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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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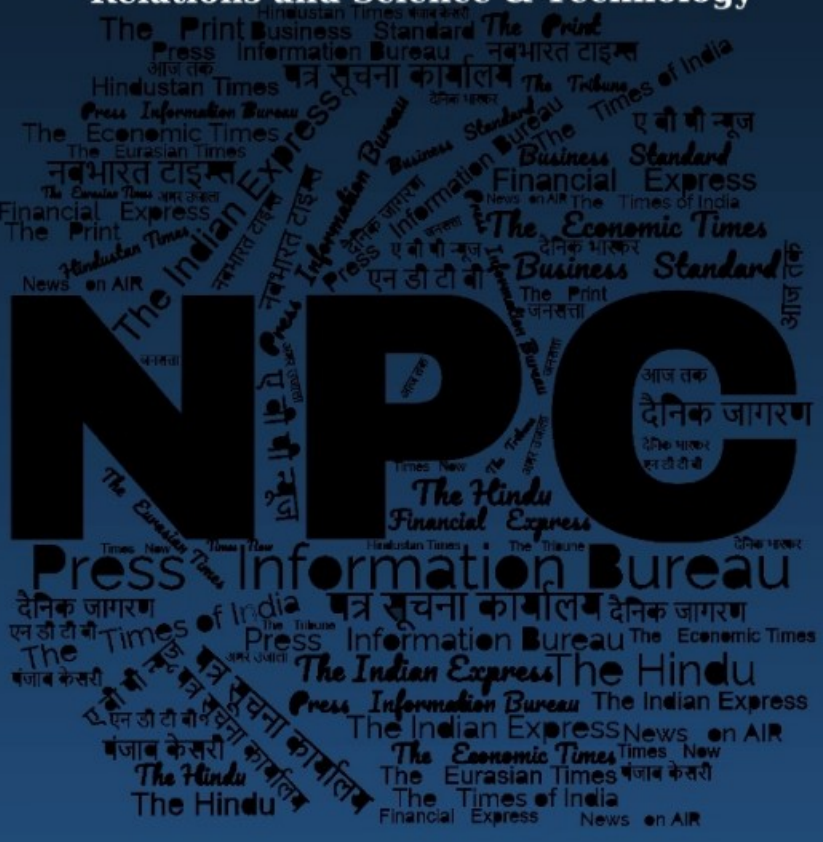

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Source: Press Information Bureau, Dt. 07 Apr 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2119805

Ministry of Defence has signed a contract with Bharat Electronics Limited, Bengaluru for the acquisition of Electronic Warfare (EW) Suites and aircraft modification kits as well as their installation on Mi-17 V5 helicopters, along with associated equipment, for the Indian Air Force at an overall cost of Rs 2,385.36 crore. The contract, under Buy (Indian-Indigenously Designed Developed and Manufactured) category, was inked in the presence of Defence Secretary Shri Rajesh Kumar Singh in New Delhi on April 07, 2025.

This state-of-the-art EW Suite will considerably enhance operational survivability of the helicopters in hostile environment. Majority of sub-assemblies and parts will be sourced from indigenous manufactures. The project will boost and encourage active participation of Indian electronics and associated industries, including MSMEs. The Suite for Mi-17 V5 is a significant leap forward in developing indigenous EW capabilities, making the country Aatmanirbhar in consonance with the Make-in-India initiative.

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A Tri-services All Women Circumnavigation Sailing Expedition, Samudra Pradakshina, kick-starts its 55-Day Voyage

Source: Press Information Bureau, Dt. 07 Apr 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2119784

A tri-services all women Circumnavigation Sailing Expedition, "Samudra Pradakshina" from Mumbai to Seychelles and back was flagged off on April 7, 2025 by Lt Gen AK Ramesh, Commandant, College of Military Engineering (CME) from the Indian Naval Watermanship Training Centre, Colaba, Mumbai. The expedition, featuring an all-women 12-member crew from the Indian Army, Indian Navy and Indian Air Force, embarks on a challenging 55-day voyage covering 4,000 nautical miles from Mumbai to Seychelles and back aboard the IASV Triveni.

This pioneering initiative highlights the indomitable spirit of Nari Shakti and aims to promote gender parity in maritime endeavours. The expedition serves as a preparatory phase for an even more ambitious circumnavigation sailing expedition planned for 2026.

Selected from 41 enthusiastic volunteers, twelve women officers, rigorously trained for two years in ocean sailing, are set to navigate treacherous waters, demonstrating their resilience, courage and determination on the high seas. The crew have embarked upon several training expeditions, gradually increasing in complexity and distance including short and long distances over days and nights. They have come out successful through challenges of weather, mechanical issues of the yatch and physical toll.The Mumbai-Sychelles-Mumbai expedition not only symbolises the empowerment of women in the armed forces, but also pays tribute to India's legendary warrior

queens like Rani Velu Nachiyar, Rani Durgavati and Rani Lakshmi Bai, whose deeds continue to inspire generations.

The flagging-in ceremony is scheduled to take place on 30 May 2025, marking the successful completion of this ground-breaking voyage. This expedition reaffirms India's commitment to fostering inclusivity and excellence in maritime endeavours, proving that Nari Shakti is an unstoppable force capable of conquering any challenge.

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Military space doctrine in 2-3 months; working on policy too: CDS Anil Chauhan

Source: The Economic Times, Dt. 07 Apr 2025,
URL: https://economictimes.indiatimes.com/news/defence/military-space-doctrine-in-2-3-months-working-on-policy-too-cds-anil-chauhan/articleshow/120058987.cms

Having established a defence space agency, India is now moving ahead to bringing out a military space doctrine as well as a military space policy in the coming months, Chief of Defence Staff Gen Anil Chauhan has said.

Speaking at the Indian DefSpace Symposium, the officer said India should emerge as a leader in space domain and advocated greater industry participation to create infrastructure and capabilities. He said that Space is emerging as the new domain to dominate warfare and India needs to develop a 'space culture'.

"India has instituted reforms like the Defence Space Agency (DSA) and New Space India Limited (NSIL), fostering public-private partnerships. DSA is working on bringing out a military space doctrine which hopefully should be able to get out in two or three months and we are also working on a national military space policy," he said.

