axiom's planned Crew Dragon mission to the International Space Station.

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Somanath: Setting up space parks next step forward

Source: The New Indian Express, Dt. 14 Feb 2025,
URL: https://www.newindianexpress.com/cities/bengaluru/2025/Feb/14/somanath-setting-up-space-parks-next-step-forward

Though Bengaluru has the highest PhD holders and a high research ecosystem, it is yet to see the development of a satellite, pointed out S Somanath, former chairman of the Indian Space Research Organisation (ISRO). “Integration is lacking. Maybe a liquid engine or a software package of high calibre is lacking. A solution that will rewrite the software industry is not visible yet. I hope such a company comes up here that will be able to integrate and provide a full bright solution,” he said.

“Space data is very important. The data that we have been collecting is extremely huge. The entire groundwater perspective of this country is possible. The information on arid regions, water bodies and forests has a lot of value. The data is more democratic and available.

The data is generated by the government, but the monetisation is done by the public. There is a huge potential to convert this data into various possibilities,” said Somnath. He gave the example that ocean data can be collected and provided to fishermen to help them for a better catch.

Speaking in a panel discussion on ‘Future of Commercial Space’ at GIM on Thursday, Somanath specified the next steps for the space sector. “The first is the Rs 1,000-crore VC fund.

The purpose of the fund is not to fund any company, but to give confidence to investors that the company is seen by space professionals. It is not yet operational, but it will happen. Also, funds for startups have been implemented to scale up technologies. A grant of up to Rs 25 crore can be given to space startups.”

Next is the establishment of space parks across states. Facilities for startups can be established where they find investments for testing and validation. These will be under the state governments’ control, and run on a commercial basis, he added.

Jacob Gullish, Executive Director, Digital Economy Media, Entertainment, and Satcom, US-India Business Council, US Chamber of Commerce, talked about the perception of India in the international market. “India is on a tremendous journey.

From leadership to tapping the commercial capabilities, and changes in the policy, it has a big potential. Whether it is making semiconductors or software and space applications, Indian technology is the lead. ISRO has tremendous technology and the private sector has several ideas that can be leveraged.”

Speaking to TNIE, Jacob said, “I know of a member who said if you take the population of South Africa and compare it with India, India can produce 33 Elon Musks. The USA makes it easy to try out innovations with regulations. India is down that pathway. The Space Bill, which I haven’t seen yet, might be incremental or generate a competitive SATCOM market. If you see Europe or the USA, there are 4-5 competitive satellite companies. That drives the innovation. In India, the market is commercial, and the Bill might open the market.”

Husain Suterwala, Senior Policy Advisor, Office of the Secretary of Defence Space Policy Partnerships, amplified the scope for the space sector, pointing out that there is great talent in the country. “Many companies are coming up for space analysis.”

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Chandrayaan software for cars to anti-corrosive paints: Tech from ISRO missions to find its way into daily lives

Source: The Indian Express, Dt. 14 Feb 2025,
URL: https://indianexpress.com/article/long-reads/chandrayaan-software-cars-anti-corrosive-paints-tech-isro-missions-daily-lives-9833952/

Can the software used for Chandrayaan-3 landing be used to prevent your car from colliding? Can the technology from a camera developed for navigation in space be used to count people in heavily crowded places? Can the anti-corrosive paints developed in Indian Space Research Organisation (ISRO) laboratories be utilised to protect your roof?

The Indian National Space Promotion and Authorization Centre (IN-SPACe), an independent body under the Department of Space to regulate and promote private space industry in India, has identified at least 166 technologies developed for various ISRO missions that can be shared with industry to be utilised for other purposes.

While some materials and sensors are already being utilised by space start-ups in their own launch vehicles or satellites, several technologies have been offered to industries like automotive and construction.

“All these technologies have been developed by ISRO for its own utilisation, whether in launch vehicles or satellites. Now, they can be used in other fields. For example, the camera, software and algorithms used for Chandrayaan-3 landing can be used by the automotive industry to prevent collisions. Or the pressure sensors that are used to keep a check on propellants during a launch can be used to determine when airbags should open,” Rajeev Jyoti, director, technical directorate, IN-SPACe, tells The Indian Express.

So far, 79 memorandums of understanding — all non-exclusive — have been signed with private companies for transfer of such technology. Since all these agreements are non-exclusive, this technology can be shared with multiple companies, though ISRO continues to hold the intellectual property rights.

Over the years, space exploration has led to the development of technologies that have improved daily lives. Daily-use items like cell phone cameras, air purifiers, memory foam mattresses or

reflective blankets used in emergencies all came from research by the United States-based National Aeronautics and Space Administration (NASA) for its own missions.

While IN-SPACe recently showcased its technologies to the automotive industry, director Jyoti says several other industries, like construction, logistics and electrical, could benefit from their use too.Story continues below this adOne of the technologies on offer is the 3D LiDAR (Light Imaging Detection and Ranging) camera, developed by the Space Application Centre for navigation in space. The camera generates a 3D image with information on the depth of various objects in the frame. The camera provides this information by correlating the light reflected from these objects.

This technology could have multiple uses, including detection and counting of people in heavily crowded places like markets, measurement of parcels before they are posted, near-terrain flight assistance for helicopters and hazard or pedestrian detection to avoid collisions.In the field of healthcare, body measurements, like waist and hip size, done using the 3D LiDAR camera could be used to predict the risk of lifestyle diseases. This technology may also have an impact in the field of home devices, including gesture recognition in mobile phones, televisions or gaming platforms.

