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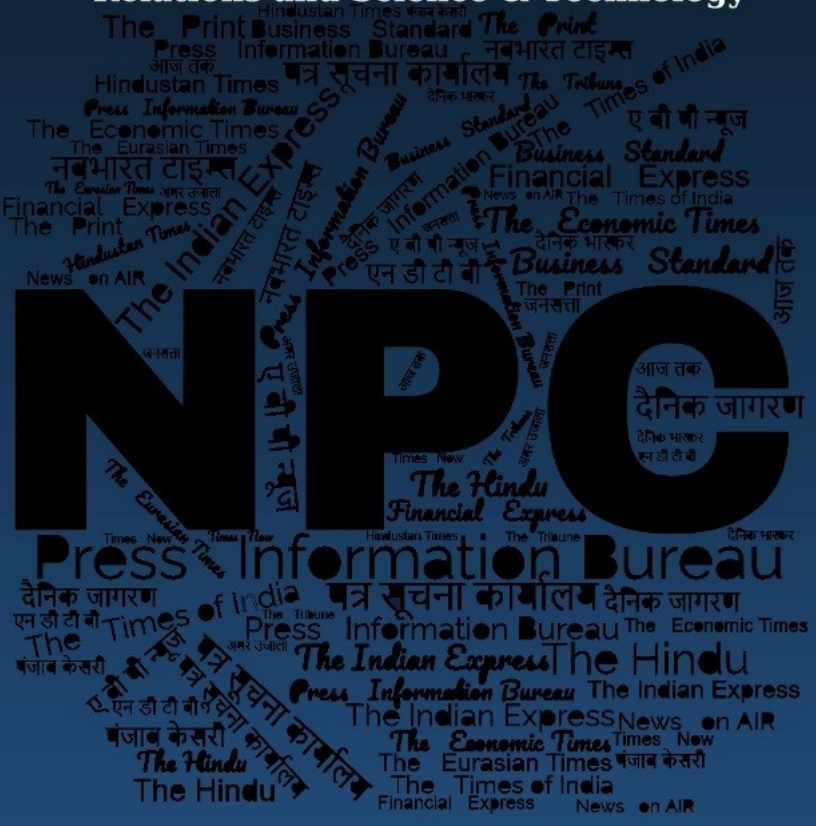
समाचार पत्रों से चयनित अंश
Newspapers Clippings

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

A Daily service to keep DRDO Fraternity abreast with DRDO Technologies, Defence Technologies, Defence Policies, International Relations and Science & Technology



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डीआरडीओ का एक और कारनामा; 651 किलोवाट वाटर जेट सिस्टम का सफल ट्रायल, नौसेना को नई धार

Source: Hindustan, Dt. 15 April 2025,
URL: https://www.livehindustan.com/national/drdo-651-kw-waterjet-propulsion-system-successfully-completes-sea-trials-in-detail-201744737602248.html

डिफेंस रिसर्च एंड डेवलपमेंट ऑर्गनाइजेशन (DRDO) के 651 किलोवाट वाटर जेट प्रोपल्शन सिस्टम का मंगलवार को सफल ट्रायल हुआ। इसे लार्सन एंड टर्बो ने टेक्नोलॉजी डेवलपमेंट फंड स्कीम के तहत डिजाइन किया है, जिसका भारतीय नौसेना के फास्ट इंटरसेप्टर क्राफ्ट पर प्रारंभिक समुद्री परीक्षण किया गया। एक्स पर एक पोस्ट में कहा गया, 'डीआरडीओ की टीडीएफ स्कीम के तहत एक बड़ा मील का पत्थर हासिल हुआ। 651 किलोवाट वॉटरजेट प्रोपल्शन सिस्टम ने भारतीय नौसेना के फास्ट इंटरसेप्टर क्राफ्ट पर समुद्री परीक्षण सफलतापूर्वक पूरा किया। इसे लार्सन एंड टर्बो ने पूरी तरह स्वदेशी रूप से डिजाइन और डेवलप किया है।

वाटर जेट प्रोपल्शन सिस्टम क्या है?

वाटर जेट प्रोपल्शन सिस्टम एक आधुनिक तकनीक है जो जहाजों (खासकर तेज रफ्तार वाली नावों) को पानी में चलाने के लिए इस्तेमाल होती है। यह सिस्टम पानी को तेज गति से पीछे की ओर छोड़ता है, जिससे जहाज न्यूटन के तीसरे नियम (प्रतिक्रिया का सिद्धांत) के आधार पर आगे बढ़ता है। इसमें एक शक्तिशाली पंप पानी को जहाज के नीचे से खींचता है और नोजल के जरिए तेज जेट के रूप में बाहर फेंकता है। इसकी खासियत यह है कि इसमें पारंपरिक प्रोपेलर की तरह बाहर निकले हुए हिस्से नहीं होते, जिससे यह उथले पानी और तंग जगहों में भी प्रभावी है।

DRDO का 651 किलोवाट वॉटरजेट सिस्टम स्वदेशी तकनीक का शानदार उदाहरण है। यह सिस्टम तेज गति, बेहतर नियंत्रण और कम रखरखाव की जरूरत के लिए जाना जाता है। इसका डिजाइन इसे तेज मोड़ लेने और तुरंत रुकने में सक्षम बनाता है, जो नौसैनिक ऑपरेशनों के लिए जरूरी है। इसके अलावा, यह सिस्टम शोर और कंपन को कम करता है, जिससे यह गुप्त मिशनों के लिए भी उपयोगी है। लार्सन टर्बो की ओर से विकसित इस सिस्टम में 70% से ज्यादा स्वदेशी सामग्री है, जो भारत की आत्मनिर्भरता को दर्शाता है।

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DRDO's 651 kW Waterjet Propulsion System successfully completes preliminary sea trials

Source: ANI News, Dt. 15 April 2025,
URL: https://www.aninews.in/news/national/general-news/drdos-651-kw-waterjet-propulsion-system-successfully-completes-preliminary-sea-trials20250415201617/

The Defence Research and Development Organisation's (DRDO) 651 kW Waterjet Propulsion System, designed by Larsen Turbo under the Technology Development Fund scheme, has successfully completed preliminary sea trials aboard the Indian Navy's Fast Interceptor Craft.

In a post on X, " A key milestone under @DRDO_India's TDF scheme. The 651 kW Waterjet Propulsion System, designed & developed indigenously by @larsentoubro (Precision Engineering Systems IC) >70% IC content, successfully completed preliminary sea trials aboard Indian Navy's Fast Interceptor Craft.

"W Waterjet Propulsion System, designed & developed indigenously by @larsentoubro (Precision Engineering Systems IC) >70% IC content, successfully completed preliminary sea trials aboard Indian Navy’s Fast Interceptor Craft. pic.twitter.com/2O0hItnFtF

Earlier on April 13, in a major success for the country, India joined the select League of Nations, including the US, China and Russia, with the capability of shooting down fixed-wing drones and swarm drones using a high-energy 30-kilowatt laser beam.

The successful trial of the Mk-II(A) Laser- Directed Energy Weapon (DEW) system was showcased at the National Open Air Range (NOAR), Kurnool, mastering the technology of disabling missiles, drones and smaller projectiles, Defense Research and Development Organisation (DRDO) officials told ANI here.

Success has put India in the exclusive and limited club of nations that possess the high-power Laser-DEW.

Speaking with ANI, DRDO Chairman Samir V Kamat said, "As far as I know, the United States, Russia and China have demonstrated this capability. Israel is also working on similar capabilities, I would say we are the fourth or fifth country in the world to demonstrate this system."

Kamat said that this is just the "beginning of the journey", adding that DRDO is working on a number of technologies "that will give us Star Wars capability."

"This is just the beginning of the journey. The synergy that this lab has achieved with other DRDO labs, industry and academia, I am sure we will reach our destination soon... We are also working on other high-energy systems like high-energy microwaves and electromagnetic pulses. So we are working on a number of technologies that will give us Star Wars capability. What you saw today was one of the components of Star Wars technologies," Kamat said.

Indigenously designed and developed Mk-II(A) DEW system was demonstrated in its entire spectrum of capability by engaging the fixed-wing drones at long range, thwarting a multiple-drone attack and destroying enemy surveillance sensors and antennae.