He added that initiatives are already underway to launch satellites for intelligence surveillance and reconnaissance in partnership mode between ISRO and the private sector. "Our strategy is clear: simulate the domestic market and foster international cooperation and build state-of-the-art infrastructure to position ourselves as a global leader in space," he said.

Jayant Patil, chairman, Indian Space Association (ISpA), said India's space sector is at an inflection point, and the defence industry has been playing a pivotal role in shaping its future.

"The Indian industry has already delivered technologies like surveillance and communication satellites, jammers, and tracking radars, proving its capability. Going forward, collaboration between public and private sectors will be key to accelerating innovation and enhancing national security through space," he said.

The defence space-focused event involves over 500 participants, including industry leaders, academia and armed forces personnel. The focus has been on space-based intelligence, surveillance and reconnaissance (ISR), secure communications and cyber security in space.

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India to build underground nuclear submarine fortress to counter China as Bangladesh offers air base to Beijing near Chicken Neck

Source: The Economic Times, Dt. 07 Apr 2025,
URL: https://economictimes.indiatimes.com/news/defence/india-to-build-underground-nuclear-submarine-fortress-to-counter-china-as-bangladesh-offers-air-base-to-beijing-near-chicken-neck/articleshow/120058867.cms

India is quietly nearing the commissioning of a strategically significant naval base near the village of Rambilli, tucked into the Andhra Pradesh coastline, about 50 km south of the Eastern Naval Command headquarters in Visakhapatnam, as reported by the Times of India.

What sets this base apart isn't just its location. It's what lies beneath.

Built as part of the classified Project Varsha, the Rambilli facility includes a network of underground pens and tunnels designed to discreetly house India's growing fleet of nuclear-powered ballistic missile submarines (SSBNs). This means these vessels can slip into the Bay of Bengal undetected by enemy satellites—especially those operated by China—and head toward the strategic Malacca Strait and beyond for deterrent patrols.

"The first phase of the Rambilli base under Project Varsha is almost complete. After commissioning in 2026, it can be expanded and upgraded in phases, much like what is under way at the Karwar base under Project Seabird," a senior defence source confirmed, in a TOI report.

The construction has taken more than a decade, held back at times by significant technological, environmental, and logistical hurdles.

What Rambilli offers: Silence and stealth

Much like China's heavily fortified base on Hainan Island, the Rambilli facility is all about staying hidden.

The water depth in this area provides a natural cloak for submarines to enter and exit without detection. That stealth is vital for the success of India's nuclear deterrent. SSBNs—armed with long-range, nuclear-tipped missiles—must operate silently and invisibly during extended patrols.

India's undersea deterrent is still maturing. But Rambilli marks a big leap. For New Delhi, the ability to shield its second-strike capability from enemy eyes is not just strategic—it's existential.

INS Aridhaman joins the nuclear fleet

Meanwhile, the Indian Navy's underwater arsenal is also set to expand.

INS Aridhaman, India's third nuclear-powered submarine armed with ballistic missiles, is expected to be commissioned in 2025. With a displacement of 7,000 tonnes, it's larger than its two predecessors—INS Arihant and INS Arighaat—and capable of carrying more K-4 ballistic missiles, which have a range of 3,500 kilometres.

This addition will further cement India's nuclear triad, the ability to deliver nuclear weapons from land, air, and sea.

And there's more to come. A fourth SSBN is already under construction as part of the secretive ₹90,000 crore Advanced Technology Vessel (ATV) project. The plan eventually includes the development of 13,500-tonne SSBNs powered by more advanced 190 MW pressurised light-water reactors, up from the current 83 MW designs.

India is also moving ahead with six nuclear-powered attack submarines (SSNs), designed for conventional warfare. In October last year, the Cabinet Committee on Security cleared the construction of the first two such SSNs, each weighing around 9,800 tonnes, with a budget of ₹40,000 crore.

Karwar: The Other Power Centre

While Rambilli secures India's eastern flank, the western coast isn't being ignored.

Defence Minister Rajnath Singh recently inaugurated new operational, repair, and logistics infrastructure at Karwar, under Project Seabird, with investments worth over ₹2,000 crore. These upgrades provide the Navy with vital strategic depth and flexibility, particularly in relation to Pakistan.

"Phase-IIA of Project Seabird will enable Karwar to berth 32 warships," said a defence official. "The inner harbour is ready. Work on the outer harbour, with the requisite breakwaters and jetties, is in progress."

Karwar, already home to more than a dozen major warships, is rapidly scaling up. Once Phase-IIB is completed, the 25-km-long base will be capable of accommodating 50 warships and submarines and 40 auxiliary craft. This will also help decongest the heavily used Mumbai harbour.

The base includes a dual-use naval air station, a full-fledged dockyard, covered dry berths, and complete logistics support for ships and aircraft.

A Strategic Squeeze in the East

India's moves come at a time of heightened concern about Chinese military activity closer to its eastern borders.

New Delhi is reportedly studying intelligence suggesting that China may help Bangladesh build an airfield in Lalmonirhat, in northwestern Bangladesh, not far from India's strategic Siliguri Corridor, or "Chicken's Neck." The narrow stretch of land links the rest of India to its northeastern states and is bordered by four countries—Nepal, Bangladesh, Bhutan, and China.

While no Chinese jets have yet been stationed in India's eastern neighbourhood, even the possibility raises eyebrows.

"Any such proposal has serious security implications for India as the entire northeast, Sikkim and West Bengal will be vulnerable," say Bangladesh watchers.

India’s security concerns in this region are already amplified by China’s expanding presence in the Indian Ocean and infrastructure projects across South Asia. The proposed Lalmonirhat airfield could further tilt the balance.

Adding to the regional churn, Pakistan is also stepping up diplomatic engagement with Bangladesh.

Pakistani Foreign Minister Ishaq Dar is scheduled to visit Dhaka on April 24, with Foreign Secretary Amna Baloch visiting earlier on April 17. These will be the first high-level visits from Pakistan to Bangladesh since 2012, with several agreements likely to be signed.

The commissioning of Rambilli and expansion of Karwar are more than just military milestones—they’re a message.

In an increasingly crowded and contested Indo-Pacific, India is reinforcing its place as a major maritime power. Nuclear submarines, hidden bases, advanced reactors, and dual-coast naval hubs—all of it points to a shift in doctrine and design: silent strength.