The space agency will also transfer its technology on developing cost-effective lithium-ion (li-ion) batteries. It will help in greening the transportation systems as li-ion batteries are essential for upcoming sectors like electric vehicles.

Also on offer is the space agency’s technology on vibration management systems, which was developed to protect the delicate electronic and optical systems on satellites from vibrations, shock and noise that they experience on their journey, especially during a take-off. Besides its possible applications in seismic isolation, a technique that enables buildings and other structures to remain safe during an earthquake, vibration management systems could also have applications in air, road, and sea transportation.

Then, there are several paints, coatings and polymers developed by ISRO. For example, NRCM-204 is a highly corrosion-resistant coating. Unlike conventional coatings that cannot withstand such a corrosive environment, NRCM-204 can protect metals and composites from almost all types of corrosion, including by various acids.

ISRO’s Benzoxazine polymer can be used for encapsulation in electronics or for printed circuit boards. Easily processable, this polymer remains stable in different temperatures and is a good flame retardant.

“These technologies have either been provided to space start-ups to use as they are or to other industries to be adapted for their own applications. The companies are selected on the basis of their technology absorption capability. If we look at the automotive industry alone, most sensors are currently procured from other countries. While ISRO has developed niche sensors that are not produced at high volumes, production and scaling up within the country will definitely lead to multifold reduction in prices of these sensors eventually,” says IN-SPACe’s Jyoti.

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High-energy cosmic neutrino detected under Mediterranean Sea

Source: The Hindu, Dt. 14 Feb 2025,
URL: https://www.thehindu.com/sci-tech/science/high-energy-cosmic-neutrino-detected-under-mediterranean-sea/article69215130.ece

Researchers conduct final inspections on a neutrino detection unit on a launcher vehicle aboard a research vessel to the seafloor in the Mediterranean Sea

Using an observatory under construction deep beneath the Mediterranean Sea near Sicily, scientists have detected a ghostly subatomic particle called a neutrino boasting record-breaking energy in another important step toward understanding some of the universe's most cataclysmic events.

The researchers, part of the KM3NeT (Cubic Kilometre Neutrino Telescope) Collaboration, believe the neutrino came from beyond the Milky Way galaxy. They identified 12 supermassive black holes actively guzzling surrounding matter at the center of distant galaxies as possible origination points, though the neutrino may have arisen from some other source.

KM3NeT comprises two large neutrino detectors at the bottom of the Mediterranean. One called ARCA - 3.4 km deep near Sicily - is designed to find high-energy neutrinos. One called ORCA - 2.4 km deep near Provence, France - is designed to detect low-energy neutrinos.

The newly described "ultra-high energy" neutrino, detected by ARCA in February 2023, was measured at about 120 quadrillion electronvolts, a unit of energy.

It was 30 times more energetic than any other neutrino detected to date, a quadrillion times more energetic than particles of light called photons and 10,000 times more energetic than particles made by the world's largest and most powerful particle accelerator, the Large Hadron Collider near Geneva.

"It's in a completely unexplored region of energy," said physicist Paschal Coyle of the Marseille Particle Physics Centre (CPPM) in France, one of the leaders of the research published on Wednesday in the journal Nature.

"The energy of this neutrino is exceptional," added physicist Aart Heijboer of the Nikhef National Institute for Subatomic Physics in the Netherlands, another of the researchers.Neutrinos offer scientists a different way to study the cosmos, not based on electromagnetic radiation - light. Many aspects of the universe are indecipherable using light alone.Neutrinos are electrically neutral, undisturbed by even the strongest magnetic field, and rarely interact with matter. As neutrinos travel through space, they pass unimpeded through matter - stars, planets or anything else.

That makes them "cosmic messengers" because scientists can trace them back to their source, either within the Milky Way or across galaxies, and thus learn about some of the most energetic processes in the cosmos.

"Neutrinos are ghost particles. They travel through walls, all the way through the Earth, and all the way from the edge of the universe," Coyle said. "Neutrinos have zero charge, zero size, almost zero mass and almost zero interaction. They are the closest thing to nothing one can imagine, but nevertheless they are key to fully understanding the universe."

Other high-energy cosmic messengers zipping through space are not as reliable. For instance, the path of cosmic rays gets bent by magnetic fields, so they cannot be traced back to their place of origination.

Detecting neutrinos is not simple, requiring large observatories located deep underwater or in ice. These mediums offer an expansive and transparent volume where a passing neutrino may interact with a particle, producing a flash of light called Cherenkov radiation.

The researchers concluded that the one spotted at ARCA - which was a type of neutrino called a muon - was of cosmic origin based on its horizontal trajectory and the fact that it had traversed through about 140 km of rock and seawater before reaching the detector.

Scientists puzzled by super-bright light from the sun

The KM3NeT detectors are still under construction and have not yet reached their full capabilities.Neutrinos are produced through various astrophysical processes at various energy levels. For instance, low-energy neutrinos are born in nuclear fusion processes inside stars.

High-energy neutrinos arise from particle collisions occurring in violent events such as a black hole greedily eating infalling matter or bursts of gamma rays during the explosive deaths of stars. They also can be produced by interactions between high-energy cosmic rays and the universe's background radiation.

The study of neutrinos is still in its formative stages. "So why it matters? It's basically just trying to understand what is going on in the cosmos," Heijboer said.

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