The lightning speed of engagement, the precision, and the lethality delivered to the target within a few seconds made it the most potent Counterdrone System.

DRDO's Centre for High Energy Systems and Sciences (CHESS), Hyderabad, developed the system along with LRDE, IRDE, DLRL, academic institutions, and Indian industries.

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Apollo Micro reloads with ₹75 cr in fresh DRDO orders, targets global defence arena

Source: The Economic Times, Dt. 15 April 2025,
URL: https://economictimes.indiatimes.com/news/defence/apollo-micro-reloads-with-75-cr-in-fresh-drdo-orders-targets-global-defence-arena/articleshow/120312121.cms

Apollo Micro Systems Ltd (AMSL), a Hyderabad-headquartered defence and aerospace company, has received a fresh round of orders worth ₹75.2 crore. The announcement came via an official exchange filing on 15th April.

The company stated, “We are pleased to inform you that the Company, in the ordinary course of its business, has received orders worth Rs. 7.52 crores from DRDO, Public Sector Undertaking (PSU) and a private company and has also been declared the Lowest Bidder for orders worth Rs. 11.48 crores from DRDO & PSU.”

In a separate filing, Apollo also confirmed additional orders worth ₹50.97 crore from multiple private sector firms for the execution of security solutions and the supply of defence products. “We are pleased to inform you that the Company has received for orders worth Rs 50.97 crore for execution of Security Solutions and supply of Defence Products from multiple private companies,” the company added.

Tie-ups with defence giants

Apollo Micro Systems is actively partnering with major players in India’s defence ecosystem. It recently signed an agreement with Garden Reach Shipbuilders & Engineers Ltd (GRSE) to explore opportunities in defence and related sectors. The two companies plan to collaborate on the production and export of underwater weapons and vehicles, underwater communication systems, and air defence systems.

The tie-up also extends to supplying advanced weapons and electronics for both defence and civilian applications.

Earlier, AMSL also inked an MoU with Munitions India, a state-owned enterprise. According to the regulatory filing, the collaboration will focus on “the design, development, and deployment of advanced defence technologies.” This move is expected to boost the company's domestic and international presence.

In another strategic move, the firm signed a deal with Troop Comforts. The agreement covers the joint development and marketing of air-defence solutions, including anti-drone and anti-aircraft systems. These products are targeted not just at the Indian Armed Forces but also at police units, central and state governments, and potential export clients.

Market performance and stock movement

Apollo Micro Systems’ stock has shown robust performance over the years, especially among smallcap defence counters. It currently forms part of the BSE SmallCap index. According to BSE data, the stock has surged 25 per cent over the past three months. Its one-year performance has

remained flat, but long-term investors have seen sizeable gains—259 per cent in two years and 777 per cent in three.

Over the last five years, the stock has skyrocketed by more than 1,400 per cent.

The company completed a stock split in May 2023, changing the face value ratio from 1:1 to 10:1. Its 52-week share price range sits between ₹88.10 and ₹157. As of its latest close, the share price stood at ₹125.05 on the BSE. At the time of reporting, the stock was trading at ₹117.80, up 4.57 per cent from the previous close. The current market capitalisation of the firm stands at ₹3,619.64 crore.

Apollo Micro Systems develops and delivers technology-based solutions across sectors like infrastructure, aerospace, transportation, and defence. With its recent string of orders and joint ventures, the company is positioning itself to play a larger role in India's defence manufacturing ambitions and export potential.

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Defence News

Defence Strategic: National/International

Defence Secretary calls on Italian Defence Minister in Rome to further enhance bilateral defence cooperation

Source: Press Information Bureau, Dt. 15 April 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2121937

Defence Secretary Shri Rajesh Kumar Singh visited Rome, Italy from April 14-15, 2025 on an official trip. The visit started with the Defence Secretary calling on the Defence Minister of Italy Mr Guido Crosetto. During the meeting, the two sides held productive discussions aimed at further enhancing defence cooperation as a key pillar of India-Italy strategic partnership.

During his visit, Shri Rajesh Kumar Singh co-chaired the 11th India-Italy annual bilateral Joint Defence Committee meeting with his Italian counterpart, Secretary General of Defence Ms Luisa Riccardi. They discussed a wide range of defence, security and industrial cooperation issues including maritime cooperation and information sharing arrangements between India and Italy with emphasis on Trans Regional Maritime Network. The situation in the Red Sea and Western Indian Ocean Region also came up during the discussions.

The Defence Secretary stressed on closer defence collaboration especially in technology and armament production, which is a priority area for India. He also brought out that the Government of India is proactively building an ecosystem for defence production and innovation within the

country through conscious policy initiatives. India has developed a vibrant innovation and industrial ecosystem.

In his keynote address during India-Italy Defence Industry Roundtable, Shri Rajesh Kumar Singh shared his views on how the Indian defence industry has witnessed significant changes, particularly in the past few years through progressive reforms. He said that these reforms have been marked by the creation of a conducive environment for the growth of the Indian Industry through transparency, predictability and Ease of Doing Business.

An MoU between Society of Indian Defence Manufacturers (SIDM) and the Federation of Italian Companies for Aerospace, Defence and Security (AIAD) was also signed, marking a significant step toward fostering closer cooperation between the defence industries of both nations.

The Defence Secretary was accompanied by a high-level Ministry of Defence delegation, comprising senior officials from Service Headquarters, Department of Defence and Department of Defence Production. A substantial industry delegation from SIDM also accompanied the Defence Secretary to foster closer B2B connections between the Indian and Italian defence industries.

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Centre for Joint Warfare Studies Hosts Defence Literature Festival 'Kalam & Kavach 2.0' in New Delhi

Source: Press Information Bureau, Dt. 15 April 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2121877

The Centre for Joint Warfare Studies (CENJOWS), under the aegis of Headquarters Integrated Defence Staff (HQ IDS), Ministry of Defence, in collaboration with Pentagon Press, successfully hosted the second edition of the Defence Literature Festival 'Kalam & Kavach 2.0' at Manekshaw Centre in New Delhi. This year's theme was 'Securing India's Rise through Defence Reforms'.

The event, held on April 15, 2025, focused on Defence Technology and Future Warfare, particularly in the context of defence manufacturing. It was aligned with the Prime Minister's call for 'Aatmanirbhar Bharat' (Self-reliant India) and highlighted key aspects of acquisition & procurement reforms.

The event brought together distinguished experts from the Armed Forces, strategic policymakers, industry leaders, and domain specialists to deliberate on critical issues affecting India's national security. Discussions included several cutting-edge topics including Technology & Future Warfare; the role of AI, cyber technologies, quantum computing, drones, space technology, and semiconductors in modern military operations; Defence Manufacturing & Aatmanirbharta, Acquisition & Procurement Reforms.

The event focused on charting a strategic roadmap for its national security, diplomacy and development. It also covered the progress made on adoption of niche technologies, enhancing multi-domain and cross-domain operational capabilities to include land, air, sea, cyber and space.

The agenda also included contemporary maritime security paradigms, future challenges and the way ahead to further the combat capability.

Raksha Mantri Shri Rajnath Singh declared 2025 as the 'Year of Reforms,' marking a transformational year aimed at converting the Armed Forces into a technologically-advanced, combat-ready force. This vision underscores the nation's commitment to multi-domain, integrated operations and emphasises a mission-mode approach to defence reforms, facilitating technology transfer, and improving public-private partnerships.

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India, Tanzania explore new ways to boost defence ties

Source: The Economic Times, Dt. 15 April 2025,
URL: https://economictimes.indiatimes.com/news/defence/india-tanzania-explore-new-ways-to-boost-defence-ties/articleshow/120304195.cms

Minister of State for Defence Sanjay Seth met Tanzania's Minister of Defence and National Service Stergomena Lawrence Tax in Dar es Salaam and discussed new ways to bolster bilateral ties and cooperation in counter-insurgency and counter-terrorism operations. The meeting was held on April 14. Seth also called on Vice President of Tanzania Philip Isdor Mpango, the Indian Ministry of Defence said on Tuesday.

During the meeting between Seth and Tax, the ongoing defence cooperation was reviewed and "new ways were explored" to further bolster the ties.