And while submarines patrol the deep and airfields rise near borders, one thing is clear—India is preparing, quietly but firmly, for the long game.

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Electronic surveillance system being deployed to safeguard country's borders: Home Minister during visit to IB

Source: The Economic Times, Dt. 07 Apr 2025,
URL: https://economictimes.indiatimes.com/news/defence/electronic-surveillance-system-being-deployed-to-safeguard-countrys-borders-home-minister-during-visit-to-ib/articleshow/120062574.cms

Union Home Minister Amit Shah on Monday said the government is deploying an electronic surveillance system to safeguard the country's borders and that technology will be used to detect and dismantle underground cross-border tunnels to thwart infiltration by terrorists into Jammu and Kashmir. Addressing BSF personnel during a visit to Border Outpost 'Vinay' near the International Border in the Hiranagar sector of Kathua district, Shah lauded the contribution of the force and praised the troops for performing their duties in challenging circumstances.

"We are deploying the electronic surveillance system on the borders, having two models. ..if anything happens (from the enemy side), you will be able to respond immediately," he said.

He said technology will also help to increase accessibility. "And at the same time, to identify and dismantle underground tunnels, technical means would be put in place," the home minister said.

He commended the dedication and devotion of the BSF in safeguarding the borders throughout the year and said "the real challenge is understood only when one visits the place".

"In cold, rain or extreme heat when temperatures cross 45 degrees Celsius, you remain on guard 365 days and 24 hours on the forward posts keeping an eye on enemy activities.

"The BSF has a glowing history and the entire nation knows their role in safeguarding the nation," he said, adding that in the past wars with Pakistan, the BSF's contribution was similar to the army's.

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India to seal Rs 63,000-crore deal with France for 26 Rafale M Jets for Navy

Source: India Today, Dt. 07 Apr 2025,
URL: https://www.indiatoday.in/india/story/central-government-rafale-m-jet-defence-deal-france-indian-navy-2705408-2025-04-07

The Ministry of Defence is set to finalise a major Rs 63,000-crore deal this month to acquire 26 Rafale M fighter jets, which is the naval variant of France's Rafale, for the Indian Navy.

Sources indicate that the deal is in its final stages, with the Cabinet Committee on Security (CCS), led by the Prime Minister, expected to give its approval in the coming weeks.

This government-to-government contract will include 22 single-seater and four twin-seater jets, along with a comprehensive package for fleet maintenance, logistical support, personnel training, and indigenous manufacturing components under offset obligations. The deal also includes training for Navy personnel.

Deliveries of the Rafale M jets are expected to begin approximately four years after the deal is signed. The Indian Navy is likely to receive the first batch by the end of 2029, with the entire order set to be completed by 2031.

These advanced fighter jets will operate from India's aircraft carriers, INS Vikramaditya and the indigenous INS Vikrant, replacing the ageing MiG-29K fleet.

The Rafale M, specifically designed for carrier-based operations, is equipped with reinforced landing gear, arrester hooks, and a strengthened frame to perform Short Take-Off But Arrested Recovery (STOBAR) operations -- the method used for launching and recovering aircraft from carriers.

Optimised for India's maritime requirements, these jets are capable of carrying advanced missiles such as the Meteor, Exocet, and Systme de Croisire Autonome Longue Porte (SCALP), enabling versatile combat capabilities.

With its Active Electronically Scanned Array (AESA) radar and the Spectra electronic warfare suite, the Rafale M offers superior target detection, stealth, survivability, and electronic countermeasures. It can reach speeds of up to Mach 1.8, has a combat range exceeding 1,850 km, and features mid-air refuelling capability for extended operational endurance.

In addition to the Rafale M acquisition, India also plans to construct three Scorpene-class submarines under Project-75, in collaboration with Mazagon Dock Shipbuilders Limited (MDL) and France's Naval Group. These submarines will bolster India's underwater combat strength and

supplement the Navy's long-term procurement plans, further enhancing the country's defence capabilities.

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INS Sahyadri docks in Colombo amid high-level India-Sri Lanka engagements

Source: ANI News, Dt. 07 Apr 2025,
URL: https://www.aninews.in/news/world/asia/ins-sahyadri-docks-in-colombo-amid-high-level-india-sri-lanka-engagements20250407174818/

In a display of deepening maritime cooperation between India and Sri Lanka, the Indian Navy's indigenously-built warship, INS Sahyadri, arrived at the port of Colombo as part of its mission deployment in the Indian Ocean Region (IOR), an official press release by the Indian Navy stated.

The warship, part of the Eastern Fleet, is on an operational visit that reinforces the shared commitment of both nations to maritime security, regional collaboration, and environmental protection.

During its stay in Colombo, personnel from the Indian and Sri Lankan navies will participate in a series of joint activities designed to enhance operational interoperability. These include professional exchanges, joint drills, and knowledge-sharing sessions aimed at fostering mutual understanding and boosting synergy between the two naval forces, the press release stated.

The visit is expected to significantly strengthen naval diplomacy and promote a spirit of camaraderie among maritime professionals from both countries.

The presence of INS Sahyadri in Colombo further reflects India's continued focus on its 'Neighbourhood First' and MAHASAGAR (Security and Growth for All in the Region) initiatives.

The Indian Navy, through such sustained outreach, remains committed to regional stability and fostering close ties with partner nations in the Indo-Pacific.

Earlier this week, Prime Minister Narendra Modi paid tribute at the Indian Peace Keeping Force (IPKF) Memorial in Sri Jayawardenapura Kotte, near Colombo. During the solemn ceremony, he honoured the courage and sacrifice of Indian soldiers who lost their lives while serving for peace, unity, and the territorial integrity of Sri Lanka. The tribute formed part of his ongoing state visit to Sri Lanka--his first since 2019--undertaken at the invitation of Sri Lankan President Disanayaka.

Prime Minister Modi was accorded an unprecedented ceremonial welcome at Colombo's Independence Square, marking the first time Sri Lanka has extended such honours to a visiting leader.

His arrival in Colombo on Friday followed his participation in the BIMSTEC Summit in Thailand, where he held key bilateral meetings with regional counterparts, including the Prime Ministers of Thailand and Bhutan.

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Army to equip T-72, T-90 tanks with self-protection systems to detect, destroy attack drones

Source: The Tribune, Dt. 07 Apr 2025,
URL: https://www.tribuneindia.com/news/india/army-to-equip-t-72-t-90-tanks-with-self-protection-systems-to-detect-destroy-attack-drones/

Faced with growing threats from drones and loiter munitions that are now dominating the contemporary battle space, the Indian Army is set to procure Counter-Unmanned Aircraft System (C-UAS) to protect its tanks.

The Army plans to procure an initial consignment of 75 C-UAS, that would be retrofitted on its T-72 and T-90 tanks. The project is expected to be completed within 36 months.

According to a Request for Information (RFI) issued by the Ministry of Defence om April 5, “The current conflicts have highlighted that anti-tank threat is not limited to frontal arc. The proliferation of various types of Unmanned Aircraft Systems (UAS) has made the threat omnidirectional.”

Since the tank design based is based on the equilateral triangle of lethality, mobility, and survivability, and offers limited scope for enhancing armour protection, the Army believes that there is an urgent requirement of equipping the current generation of tanks with a platform-based C-UAS to defeat drones.

The Army has a fleet of about 1,650 T-90 tanks with another 460 on order, and over 2,400 older generation T-72 tanks, both of Russian/Soviet origin. While these tanks are heavily armoured and equipped with explosive reactive panels to deflect threats from traditional weapons like rockets and anti-tank missiles, they are small rectangular canisters attached to the tanks hull and turret which explode when a projectile hits them, destroying it before it can penetrate the tank's armour.

The C-UAS can detect all types of flying objects, such as first-person view drones, swarm drones, loitering munitions, and kamikaze drones, through active, passive, or hybrid detection methods. The systems include both soft kill measures, like jamming the UAS' radio links, and hard kill options, like integration with the anti-aircraft machine gun mounted on the tanks.

These systems should function effectively across India's environmental conditions prevailing, including deserts, plains, and high-altitude regions, under all-weather and day-night conditions.

In addition, the system should be lightweight, modular, and should not compromise the operating capability of the tank and its crew. They must not require the removal of existing fitments or expose the crew to harmful radiation.

The Ministry of Defence is looking at original equipment manufacturers, defence public sector undertakings, and private industry players under the Make in India initiative for production of these systems.

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दक्षिण कोरिया भारत को देगा 100 अत्याधुनिक K9 वज्र T तोपें, चीन की सीमा पर होगी तैनाती, ड्रैगन सेना की अब खैर नहीं

Source: NavBharat Times, Dt. 07 Apr 2025,
URL: https://navbharattimes.indiatimes.com/world/asian-countries/india-south-korea-sign-pact-for-k9-vajra-t-next-generation-artillery-to-enhance-indian-army-power/articleshow/120054797.cms

भारत और दक्षिण कोरिया ने नेक्स्ट जेनरेशन तोप बनाने के लिए ऐतिहासित समझौता किया है। इस सौदे के तहत भारतीय सेना के लिए अगली पीढ़ी के विनाशक तोपों का निर्माण किया जाएगा। 3 अप्रैल 2025 को दक्षिण कोरियाई कंपनी हनवा एयरोस्पेस ने भारतीय कंपनी लार्सन एंड टुब्रो (L&T) के साथ 253 मिलियन डॉलर का अनुबंध किया है, जिसके तहत भारतीय सेना के लिए 100 अतिरिक्त K9 वज्र–T ऑटोमेटिक होवित्जर तोपों के लिए कंपोनेंट्स की आपूर्ति की जाएगी। भारत और दक्षिण कोरिया के बीच हुई इस रक्षा साझेदारी ने आधुनिक तोपखाने प्रणालियों के क्षेत्र में एक महत्वपूर्ण मील का पत्थर स्थापित किया है। यह सहयोग न सिर्फ भारतीय सेना की मारक क्षमता को बढ़ाएगा, बल्कि 'मेक इन इंडिया' पहल के तहत स्वदेशी उत्पादन को भी अगले स्तर पर ले जाएगा।

नई दिल्ली में दक्षिण कोरियाई दूतावास में इस सौदे पर दस्तखत किए गये हैं। यह समझौता दोनों कंपनियों के बीच चल रही साझेदारी के लिए एक महत्वपूर्ण कदम है और 2017 के पिछले अनुबंध पर आधारित है, जिसमें 100

इकाइयों के शुरुआती बैच की डिलीवरी की गई थी। यह सौदा, जो भारत में स्थानीय उत्पादन को 50 प्रतिशत से बढ़ाकर 60 प्रतिशत करता है, सियोल और नई दिल्ली के बीच गहरे होते रक्षा संबंधों को दिखाता है।

कितना विनाशक है भारत का K9 Vajra–T

के9 वज्र–टी, दक्षिण कोरिया की के9 थंडर का भारतीय वैरिएंट है। इसे भारतीय सेना की जरूरतों के मुताबिक ढाला गया है। यह 155 मिमी/52–कैलिबर की ऑटोमेटिक होवित्जर तोप है, जो विस्तारित रेंज के गोला–बारूद के साथ 50 किलोमीटर तक की दूरी तक मार करने में सक्षम है। इसकी उच्च फायरिंग दर और गतिशीलता इसे आधुनिक युद्धक्षेत्र में अत्यंत प्रभावी बनाती है। भारतीय सेना ने फील्ड आर्टिलरी रेशनलाइजेशन प्लान (FARP) के तहत, विभिन्न प्रकार की 155 मिमी तोपों की खरीद और विकास का लक्ष्य रखा है। इस योजना में करीब 3,000 से 3,600 तोपों की खरीद शामिल है, जिसमें टोव्ड, माउंटेड, स्वचालित पहिएदार और ट्रैक्ड होवित्जर शामिल हैं। के9 वज्र–टी की खरीद इस योजना का एक महत्वपूर्ण हिस्सा है, जो सेना की मारक क्षमता और गतिशीलता को बढ़ाने में मदद करेगी।