"Training of Tanzanian officers in military training institutes of India, defence industry collaboration, cooperation in counter-insurgency and counter-terrorism operations, and cyber security were some of the key areas of cooperation deliberated upon during the meeting," the defence ministry said in a statement.

On April 13, Seth and Tax inaugurated the harbour phase of the Indian Navy's maiden initiative of Africa India Key Maritime Engagement (AIKEYME), a multilateral naval exercise in Dar es Salaam, onboard INS Chennai. A Defence Expo was also inaugurated.

In his address on the occasion, Seth emphasised oneness and unity of purpose to overcome the "vast maritime challenges" and to ensure a peaceful and prosperous future.

Co-hosted by India and Tanzania, the naval exercise also involves participation of Comoros, Djibouti, Kenya, Madagascar, Mauritius, Mozambique, Seychelles and South Africa.

During his meeting with the Tanzanian Vice President Mpango, Seth updated him on the Africa-India Key Maritime Engagement cooperation, from Indian defence industries to exercise AIKEYME, and the Defence Expo.

He offered to fulfil the defence requirements of Tanzania People's Defence Force. India-Tanzania development partnership, cultural connections and cooperation in health and education were also discussed, the statement said.

The exercise represents the commitment of the participating countries to a free, open and secure Indian Ocean. A "new chapter has been added today" to the growing relations between India and Africa, the Indian defence ministry said in a statement on Sunday.

On April 14, Seth also visited Sanatan Dharma and Swaminarayan Mandir prior to an interaction with the Indian diaspora.

He also participated in Ambedkar Jayanti celebrations organised in the High Commission of India in Tanzania.

During his interaction with the Indian community, Seth highlighted the progress India has made in various spheres in recent years.

He underlined the contribution of the Indian diaspora to the growth and prosperity of not only India but Tanzania too.

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India handing out soft deals as Modi govt plots global arms push in shadow of war

Source: The Economic Times, Dt. 16 April 2025,
URL: https://economictimes.indiatimes.com/news/defence/india-handing-out-soft-deals-as-modi-govt-plots-global-arms-push-in-shadow-of-war/articleshow/120329242.cms

Prime Minister Narendra Modi's bid to transform India into a global factory floor has produced billions of dollars of low-cost iPhones and pharmaceuticals. Now he hopes to add missiles, helicopters and battleships to the shopping carts of foreign governments.

The world's largest importer of weapons after Ukraine is expanding the ability of the state-owned Export-Import Bank (EXIM) to offer long-term, low-cost loans to clients, including those whose political or credit risk profiles may limit their access to conventional financing, according to two Indian officials and three industry sources.

New Delhi will also sharply increase the number of defense attaches in its foreign missions as part of a new program that will see the government directly negotiate some arms deals, four Indian officials said. India is particularly targeting governments which have long relied on Russia for arms, two of the people said.

India's plans, which were detailed to Reuters by 15 people and have not been previously reported, mark an unprecedented effort by the government to inject itself into the recruitment and financing of foreign buyers as the world is rearming and longstanding geopolitical relationships are being recast.

Indian bureaucrats have long focused more on buying fighter aircraft from Russia's Sukhoi and howitzers from the United States to ward off China and Pakistan, Delhi's two nuclear-armed neighbors. While India has long had a small-arms production sector, its private firms have only recently started to make higher-end munitions and equipment.

The Indian defense and external affairs ministries, as well as Modi's office, did not respond to requests for comment. EXIM declined to comment.

"India is marching towards achieving the target of increasing defence exports," defense minister Rajnath Singh wrote on X this month.

One turning point was Russia's invasion of Ukraine in February 2022, according to an Indian official tasked with growing arms exports. Like most of the people interviewed by Reuters for this story, the official spoke on condition of anonymity to discuss sensitive government matters.

Spare Western arsenals were shipped to Kyiv while Russia's factories churned out munitions almost exclusively for its war effort. That left other nations that had historically relied on Washington and Moscow - the world's two largest arms exporters - scrambling for alternatives.

With its history of buying and absorbing arms technology from both the West and Russia, Delhi started to get more inquiries, the official said.

In response to Reuters' questions, Russian state arms exporter Rosoboronexport referred to previously issued statements that said it was in talks with India about jointly producing and promoting equipment to third-party states that are "friendly to Russia."

The Pentagon had no comment.

India produced $14.8 billion of arms in 2023-2024 fiscal year, up 62% since 2020, government data show. Some Indian-made artillery shells were found on the frontline in Ukraine in support of Kyiv's defense, Reuters previously reported.

Delhi has started brokering meetings between visiting delegations and domestic arms contractors, as well as demonstrating more sophisticated equipment like combat helicopters during military exercises, four officials said.

Viraj Solanki, a research fellow at London's International Institute for Strategic Studies think-tank, said India faced challenges selling its newer and more high-end wares.

"Unless it starts using its indigenous equipment more frequently and demonstrating its effectiveness, it is likely to struggle to convince potential buyers," he said.

Modi's government has set a target of doubling arms-and-equipment exports to $6 billion by 2029. It hopes sales will go beyond the ammunition, small arms and defense-equipment components that currently compose much of its military exports.

Delhi missed its target of $3.5 billion in arms sales for the latest fiscal year by about a third, but that still marks a significant increase from the $230 million in weapons and defense components it exported a decade ago.

At a time of stretched global budgets and burgeoning defense demand, India is pitching itself partially as a relatively low-cost producer.

India can produce 155 mm artillery ammunition for about $300 to $400 a piece, two Indian sources said, while European equivalents sell for upwards of $3,000.

Indian firms have also sold howitzers for about $3 million each, one of them said, or roughly half what a European-made version costs.

While Western nations that reduced artillery and other defense production after the Cold War are rushing to restart factories, state-owned Munitions India was among the Indian firms that kept such capacity.

Delhi - which has in recent years faced off with Pakistan and China in combat - had a different strategic scenario, said retired naval Cdr. Gautam Nanda, who leads KPMG's Indian aerospace and defense consulting practice. "There were no cuts on our production capacity."

Private manufacturers like Adani Defence and Aerospace and armor-and-ammunition maker SMPP are beginning to produce 155 mm artillery shells, which they said had already been ordered by foreign governments.

"With this changing scenario, definitely we see a huge, massive demand for artillery ammunition," said SMPP chief executive Ashish Kansal, whose company is setting up a plant to manufacture large caliber 155 mm artillery ammunition.

India plans to use increased financing of arms exports via EXIM, which had a loan portfolio of $18.32 billion in the 2023-24 fiscal year, to move its products up the value chain.

Such financing will largely be conducted by EXIM's commercial business, which has the state as a backstop but doesn't draw solely from the national budget. Indian arms makers lobbied heavily for the move, an industry source said.

Most banks in India have been unwilling to offer commercial loans for arms exports because they don't want to deal with countries that may have higher credit and political risks, one Indian diplomat told Reuters.

That has long hampered India from competing on big deals with countries like France, Turkey and China, whose packages come with financing or credit guarantees, the diplomat said.

One market India is hoping to expand in is Brazil, where EXIM opened an office in January.

Delhi is in talks to sell Akash missiles to Brasilia, according to two industry sources and two Brazilian officials. Even as India faces shortfalls in its own shipbuilding capacity, it is also pursuing a deal to build battleships for Brazil, according to the two Brazilian officials and an Indian official.

India's Bharat Electronics, which develops components for the Akash missile system, opened a marketing office in Sao Paulo this year, two Indian industry sources said.

EXIM was expected to help finance some of the deals in Brazil, they added.

Brazil's army said in an email to Reuters that the developers of Akash had responded to a request for information and that it had not made a decision on the purchase.

Bharat Electronics did not respond to requests for comment.

Delhi is focusing its arms-export strategy on countries in Africa, South America and Southeast Asia.

India plans to dispatch at least 20 new defense attaches to foreign embassies by March 2026, three Indian defense officials said. Their host nations include Algeria, Morocco, Guyana, Tanzania, Argentina, Ethiopia, and Cambodia, they said, adding that Delhi believed it had the ability to significantly expand arms exports to those governments.

One of the officials said this would be accompanied by a reduction in the number of defense attaches posted to Western embassies, who would be sent elsewhere.

The attaches have been tasked with promoting Indian weapons and were given resources to analyze the arms requirements of their host governments, the officials said.