यह तोप से हर 15 सेकंड में तीन राउंड की बर्स्ट फायरिंग और तीन मिनट में छह से आठ राउंड प्रति मिनट की अधिकतम फायरिंग दर प्राप्त कर सकती है। इसके अलावा 1,000 हॉर्सपावर के इंजन के साथ, यह 67 किमी/घंटा की अधिकतम गति और 360 किमी की परिचालन रेंज प्रदान करती है। भारतीय सेना की योजना के मुताबिक के9 वज्र–टी होवित्जर की कुल संख्या 300 तक पहुंचाने की संभावना है, जिसमें भविष्य में और 100 इकाइयों की खरीद शामिल हो सकती है। इसके अलावा, इन तोपों को उच्च ऊंचाई वाले क्षेत्रों में तैनात करने की भी योजना है, जिसके लिए कई और संशोधन और टेस्ट करने होंगे। इसे हिमालयी क्षेत्र में ऑपरेशन के लिए अनुकूलित किया जा रहा है, ताकि माइनस 30 डिग्री सेल्सियस में भी ये तोप प्रभावी बना रहे।

भारतीय सेना अपनी तोपखाने क्षमताओं का लगातार विस्तार कर रही है। के9 वज्र–टी होवित्जर की खरीदारी इस योजना का ही एक महत्वपूर्ण हिस्सा है। इसके अलावा, सरकार ने हाल ही में 307 एडवांस टोएड आर्टिलरी गन सिस्टम (ATAGS) की खरीद को भी मंजूरी दी है, जो स्वदेशी रूप से विकसित की गई हैं। यह कदम भी 'आत्मनिर्भर भारत' पहल के तहत रक्षा उत्पादन में स्वदेशीकरण को बढ़ावा देने की दिशा में है। इस सौदे के तहत तोपों का उत्पादन गुजरात के हजीरा में एलएंडटी के आर्मर्ड सिस्टम कॉम्प्लेक्स में किया जाएगा।

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पाकिस्तानी एयरफोर्स होगी इंडिया से मजबूत... पाक एक्सपर्ट का 5वीं पीढी के जेट पर बड़ा दावा, भारत के लिए खतरा?

Source: NavBharat Times, Dt. 07 Apr 2025,
URL: https://navbharattimes.indiatimes.com/world/pakistan/pakistan-air-force-poised-to-outpace-iaf-with-5th-generation-aircraft-says-retired-paf-air-commodore/articleshow/120069467.cms

पाकिस्तान की वायुसेना (PAF) बेहतर लड़ाकू विमानों के जरिए भारतीय एयरफोर्स से बेहतर होने जा रही है। इतना ही नहीं पाकिस्तानी एयरफोर्स की भारत पर ये बढ़त अगले करीब डेढ़ दशक तक जारी रहेगी। ये दावा PAF के रिटायर एयर कमोडोर जाहिद उल हसन ने किया है। हसन ने द एक्सप्रेस ट्रिब्यून से बात करते हुए कहा कि पाक

अपनी हवाई ताकत को बढ़ाने के लिए 5वीं पीढ़ी के नए विमान खरीद रहा है। दूसरी ओर भारतीय वायुसेना में उलझन है। ऐसे में PAF अगले 10 से 15 सालों तक इंडियन एयरफोर्स (IAF) से बेहतर रहेगी।

हसन का मानना है कि PAF अपनी 5वीं पीढ़ी के विमानों को पूरी तरह से इस्तेमाल करने पर ध्यान दे रही है। हसन ने कहा कि IAF अपनी वायुसेना को आधुनिक बनाने में मुश्किलों का सामना कर रही है। वह इस चीज में फंसी है कि घर में जेट बनाए जाएं या तुरंत जरूरत को पूरा करने के लिए विदेश से विमान खरीदें। हालांकि देश में विमान बनाने में भी देरी हो रही है और भारत की विदेश से विमान खरीदने की प्रक्रिया भी धीमी है।

चीन के साथ किया है समझौता

PAF के चीफ एयर चीफ मार्शल जहीर अहमद बाबर ने बीते साल बताया था कि पाकिस्तान की चीन से शेनयांग FC-31 (इसे J-31 या J-35 भी कहते हैं) खरीदने की डील की है। पाकिस्तान ने 5वीं पीढ़ी के 40 विमान खरीदने का समझौता चीन से किया है। ये विमान अगले दो सालों में पाकिस्तान को मिल जाएंगे। J-35 को अमेरिका के F-35 जैसे विमानों को टक्कर देने के लिए बनाया गया है।

हसन का कहना है कि कि 5वीं पीढ़ी के विमानों को खरीदकर और लंबी दूरी के हथियारों पर ध्यान देकर IAF से आगे निकल जाएगी। PAF के पास पहले से ही JF-17 थंडर ब्लॉक III विमान हैं, जो उसने चीन के साथ मिलकर बनाए हैं। हसन ने यह भी कहा कि चीन 6वीं पीढ़ी के विमान बना रहा है, जो IAF की चिंता को बढ़ाता है। हसन का कहना है कि PAF अगले 10 से 15 सालों तक IAF से बेहतर रहेगी।

भारत के लिए चिंता की बात!

IDRW की रिपोर्ट कहती है कि पाकिस्तान के जाहिद हसन का दावा IAF के लिए एक चेतावनी है। अभी तक IAF के पास PAF से ज्यादा विमान हैं। IAF के पास 2,229 विमान तो PAF के पास 1,399 जेट हैं लेकिन उसके पुराने विमान और आधुनिकीकरण में देरी से उसकी हवाई ताकत कमजोर हो सकती है। खासतौर से चीन से मिलने वाले विमान पाकिस्तानी एयरफोर्स की ताकत में बड़ा इजाफा कर सकते हैं।

चीन से पाकिस्तान को J-35 फाइटर जेट मिलने जा रहा है। चीन इसे फिफ्थ जेनरेशन फाइटर जेट बताता है। इस जेट में रडार को चकमा देवने के लिए एडवांस सेंसर का इस्तेमाल किया गया है। ये एक ट्विन इंजन स्टील्थ फाइटर जेट है, जिसे स्ट्राइक मिशन के लिए डिजाइन किया गया है। पाकिस्तानी एयरफोर्स साल 2030 तक करीब 50 जे-35 लड़ाकू विमान को अपने बेड़े में शामिल करना चाहती है। इससे पाकिस्तानी एयरफोर्स को भारतीय एयरफोर्स पर बढ़त मिल सकती है।

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Indian Army To Deploy Three Indigenous Next-Gen Air Defense Systems To Cover Full Spectrum Of Aerial Threats

Source: The EurAsian Times, Dt. 07 Apr 2025,
URL: https://www.eurasiantimes.com/indian-army-to-field-three-fully-indigenous/

The Indian Army (IA) is set to bolster its air defense capabilities by inducting three advanced, fully indigenous systems that cover the full spectrum of aerial threats. These include the Indo-Israeli MRSAM (Medium Range Surface-to-Air Missile), the indigenously developed QRSAM (Quick

Reaction Surface-to-Air Missile), and the VSHORADS (Very Short Range Air Defence System). Together, these systems reflect technical excellence and mark a significant milestone in the maturity of DRDO's air defense missile development.

MRSAM

The Indian Army's Eastern and Southern Commands, under DRDO guidance, successfully conducted four operational flight tests of the MR-SAM system on April 3 and 4 from Dr APJ Abdul Kalam Island off the Odisha coast. "The missiles intercepted and destroyed high-speed aerial targets with direct hits. The trials validated the system's performance against targets at long range, short range, high altitude, and low altitude," a defense ministry official said.

"These tests have demonstrated the operational readiness of both Army commands and paved the way for inducting the MR-SAM system into two regiments," the official added. Previously, on March 30, 2022, the MR-SAM Army variant completed its development trials following a series of successful tests at the Integrated Test Range, Chandipur, Odisha.

MRSAM Induction

According to The Times of India, the Army operationalized its first 'Abhra' MR-SAM regiment in February 2023 under the 33 Corps, tasked with defending the frontier with China in Sikkim and the strategically vital Siliguri Corridor. Each MR-SAM system consists of a command-and-control unit, tracking radar, mobile launchers, and surface-to-air missiles. Eventually, five MR-SAM regiments are planned for deployment along the borders with China and Pakistan, with each regiment equipped with eight launchers carrying eight missiles each.

The MR-SAM systems are set to replace the aging Russian-made Kvadrat and OSA-AKM systems, which were inducted between the 1970s and 1980s.Image

MRSAM – Ballistic Missile Integration

It's likely that the Army variant of the MRSAM will eventually be integrated with the ballistic missile defense system being developed by the DRDO. The colocation of S-400 IADS and MRSAM squadrons at the IAF base in Adampur may aim to integrate the IAF MRSAM variant with the S-400 system.

(On an aside, the IAF MRSAM system differs from the IA MRSAM. IAF MRSAM systems are semi-static – the radars and launchers are mounted on trailers and optimally deployed for maximum efficiency. The IA MRSAM systems are mobile – the radars and launchers are mounted directly on Tata LPTA 3138 8×8 HMVs).

System Capabilities

The MRSAM system employs a vertically launched missile with an active radar seeker and a dual-pulse, smokeless solid-fuel motor, enhancing stealth and endgame maneuverability. The Indian Air Force (IAF) and Indian Navy (IN) MRSAM variants both have a 70 km range, while the Indian Army (IA) variant is reported to have a shorter 50 km range. This reduced range, if accurate, likely stems from mobility constraints, as the Army variant integrates its radar and launchers onto mobile platforms. All three variants—IN, IAF, and IA—use the same missile and radar systems

(LBMFSTAR, EL/M-2084). However, the Army's radar, mounted on a Tata LPTA 3138 8×8 high-mobility vehicle (HMV), may face range limitations due to restricted electrical power and terrain challenges.

The Army MRSAM, designed to replace systems like Kvadrat and OSA-AKM, operates from mobile-tracked vehicles to protect mechanized formations on the move. It was showcased during the Republic Day Parade in 2024, highlighting its launcher and radar on the Tata 8×8 HMV platform.

QRSAM

The Quick Reaction Surface-to-Air Missile (QRSAM) is an area defense system designed for search-on-move, track-on-move, and fire-on-short-halt operations, engaging multiple targets up to 30 km. It operates with a two-vehicle configuration: a fully automated Command and Control System, an Active Array Battery Surveillance Radar (BSR), an Active Array Battery Multifunction Radar (BMFR), and a Launcher. Both radars are four-walled, AESA (Active Electronically Scanned Array) systems with 360-degree coverage, using GaN technology and Quad Transmit and Receive Modules (QTRMs) for electronic warfare resistance. Mounted on 8×8 High Mobility Vehicles (HMVs), they feature advanced platform motion compensation, electronic stabilization algorithms, and high-accuracy motion sensors, enabling operations in plains, deserts, and semi-deserts while on the move.

The single-stage missile employs an Inertial Navigation System (INS) with a two-way data link for midcourse guidance and an active Radio Frequency (RF) seeker for terminal guidance. Reports suggest the QRSAM could integrate an indigenous optical system for passive target acquisition. The DRDO's Instruments Research and Development Establishment (IRDE) has developed the Stabilised Electro-Optical Sight (SEOS), a two-axis stabilized panoramic sight mountable on mobile platforms like tanks, boats, or aircraft.

The SEOS, capable of passively acquiring targets up to 40 km, includes a laser range finder, CCD camera, thermal imager, and automatic video tracker. Hyderabad-based VEM Technologies has been tasked with manufacturing these systems for the Ministry of Defence. The SEOS could also support the Akash-NG missile system. While foreign equivalents cost around Rs. 12 crore, the indigenous SEOS is estimated at Rs. 2 crore, offering significant cost savings.

QRSAM Development Status

The QRSAM system was last tested in September 2022 as part of evaluation trials by the Indian Army. During the trials, six missiles were launched from Integrated Test Range (ITR) Chandipur off the Odisha coast against high-speed aerial targets mimicking various types of threats to evaluate the capability of the weapon systems under different scenarios, including long-range medium altitude, short-range, high altitude maneuvering target, low radar signature with receding & crossing target and salvo launch with two missiles fired in quick succession.

These tests were conducted in the final deployment configuration, which consists of all indigenously developed subsystems, including the missile with indigenous Radio Frequency (RF) seeker, mobile launcher, fully automated command and control system, surveillance, and multi-function Radars.

However, the fact that no orders have been placed for the system, nor have there been any follow-up tests, suggests that DRDO is likely addressing some technical shortcomings with the system brought to light by the IA. If such a technical issue exists, it's unlikely to be a showstopper since several media reports indicate that the IA is poised to place its first order for the QRSAM system.