Like India, many of these nations have a history of buying military equipment from the Soviet Union and Russia, which differs from the NATO standards adopted by many Western producers. One early success story is Armenia, where India posted a defense attache for the first time last year.

India has already eroded Russia's monopoly over arming Armenia, which was part of the Soviet Union but has since said that it cannot rely on Moscow.

It sold 43% of the arms Armenia imported between 2022 and 2024, according to data from the Stockholm International Peace Research Institute, up from almost nothing between 2016 and 2018.

Rosoboronexport said in March that SIPRI, which relies on open-source information, does not have comprehensive data.

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Italian 'Black Shark' surfaces as top torpedo contender

Source: The Economic Times, Dt. 15 April 2025,
URL: https://economictimes.indiatimes.com/news/defence/italian-black-shark-surfaces-as-top-torpedo-contender/articleshow/120319799.cms

The Italian 'Black Shark' torpedo, which courted controversy over a decade ago after allegations of irregularities, has emerged as the top contender for an Indian Navy requirement of heavy weight torpedoes after its German competitor dropped out of the race.

Sources told ET that Germany's ThyssenKrupp Marine Systems (TKMS) has dropped out of the competition to supply 48 heavyweight torpedoes to the Indian Navy for its Kalvari class submarines. This leaves only France's Naval Group in the competition, but its offer could be more expensive than the Italian option.

The Black Shark has a controversial past-it was the frontrunner for a requirement of 98 torpedoes in 2008-09. However, the project was dropped in 2013 and the case was referred to the Central Bureau of Investigation (CBI) by the ministry of defence. The Italian torpedo was last tested by India in 2009 and the current competition does not mandate fresh trials.

The Black Shark torpedo belonged to a Finmeccanica company (now called Leonardo), which was being investigated for corruption in the AgustaWestland chopper scandal. The Italian company was on an official blacklist for almost a decade and is now trying to re-enter the Indian market.

However, the torpedo business has recently been acquired by another Italian company, Fincantieri, which has had a long presence in India. The company has also supplied two fleet tankers to the Indian Navy in the past.

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JCBL arm Airbornics Defence & Space to co-develop tech for light tanks, combat vehicles

Source: The Economic Times, Dt. 15 April 2025,
URL: https://economictimes.indiatimes.com/news/defence/jcbl-arm-airbornics-defence-space-to-co-develop-tech-for-light-tanks-combat-vehicles/articleshow/120304534.cms

JCBL Group on Tuesday said its defence business arm Airbornics Defence & Space Pvt Ltd (ADSL) will co-develop and manufacture next-generation technologies for light tanks and other combat vehicles under a strategic partnership between India and Slovakia. A memorandum of understanding (MoU) was formalised between India and Slovakia during the recent visit of President Droupadi Murmu to the Central European nation, JCBL said in a statement.

Under this partnership, ADSL will play a pivotal role in indigenous development and manufacturing of critical combat systems for light tanks, including turrets, active protection systems (APS), remote-controlled weapon systems (RCWS), and human-machine interface (HMI) modules, JCBL said.

According to the company, all manufacturing will be conducted in India, reinforcing the goals of the Atmanirbhar Bharat initiative.

The collaboration is designed to foster technology transfer, operational excellence, and co-development of advanced combat platforms tailored for complex terrains and high-altitude environments, it said.

The partnership also opens avenues for future defence exports by combining Slovakia's technological expertise with India's robust industrial base, it added. President Murmu, during her visit to Slovakia, was accompanied by a high-level business delegation.

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ET Graphics: A decade in the making, India’s first high-powered laser weapon

Source: The Economic Times, Dt. 15 April 2025,
URL: https://economictimes.indiatimes.com/news/defence/et-graphics-a-decade-in-the-making-indias-first-high-powered-laser-weapon/articleshow/120289633.cms

India has successfully demonstrated its first high-powered laser weapon—a 30KW laser beam capable of neutralising drones, UAVs, and static targets—at the National Open Air Range (NOAR) in Kurnool.

The milestone marks a major step in India's directed energy weapons (DEW) program, over a decade in the making.

A decade in development

The foundation for laser-based defence began with a 2012 research paper advocating indigenous development. The programme took shape under DRDO, initially through LASTEC and later through the CHESS lab in Hyderabad. Under the codename Sahastra Shakti, the aim was clear: create weapons to disable enemy drones, optics, and electronic systems.

Slowdown in US economy could weigh on Info Edge in short term; traders can go short

Slowdown in US economy could weigh on Info Edge in short term; traders can go shortSlowdown in US economy could weigh on Info Edge in short term; traders can go short

Progressive upgrades: From MK1 to MK2A

- Mk1 (2024): A 2KW laser system effective against small drones at 1 km. Successfully shot down a Pakistani drone this month.
- Mk2: Combined six 2KW lasers into a powerful 12KW beam, extending range to over 2 km.
- Mk2A (2025): India's first true high-powered laser at 30KW. Uses six 5KW beams, with a range of 4 km. Can target drones, helicopters, and enemy sensors. Fully indigenous and truck-mounted.

What's next

- Deployment: System is in trials and expected to be field-ready within two years.
- Future Variants: DRDO is developing versions with 50–100KW power to counter cruise missiles, jets, and even artillery shells.
- Next-gen Platforms: Miniaturized pods for aircraft, naval systems, and eventually space-based lasers are in the pipeline.

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IAF says its pilots are trained to tackle 'GPS spoofing'; claims every mission achieved as planned

Source: The Week, Dt. 15 April 2025,
URL: https://www.theweek.in/news/defence/2025/04/15/iaf-says-its-pilots-are-trained-to-tackle-gps-spoofing-claims-every-mission-achieved-as-planned.html

Amid reports that the Indian Air Force's transport aircraft carrying relief materials to earthquake-hit Myanmar under 'Operation Brahma' late last month faced "GPS spoofing", the IAF said its crew is efficient in handling such situations and "every mission was achieved as planned".

GPS (global positioning system) spoofing is a form of cyber attack that includes generating false GPS signals to mislead an aircraft, vehicle or vessel. The false signals result in misleading the navigation equipment, posing a significant risk.

"The possibility of degraded GPS availability was published by the Mandalay International Airport as NOTAM and all due precautions were put in place to cater for such conditions," the IAF said in a post on X on Monday.

NOTAM or 'Notice to Airmen' is a notice filed with an aviation authority that seeks to alert pilots of an aircraft of potential hazards.

"IAF crew are well capable to handle such unavailability, while ensuring safety of flight and achievement of the designated task or mission. Accordingly, every mission was achieved as planned," the tweet further read.

India sent the first consignment of relief materials to Myanmar on March 29 in a C-130J aircraft and its pilots reported that the plane's GPS signal was tampered with when it was in Myanmar's airspace, sources told PTI on Sunday.

IAF transport aircraft carrying relief materials to Myanmar late last month faced "GPS spoofing", triggering security concerns as pilots were forced to rely on the backup systems, sources in the military establishment had said.

Besides the C-130J Super Hercules, the Indian Air Force also operated C-17 Globemaster heavy-lift transport aircraft to carry relief materials and rescue teams to Myanmar.

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If you lose your design, you lose everything: Principal Advisor to MoD on cyber confidentiality

Source: ANI News, Dt. 16 April 2025,
URL: https://www.aninews.in/news/national/general-news/if-you-lose-your-design-you-lose-everything-principal-advisor-to-mod-on-cyber-confidentiality20250416033813/

Highlighting the growing significance of cyber security in national defence and industry, Lt Gen (Retd) VG Khandare, Principal Advisor to the Ministry of Defence, stressed that safeguarding proprietary designs is paramount and "if you lose your design, you lose everything."

He was speaking at the international seminar Cyber Warfare 2025: Strategies and Challenges organised by Lisianthus.

"If you look at anybody's design in any industry, that is the most valuable thing. If you lose your design, you lose everything," said Lt Gen Khandare while addressing participants from strategic, industrial, and academic sectors.

He emphasised that both the public and private sectors must treat national and strategic information as confidential. "Anyone in the public or private sector should keep the national information confidential," he noted.

Ahead of this, India's G20 Sherpa, Amitabh Kant, emphasised the growing threat of cyber warfare, describing it as "silent, borderless, and totally anonymous" at the launch of the Cyber Sikshit Bharat initiative in New Delhi on Tuesday.

Kant highlighted that India has seen a significant surge in cyber-attacks, with a 300 per cent increase between 2021 and 2024.

During the G20 summit in September 2023, the website faced over 1.6 million cyber intrusions per minute while attending an international seminar on 'Cyber Warfare 2025: Strategies and Challenges', organised by Lisianthus Tech, a cybersecurity solutions company.

He added that India faces a shortage of trained cyber professionals and that cyber warfare is no longer a fringe concern but needs to be a pillar of India's national security. "India must build not only walls to protect digital borders but also bridges to collaborate with international players," he said.

"We had more than 16 lakh cyber intrusions per minute aimed at the G20 summit website in September 2023," he said.

Cyber Sikshit Bharat initiative is inspired by the Indian government's Viksit Bharat and Cyber Sikshit Bharat missions. This initiative launched by Lisianthus Tech, aims to create a central cybersecurity centre of Excellence in India that focuses on AI-driven security, digital risk management, hardware-based protection, and global policy advocacy.

Appreciating the initiative, Kailash Vijayvargiya, Madhya Pradesh's Urban Development, Housing, and Parliamentary Affairs minister, said Prime Minister Narendra Modi's leadership has gained a prominent stand for India in the digital market.

"Cyber-attacks create vulnerability towards such achievements, and therefore, I appreciate such events and initiatives where efforts are made to reach effective solutions against cybercrimes," the minister said.

Led by Lisianthus Tech's founder and CEO Khushhal Kaushik, the programme seeks to empower India's digital infrastructure, train future-ready professionals, and contribute to the creation of a secure global cyber ecosystem.

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INSV Tarini with two women Naval officers departs Cape Town on final leg of global circumnavigation

Source: The Hindu, Dt. 15 April 2025,
URL: https://www.thehindu.com/news/national/insv-tarini-with-two-women-naval-officers-departs-cape-town-on-final-leg-of-global-circumnavigation/article69452836.ece

Indian Navy Sailing Vessel (INSV) Tarini has set sail from Cape Town, South Africa, for Goa, on the final leg of a global circumnavigation. The voyage, part of the Navika Sagar Parikrama-II initiative, is being undertaken by two women officers, Lieutenant Commander Dilna K. and

Lieutenant Commander Roopa A. The vessel is expected to reach Goa by the end of May. “INSV Tarini was ceremonially flagged off from the Royal Cape Yacht Club (RCYC) for the final leg of her journey to Goa on April 15 at 1030 hours local time (1400 hrs IST),” the Navy said in a statement on Tuesday (April 15, 2025).

The send-off ceremony was attended by the Officiating Consul General of India in Cape Town, the Defence Attaché of India to South Africa, members of the RCYC Governing Council, and representatives of the Indian community in Cape Town.

During its port call in Cape Town, INSV Tarini served as a hub for outreach and diplomatic engagements, hosting several guests, including members of the Indian diaspora and local dignitaries. The visit also provided an opportunity for cultural exchange and highlighted the growing maritime cooperation between India and South Africa, the statement added.

“In addition to hosting guests, the crew of INSV Tarini engaged in a series of interactive events aimed at promoting gender equality, women’s empowerment, and India’s capability in indigenous boat building,” the Navy stated.

Activities included an interaction with students from the Indian diaspora and an experience-sharing session with citizens and members of the diplomatic community at the RCYC. During these events, the officers shared insights into their journey, the challenges of ocean sailing, and the vision behind Navika Sagar Parikrama. Further engagements involved a formal session with faculty and students at the University of the Western Cape, interaction with Naval Cadets at the Naval College, and meeting young sailors at the RCYC Sailing Academy.

The crew also utilised the stopover to undertake routine maintenance on INSV Tarini, ensuring the vessel remains in optimal condition for the final leg of the voyage, the Navy stated. The vessel had arrived in Cape Town on April 1, completing the penultimate leg of its journey. The entire expedition, covering approximately 23,400 nautical miles (43,300 km), was flagged off from Goa on October 2, 2024 by the Chief of the Naval Staff, Admiral Dinesh K. Tripathi, and is scheduled to conclude in Goa by the end of May.

The Navy added that the circumnavigation is a significant endeavour aimed at promoting ocean sailing in India, showcasing the strength and resilience of Indian women in uniform, and highlighting the country’s indigenous shipbuilding capabilities.

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Indian Army's Efforts to Secure Mock-Up Battle Tanks Shows Decoys Are Never Out of Fashion

Source: The Wire, Dt. 16 April 2025,
URL: https://thewire.in/security/indian-army-bhishma-mock-up-main-battle-tanks-decoy

The Indian Army has invited responses from domestic state-owned and private companies by June 6, to its request for information for ‘mock-up’ or fake Russian-origin T-90S/SK ‘Bhishma’ main battle tank platforms, to hoodwink killer enemy drones on the battlefield.

Taking its cue from the Ukrainian military, which has extensively deployed mock-ups and decoys on its frontlines over the past three years to deceive Russian forces, the Army's 'request for information' stated that 'advancements in technology in the field of surveillance, detection and acquisition had made the battlefield transparent".

Hence, the need for these mock-ups or copies, to 'preserve' real main battle tanks from drone attacks in varied terrain. The Army operates 1100-1200 T-90 variants, the majority of which have been licence-built locally via a transfer of technology. A large number of T90s were operationally deployed to Ladakh after the Chinese army infringed the disputed Line of Actual Control between the neighbours in May 2020.

The April 7 request for information detailed the army's requirement for the proposed modular mock-ups to be an 'exact MBT replica' in height, width, ground clearance, its slope of armour and other external fitments like explosive reactive armour, radio antennae, wind sensors, external fuel tanks and anti-aircraft machine guns, amongst other features.

The dummy platform would also be required to duplicate the T-90's acoustic features and generate its thermal signatures, both of which the incoming drone's sensors would be able to detect and be fooled into attacking. However, by striking the dummy the enemy drone swarms would not only expend their ammunition, thereby neutralising their offensive capability, but also enable ground formations to field their real tanks elsewhere in more advantageous positions.

A request for proposal or bid for the replica main battle tanks will follow, but the request for information did not indicate when this would be.

Germany's Field Marshal Erwin Rommel – the Desert Fox – was one of the early masters of deception involving main battle tanks, when he famously and successfully employed their inflatable or wooden mock-ups mounted on trucks or other platforms in his North African campaign to create the illusion of larger forces. German trucks and even Beetle Volkswagen cars, disguised to look like tanks by adding canvas structures shaped like turrets and gun barrels collectively misled the Allies over both the location and size of Rommel's Panzer units in the cat-and-mouse game the rivals engaged in during this critical campaign.

The brilliant German strategist often moved his real tanks at night, leaving the dummies visible during the day, effectively masking actual troop movements and outfoxing the Allies more than once. He also deployed dummy fuel tanks, fake artillery positions, and false supply dumps to trick Allied reconnaissance flights, which in those times were rudimentary and relatively easy to dupe, compared to presently.

Comparable efforts

Meanwhile, in a related ploy, the Indian Air Force too plans on deploying replicas of its principal fighters like Rafales, Sukhoi Su-30MKI and Tejas at several of its frontline bases at Leh, Ambala and Jodhpur as part of its 'passive defence strategy' to dupe an enemy attack.

Sourced domestically, these fakes, much like the T-90 MBT mock-ups, would be aimed at 'confusing' the adversary's surveillance and weapon-guidance systems, by fooling them into targeting the dummies, thereby ensuring the real combat platforms' safety and availability for

deployment. According to the independent defence news aggregator and commentator Indian Defence Research Wing, these decoy platforms would be 'lightweight, rapidly deployable and designed for minimal maintenance'.

In its March 22 post, the website stated that the Defence Research and Development Organisation, experienced in deception technologies like radar-reflective chaff, could lead the IAF's 'decoy fighter' project, with series production executed by private or state-owned corporations, for around Rs 1 crore per dummy. IDRW anticipated the IAF would issue a request for information for these fake combat platforms by mid-2025, with procurement targeted for 2027-2028.