VSHORADS

The DRDO-developed Very Short Range Air Defence System (VSHORADS) is optimized to counter low-altitude aerial threats. It is man-portable and tripod-launched, not shoulder-fired, though its technologies and subsystems could support the development of an indigenous shoulder-fired air defense missile.

Designed and developed by DRDO's Research Centre Imarat (RCI) in Hyderabad, in collaboration with other DRDO labs and two Development-cum-Production Partners (DcPPs), the VSHORADS has involved the Indian Army, Navy, and Air Force from the outset, with all three services participating in its developmental trials.

System Capabilities

The VSHORADS missile, developed by DRDO, features an Imaging Infrared (IIR) seeker and a hit-to-kill warhead. It incorporates advanced technologies, including a miniaturized Reaction Control System (RCS) and a dual-thrust solid motor, enhancing endgame maneuverability. The missile measures 2 meters in length, 0.09 meters in diameter, and weighs 21 kg.

It can engage targets at ranges of 6–7 km and achieve a top speed of Mach 1.5. While its speed and range are less than those of the Russian Igla-S or the US Stinger missiles, VSHORADS shares the Stinger's dual-pulse motor and hit-to-kill warhead, potentially making it more lethal than the Igla-S currently used by the Indian Army. Overall, VSHORADS is a capable system with room for progressive enhancements by DRDO. Its design is highly optimized for portability, ensuring ease of use in the field.

VSHORADS Development Status

The development of VSHORADS missiles has been completed, and two production agencies have been engaged in the Development cum Production Partner (DcPP) mode.

The missile was last tested on February 2, 2025, when it successfully engaged high-speed targets flying at very low altitudes in three consecutive trials. The flight tests were carried out in the final deployment configuration, where two field operators carried out weapon readiness, target acquisition, and missile firing.

Akash NG

Besides the three missiles discussed above, the IA is also actively inducting the indigenously developed Akash AD systems. The latest Akash missile variant—Alash NG—is undergoing development trials. Like the QRSAM, it is an area defense missile with a 30 km range. However, because of its dual pulse capability, it is likely to be more lethal.

Conclusion

The Indian Army is poised to field a comprehensive, multi-tiered air defense shield built entirely around indigenously developed and manufactured missile systems. This layered architecture will enhance protection against a wide range of aerial threats—from high-speed fighters and UAVs to cruise missiles—reflecting a significant leap in self-reliant defense capability. It also marks a major milestone in India's efforts to reduce dependence on foreign-origin air defense platforms.

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'War in the Atlantic': Russian spy devices found tracking UK's nuclear submarines, internet cables

Source: The Economic Times, Dt. 07 Apr 2025,
URL: https://economictimes.indiatimes.com/news/defence/war-in-the-atlantic-russian-spy-devices-found-tracking-uks-nuclear-submarines-internet-cables/articleshow/120058209.cms

British military officials have discovered covert Russian sensors in waters surrounding the United Kingdom, sparking urgent concerns about national security. Some of the devices are believed to have been monitoring the UK's four Vanguard-class submarines, which carry the nation's nuclear arsenal. The findings, initially kept from public view, were first reported by The Sunday Times.

"There should be no doubt, there is a war raging in the Atlantic," a senior military source told The Sunday Times. "This is a game of cat and mouse that has continued since the ending of the Cold War, and is now heating up again. We are seeing phenomenal amounts of Russian activity."

The surveillance efforts have been interpreted as part of an evolving Russian campaign to undermine Western defences—without ever declaring war.

Moscow's 'greyzone' strategy

Officials suspect these sensor deployments are part of Russian President Vladimir Putin's so-called greyzone strategy. This involves covert, often deniable actions such as interfering with underwater cables and sabotaging infrastructure, all designed to destabilise opponents without triggering direct confrontation.

In the past 15 months, at least 11 deep-sea communication cables in the Baltic Sea have suffered damage. According to defence sources, these incidents likely involved deliberate seabed interference—possibly carried out by ageing tankers from Putin's shadow fleet, which are often used to bypass sanctions.

"You really need to keep the [engine] power on to drag, so it is a deliberate act," a defence insider told The Sunday Times.

Threat extends beyond submarines

Military teams have also tracked unmanned Russian vessels near seabed communication lines that connect the UK to global networks. Notably, there are 60 internet cables linked to Britain—some of which are not disclosed to the public for security reasons.

Adding to the suspicions, British intelligence has gathered evidence that superyachts owned by Russian oligarchs have been involved in undersea surveillance operations. These luxury vessels reportedly carry sophisticated equipment to scan and probe underwater infrastructure while avoiding detection.

“Taking it out of the greyzone”

Captain Simon Pressdee, a senior officer aboard the Royal Navy’s specialist surveillance ship RFA Proteus, said the UK’s mission is both defensive and investigative.

“Our role is to both defeat any threats to the UK as well as take it out of the greyzone,” Pressdee said. “We do the latter by understanding who is involved and providing that evidence to avoid misunderstandings and make those who threaten the UK accountable for their actions.”

Rising Russian activity prompts new defence push

In response, the Royal Navy has launched Atlantic Bastion, a wide-ranging plan to guard British and North Atlantic waters. The effort includes the deployment of air, surface, and subsea drones and sensors designed to detect foreign incursions.

A fast-tracked sub-project, codenamed Project Cabot, will partner with private energy and communications firms that rely on undersea infrastructure. The goal is to share resources and intelligence to better defend cables, pipelines, and communication hubs from tampering or attack.

Calls to revive Cold War tactics

Behind closed doors, some Royal Navy insiders believe the UK should go further. There are renewed discussions about reintroducing Cold War-era sea mines around sensitive zones. This controversial strategy has not been used for decades, but some argue it may now be necessary to deter persistent undersea threats.

Ministry of Defence: “We’re strengthening our response”

The Ministry of Defence acknowledged the growing risks and outlined plans to step up coordination with allies and harness emerging technologies. “We are committed to enhancing the security of critical offshore infrastructure,” a spokesperson for the MoD said.

“Alongside our NATO and Joint Expeditionary Force allies, we are strengthening our response to ensure that Russian ships and aircraft cannot operate in secrecy near the UK or near NATO territory, harnessing new technologies like AI and coordinating patrols with our allies.”