Despite satellites, drones, and artificial intelligence, the basic principle of deception in combat has proven effective over millennia, as it principally served in wasting enemy ammunition, confusing intelligence, spawning hesitation and allowing tremendous scope for surprise by the deceiver.

Decoys: Forever popular

The use of decoys on the battlefield aimed at making the enemy waste time, weaponry, resources and morale, is as old as war itself.

Possibly the first and most famous of such subterfuge, involving the apocryphal Trojan horse, is attributed to the Greeks and dates back to the 12th century BCE. After 10 years of besieging Troy, the Greeks pretended to abandon the war, but left behind a giant wooden horse as an "offering" to the gods. But hidden inside the massive horse were elite Greek warriors, who then emerged, vanquished the Trojans and captured Troy.

In medieval times, fake camps and burning additional extra fires at night were used to give the illusion of greater numbers to hide troop movements, or in some cases a combination of both. During World War I, for instance, dummy soldiers, cardboard tanks, and fake trenches were used to draw enemy fire or mask true intentions by either side. But with advances in technology, sonic deception came into being, in which sound recordings were used to simulate troop or artillery movements to deceive, and presumably demoralise the enemy.

World War II, however, became the gold standard for battlefield decoys.

Other than Rommel's aforementioned dodges, the Allies, for their part, launched a massive deception in Operation Fortitude ahead of D-Day, featuring fake inflatable tanks, wooden aircraft, phoney radio traffic and a phantom army led by US General George Patton from Dover in the UK. The British also successfully used sound engineers, artists, and illusionists to stage battlefield illusions at various locations and in various battle zones during the War.

The Russians were also amongst the pioneers of battlefield duplicity via their "Maskirovka" doctrine that encompassed a broad range of measures for military deception, including camouflage, denial and disinformation. The term literally means "masking" or "disguise" and is used to mislead the enemy regarding the presence, disposition and intentions of forces and emerged as a key component of Russian military strategy, aimed at achieving surprise and securing combat operations.

Rapid advances in technology during the Cold War that followed, led to the clever use of radar reflectors that were used to mimic ships or aircraft on enemy radar, fake missile silos and airfields,

designed to confuse satellite reconnaissance and electronic spoofing or jamming and disseminating fake signals to mislead enemy systems.

Thereafter, decoys in the drone and cyber era in the 21st century took this deceit to significantly higher levels with inflatable or wooden High Mobility Artillery Rocket Systems, fake F-16s and autonomous dummy vehicles, all ably exploited by Ukraine's military to confuse Russia's armed forces.

All this merely serves to confirm the ancient wisdom of Chinese military strategist and philosopher Sun Tzu's dictum that all warfare was, indeed, based on deception.

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Army showcases tech-driven combat readiness in Arunachal field exercise

Source: India Today, Dt. 16 April 2025,
URL: https://www.indiatoday.in/amp/india/story/army-showcases-tech-driven-combat-readiness-in-arunachal-field-exercise-2709627-2025-04-16

The Indian Army's Spear Corps has successfully concluded a significant field exercise in the forward areas of Arunachal Pradesh, underscoring its commitment to operational readiness and technological advancement.

The exercise showcased the seamless integration of New Generation Equipment (NGEs) and New Generation Weapons (NGWs), in line with the Army's focus on rapid transformation under the 'Year of Technology Absorption and Year of Transformation' initiative, according to the Defence Ministry.

Conducted in challenging, rugged, and mountainous terrain, the exercise was designed to test the troops' ability to operate effectively in demanding conditions. The primary emphasis was on enhancing key operational aspects, including enhanced mobility, real-time intelligence, surveillance and reconnaissance (ISR), and advanced communication systems.

These elements are critical in developing a swift, silent, and smart tactical force capable of delivering decisive responses in modern, technology-driven battlefields.

The deployment of state-of-the-art platforms and modern combat systems during the exercise highlighted the Army's focus on achieving faster decision-making processes, seamless information sharing, and enhanced synchronised battlefield awareness, officials said.

These advanced capabilities significantly bolster the operational agility of the troops, reaffirming the Indian Army's dedication to technological progress and battlefield innovation.

This successful field exercise stands as a clear demonstration of the Indian Army's readiness to address the evolving challenges of contemporary warfare, the Defence Ministry said.

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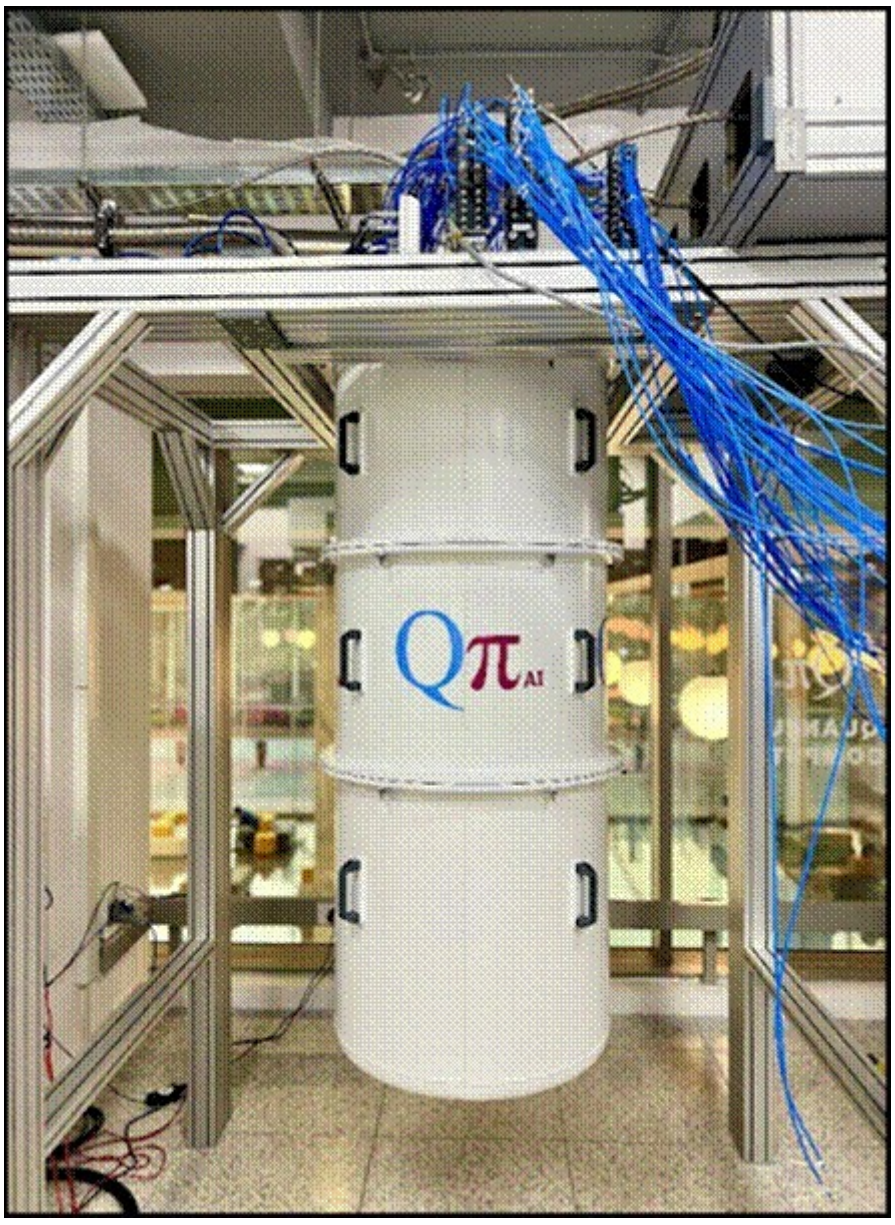
Science & Technology News

Startup selected under NQM launches one of India's most powerful quantum computers

Source: Press Information Bureau, Dt. 15 April 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2121845

Bangaluru based QpiAI, one of the 8 startups selected under the National Quantum Mission, coordinated by the Department of Science and Technology (DST) announced the launch of one of India's most powerful quantum computers featuring 25 superconducting qubits, on the occasion of World Quantum Day yesterday.

QpiAI-Indus, the quantum computer launched, is the first full-stack quantum computing system in the country and combines advanced quantum hardware, scalable control, and optimized software for transformative hybrid computing. It integrates advanced quantum processors, next-generation Quantum-HPC software platforms, and AI-enhanced quantum solutions.



With this milestone, QpiAI is driving deep-science and deep-tech innovation across life sciences, drug discovery, materials sciences, mobility, logistics, sustainability, and climate action.

As a part of India's National Quantum Mission, QpiAI is at the forefront of building the country's quantum computing technology ecosystem, national quantum adoption programs, and creating one of the world's largest quantum talent ecosystems. QpiAI is committed to accelerating India's quantum journey, making quantum computing technologies practical, accessible, and globally impactful. The technologies from the company, bootstrapped in 2019, have led to 11 patent applications and generated a revenue of around Rs 1 million per annum. They have also generated substantial capital from the Small Industries Development Bank of India (SIDBI).

With this announcement on World Quantum Day which marks a shared vision for a quantum-enabled future that transforms industries, accelerates scientific discovery, and empowers the next generation of innovators, QpiAI joins the global community of scientists, engineers, policy makers, and enthusiasts in celebrating the remarkable progress and possibilities unlocked by quantum science and technology.n and involvement with the speakers and panelists.

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How Mangalyaan-2 will land on Mars: ISRO chief reveals plan

Source: The Times of India, Dt. 15 April 2025,
URL: https://timesofindia.indiatimes.com/science/how-mangalyaan-2-will-land-on-mars-isro-chief-reveals-plan/articleshow/120306889.cms

India is gearing up for a major leap in planetary exploration with Mangalyaan-2, its second mission to Mars. The Indian Space Research Organisation (ISRO) has revealed an ambitious plan to land a spacecraft on Mars' surface. This will be a first for the country.

This mission builds on the success of Mangalyaan-1 (Mars Orbiter Mission), which was launched in 2013 and became the first Indian spacecraft to reach Mars. Remarkably, it achieved this feat on its maiden attempt. Mangalyaan-1 exceeded expectations by functioning for over eight years, far beyond its original six-month mission life.

According to ISRO Chief Dr. V. Narayanan, Mangalyaan-2 will be launched aboard the powerful LVM3 rocket and placed in an elliptical Earth orbit of 190 x 35,786 km. The spacecraft, weighing around 4,500 kg, is made up of two main components: the Cruise Stage and the Descent Stage. The Cruise Stage is responsible for powering and navigating the spacecraft during its long journey through space. It contains the engines, solar panels, communication systems, and other support equipment needed to keep the mission on track while travelling from Earth to Mars. Attached to it is the Descent Stage, which contains the lander and is designed specifically for the final phase of the mission.

After several months of interplanetary travel, as the spacecraft nears Mars, the Descent Stage will separate and begin its entry into the Martian atmosphere. Unlike earlier missions that enter Mars' orbit before landing, Mangalyaan-2 will perform a direct entry, meaning the Descent Stage will

plunge straight into the atmosphere without first orbiting the planet. This method presents significant challenges and is considered a major technological advancement for ISRO.

As the Descent Stage enters the thin Martian atmosphere, which is about 100 times thinner than Earth's, it will face what NASA calls the "seven minutes of terror," a crucial period during which the spacecraft must survive intense heat, high speeds, and rapidly changing conditions. The landing sequence will begin with aerobraking to slow the spacecraft using atmospheric drag, followed by the deployment of supersonic parachutes and a heat-resistant aeroshell to further reduce speed and shield the lander. At an altitude of approximately 1.3 kilometres above the Martian surface, powered descent engines will ignite and carefully control the final approach, guiding the lander to a safe and precise touchdown.

Helicopter to survey the Martian land

A standout feature of Mangalyaan-2 is the inclusion of a mini helicopter, inspired by NASA's successful Ingenuity drone. This rotorcraft will enable India to explore the Martian terrain from the air and extend scientific reach beyond the immediate landing site.

The helicopter's role will be to survey the landscape, assist in navigation, and potentially scout locations for future missions.

Timeline of Mangalyaan 2 mission

Although ISRO has not confirmed an official launch date, the release of such a detailed and forward-looking mission plan signals India's serious intent to join the elite club of nations that have successfully landed and operated technology on Mars.

Mangalyaan-2 is not just about reaching the Red Planet. It is about landing, exploring, and showcasing India's technological capabilities in deep space missions.

With this mission, India is set to push the boundaries of what is possible and aims to make history as one of the few countries to land and fly on Mars.

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ISRO's Landing Gear Drop Test facility inaugurated at VSSC in Thiruvananthapuram

Source: Deccan Herald, Dt. 15 April 2025,
URL: https://www.deccanherald.com/india/isros-landing-gear-drop-test-facility-inaugurated-at-vssc-in-thiruvananthapuram-3495092#google_vignette

A state-of-the-art Landing Gear Drop Test Facility was inaugurated by ISRO Chairman V Narayanan at Vikram Sarabhai Space Centre (VSSC) in Thiruvananthapuram.

The facility is geared towards the testing and qualification of the deployable Landing Gear system for ISRO's winged body Reusable Launch Vehicle– Pushpak. ISRO is developing Pushpak with a deployable Landing Gear towards the RLV-Orbital Re-entry Experiment (RLV-OREX) mission. The Pushpak vehicle will be launched to orbit in an ascent vehicle and after a few orbits, Pushpak will re-enter the atmosphere and land on a runway using the deployable Landing Gear system.

The new test rig is capable of simulating landing velocities up to 360 km/hr (100 m/s) with adjustable wheel spin speeds up to 5000 rpm. It also allows simulation of various landing sink rates (up to 4.8 m/s). Different runway conditions such as asphalt, concrete, dry, wet and icy surfaces can also be simulated at the facility.

Various parameters experienced by the landing gear can be measured using a comprehensive sensor suite comprising accelerometers, high resolution displacement sensors such as LVDTs and LiDARs (Light Detection and Ranging) to sense the vertical motion, and tri-axial load cells and strain gauges to sense landing forces, strain and moments.

The facility also integrates multiple safety features, ensuring protection for both personnel and test articles. VSSC Director Unikrishnan Nair, Director of Satish Dhawan Space Centre A Rajarajan, and Director of ISRO Inertial Systems Unit Padma Kumar ES were present at the inauguration event.

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University of Hyderabad team basks in glory as LHC wins Breakthrough Prize

Source: The Hindu, Dt. 16 April 2025,
URL: https://www.thehindu.com/sci-tech/science/uoh-team-basks-in-global-glory-as-large-hadron-collider-wins-2025-breakthrough-prize/article69452680.ece

The Large Hadron Collider (LHC) experiment at CERN — Europe's premier research centre for particle physics and home to the world's largest particle accelerator — that won the 2025 Breakthrough Prize in Fundamental Physics has an Indian connection. A team led by Bhawna Gomber at the Centre for Advanced Study in Electronics, Science and Technology (CASEST), School of Physics, University of Hyderabad (UoH), played a key role in the experiment, the university said on Tuesday.

The Breakthrough Prize honours the work of international scientists at CERN who have expanded understanding of the universe's fundamental nature. The LHC experiment, which includes the groundbreaking 2012 discovery of the Higgs boson, has been central to these efforts.

Gomber's team at the UoH has contributed to the CMS (Compact Muon Solenoid) experiment at CERN through data analysis, trigger electronics, and research in high-energy particle interactions. Their work focuses on exploring physics beyond the Standard Model, particularly in the search for dark matter particles, large extra dimensions and anomalous trilinear gauge couplings.

"We are thrilled to see our years of effort recognised as part of this global milestone. It's a proud moment not just for our team, but for the Indian scientific community as a whole," said Gomber.

The experimental high energy physics group at UoH was started by professors Bindu Bambah and Rukmani Mohanta by joining the NOVA collaboration and Indian institutes at Fermilab collaboration in the USA, a release from UoH informed.

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Miniature laser grown on silicon chip could revolutionise computing

Source: The Hindu, Dt. 16 April 2025,
URL: https://www.thehindu.com/sci-tech/science/miniature-laser-grown-on-silicon-chip-could-revolutionise-computing/article69448304.ece

The invention of silicon chips revolutionised communications. Even today they are the cornerstone of the technologies we use to move information around the world.

The way they work has changed significantly, however. They have become better: for a long time this was because experts improved its hardware to operate as efficiently as possible. But more recently, researchers have started to replace the electrons with photons, the particles of light, as the agents responsible for storing and manipulating information.

Thus today we have silicon photonics with valuable applications in data centres and sensors as well as potential ones in quantum computing. Silicon photonics is quickly gaining traction due to the many advantages it offers over traditional semiconductor chips.

In a study in Nature, scientists from the US and Europe reported that they had successfully fabricated the first miniaturised lasers directly on silicon wafers, marking a significant advance in silicon photonics.Photons carry information faster, with greater data capacity, and lower energy losses than electrons.But photons aren't silver bullets. A significant challenge associated with using photons is integrating the source of these particles — a light source — with the silicon chip itself.

Currently, engineers' best bet is to attach a separate laser light source to the chip. The resulting device operates more slowly than a chip with an integrated light source because of the small but significant mismatches that arise due to being manufactured independently. Separately manufacturing and attaching the lasers is also more expensive.

In the new study, the researchers surmounted this problem by 'growing' the laser directly on a silicon chip, in a process that is also more scalable.

The research team also conducted its entire process in a standard complementary metal-oxide-semiconductor (CMOS) manufacturing line, which the technology industry currently uses to manufacture electronic chips. Thus the new technique could be compatible with existing manufacturing methods.

Getting on the chip

A typical silicon chip has four components: a source to produce the electrons or photons, waveguides, modulators, and photodetectors.

In a photonic chip, a laser is the light source. This is the hardest part to make on the silicon chip itself. The waveguides act as paths for the photons, similar to how wires are paths for electrons.

Modulators are devices that encode information onto light (or decode information from a light signal). They do this by transcribing the information in some physical property of the light, like

varying its intensity, wavelength or phase. (Similarly, they extract information by ‘reading’ these variations in an incoming carrier signal.)

Finally, photodetectors convert light into electrical signals.Switching the laser onIn its simplest form, a laser — an acronym of ‘light amplification by stimulated emission of radiation’ — works by amplifying light in a process called stimulated emission.

Here, an electron in a higher energy level is ‘kicked’ by an incoming photon to lose some energy and drop to a lower energy level. This energy lost is in the form of another photon whose energy matches that of the incident photon. When this process occurs repeatedly, the population of electrons generates a coherent beam of light. This is a laser.

Silicon itself can’t emit light efficiently as it has an indirect bandgap. In other words, in a silicon atom, an electron in a higher energy level cannot drop to a lower one on its own; instead it requires an additional particle to help release the electron’s energy and drop down.

Most lasers use semiconductor materials like gallium arsenide to produce the light. These materials have a direct band gap, meaning that electrons inside the material can drop from a higher energy level to a lower one by emitting a photon.

Direct band-gap materials allow electrons to directly emit photons without requiring to be kicked, converting more electrical energy into light without additional interactions. Thus the laser is more energy-efficient.Integrating gallium arsenide with silicon is a major challenge because of the different arrangement of atoms in each of the elements. When gallium arsenide is grown layer by layer on silicon, the mismatch in the crystal structure of the materials causes imperfections where the atomic patterns don’t line up properly.

Imagine trying to fit two puzzle pieces together when they are not part of the same puzzle.

When electrons encounter these defects, they lose energy as heat rather than as light, rendering the laser less efficient.

In the trenchesIn their study, the researchers successfully created a chip that consisted of a silicon wafer base, nanometre-sized ridges through which photons travelled, and a small region that produced these photons.

The idea of the ridges came from a 2007 study, in which researchers from AmberWave Systems Corp. found that if gallium arsenide is deposited on silicon at the bottom of a narrow, deep trench surrounded by an insulating material, the defects become ‘trapped’, meaning they don’t interfere with the laser’s ultimate operation.

So the researchers carved nanometre-wide ridges in a 300-mm long silicon wafer, and applied silicon dioxide as the insulating material. Any defects were confined to the bottom of these trenches, allowing a defect-free gallium arsenide crystal to grow above.

Next, on the same wafer, the researchers deposited three few-atoms-thick layers of indium gallium arsenide (i.e. gallium arsenide where 20% of gallium atoms had been replaced with indium to achieve optimal light emission). These layers together functioned as the laser.Finally the team deposited a layer of indium gallium phosphide on top of the whole setup for protection.

To make the laser work, the researchers added electrical contacts connected to an external current source. When a current flowed into the indium gallium arsenide region, the latter emitted photons that flowed through the waveguides.

Solving a long-standing problem

The researchers were able to embed 300 functional lasers on a single 300-mm silicon wafer.

The size of the wafer is important because it's the industry standard in modern semiconductor manufacturing, and can thus be integrated without demanding significant changes.

Semiconductor tech: What exactly is India going to manufacture?

The laser produced light with a wavelength of 1,020 nm, which is well-suited for the short-ranged transmissions between computer chips.

Thus the researchers expect their chip could lead to a substantial improvement in computing performance and reduce energy consumption in data centres.

The threshold current required to run the laser was as little as 5 mA, comparable to that required for an LED in a computer mouse. The laser's output was around 1 mW.

The laser could continuously operate for 500 hours at room temperature (25° C). At around 55°C, its efficiency dropped.

While this duration is promising, recent research on optical silicon chips has demonstrated continuous operation at temperatures up to 120°C, highlighting ongoing challenges in developing stable semiconductor lasers.

In sum, the photonic silicon chip is novel because it's the first demonstration of a fully monolithic laser diode on a silicon wafer of this size. The team's process is also scalable and cost-effective.

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Scientists Discover New "Hall Effect" That Could Revolutionize Electronics

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URL: https://scitechdaily.com/scientists-discover-new-hall-effect-that-could-revolutionize-electronics/

A research team led by Colorado State University graduate student Luke Wernert and Associate Professor Hua Chen has identified a previously unknown type of Hall effect that could lead to more energy-efficient electronic devices.

Their study, published in Physical Review Letters, was conducted in collaboration with graduate student Bastián Pradenas and Professor Oleg Tchernyshyov of Johns Hopkins University. The researchers uncovered evidence of a new property, dubbed the "Hall mass," in a class of complex magnetic materials known as noncollinear antiferromagnets.

The traditional Hall effect, discovered by Edwin Hall at Johns Hopkins in 1879, describes how an electric current is deflected sideways when subjected to an external magnetic field, generating a measurable voltage. This effect plays a crucial role in technologies such as vehicle speed sensors and smartphone motion detectors.

But in the CSU team's work, electrons' spin (a tiny, intrinsic form of angular momentum) takes center stage instead of electric charge. Noncollinear antiferromagnets, unlike more familiar magnets where spins line up parallel or antiparallel, have spins oriented in different directions but still sum to zero net magnetization. This unique spin texture enables a fresh take on the Hall effect, where spin currents can flow at right angles rather than just electric charges.

The Role of Spin Currents and Hall Mass

"Imagine pushing a spin current in one direction and getting a second spin current going sideways," Wernert explains. "That's the hallmark of a Hall effect." The reason this new effect—governed by the "Hall mass"—appears only in noncollinear antiferromagnets is because they have three degrees of freedom describing spin orientations.

This extra complexity leads to three branches of spin waves (collective vibrations of the spins), two of which naturally flow sideways in response to a driving force.

Experimentally, researchers can measure this Hall mass either by injecting spin waves from a conventional ferromagnet into a noncollinear antiferromagnet and detecting spin accumulation along the edges, or by using scattering techniques (like neutron or x-ray) to track the low-energy spin-wave spectrum.

Implications for Spintronics and Future Technology

Because spin currents produce far less heat than electrical currents, harnessing them could revolutionize modern electronics. This prospect underlies the rapidly growing field of "spintronics," which strives to build devices—such as magnetic-based storage (Magnetoresistive Random-Access Memory, MRAM)—that are more energy efficient and resistant to data corruption by external magnetic fields.

In conventional magnetic materials, a stray magnetic field can sometimes wipe out stored information; by contrast, noncollinear antiferromagnets are much less susceptible to such interference, making them potentially safer for data storage and handling. Altogether, the discovery of this new Hall effect and its associated Hall mass opens an exciting direction in condensed matter physics and could guide the development of next-generation technology powered by spin.

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