The spokesperson added: “Our continuous-at-sea nuclear deterrent continues to patrol the world’s oceans undetected as it has done for 56 years.”

Russian naval presence in and around British waters is not a new phenomenon. But what is new is the scale, speed, and sophistication of these latest covert operations. The sudden visibility of spy sensors and unmanned Russian probes has brought these concerns into sharper focus. Britain is now racing to upgrade its defences beneath the waves—before another cable is cut or a line is crossed.

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Science & Technology News

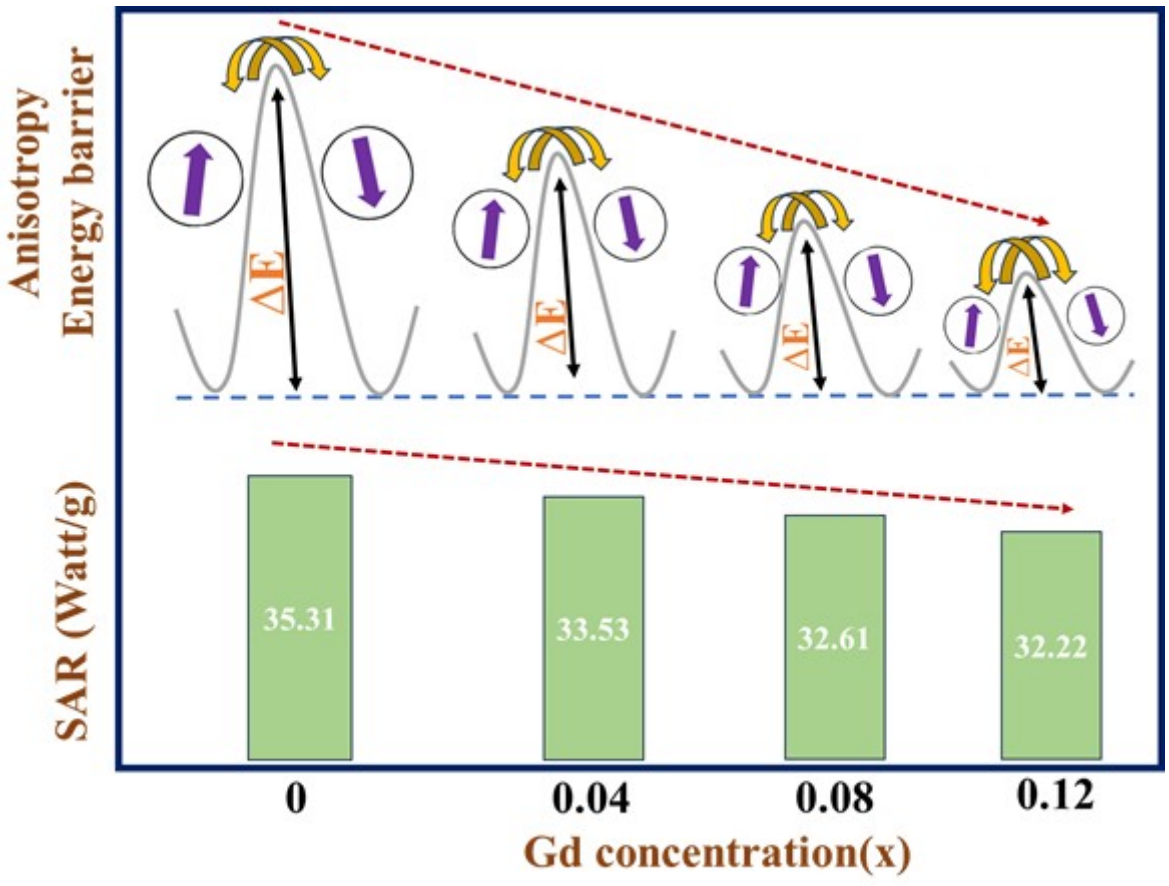
New magnetic nanoparticles may help treat Cancer

Source: Press Information Bureau, Dt. 07 Apr 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2119803

An efficient magnetic system has been developed with newly systhesised nanocrystalline cobalt chromite magnetic nanoparticles that can treat cancer by increasing temperature of tumour cells through a procedure called magnetic hyperthermia for treating cancer.

Cancer has been considered as one of the most threatening diseases for humanity. Of several available treatment methods, the most effective treatments for cancerous cells are radiation therapy, chemotherapy, targeted therapy, and stem cell transplant. All of the cancer treatment methods have demonstrated multiple side effects.

Chemotherapy and radiation treatments can lead to nausea, exhaustion, hair loss, and an elevated risk of infection. Although targeted medicines have demonstrated efficacy, they may not be appropriate for all cancer forms and may require following specific conditions. Most cancer treatments are costly and hence may be inaccessible to many.



[Gd doped cobalt chromite magnetic nanoparticles]

Nanomagnets have opened up a targeted heat generation process (hyperthermia) that can be used in treating cancer cells with comparatively less side effects and is controlled by the magnetic field from outside. Tuning the physical properties of nanomagnets is essential to make them usable for hyperthermia applications. Due to the direct impact of various physical parameters of nanomagnets on the self-heating efficacy, it is challenging to create and control biofriendly coated magnetic nanoparticles with an effective heat generation efficiency.

A team of scientists from Institute of Advanced Study in Science and Technology (IASST), an autonomous institute of Department of Science and Technology (DST), Govt. of India led by Prof. Devasish Chowdhury in collaboration with NIT Nagaland synthesized nanocrystalline cobalt chromite magnetic nanoparticles with varying rare-earth Gd dopant contents using the conventional chemical co-precipitation route.

These magnetic nanoparticles' inhomogeneous in fluid form was used further to generate heat under the applied alternating magnetic field subjection. The heat generation method of magnetic nanoparticles can be used in treating cancer cells by elevating the cell temperature up to 46oC for a specific duration, causing necrosis in the injured cells when applied to particular cancer locations. Thus, superparamagnetic nanoparticles act as nano-heaters and can potentially be utilized in magnetic hyperthermia applications for treating cancer and offering alternative cancer therapy.

This research by the team consisting of Dr. Mritunjoy Prasad Ghosh, National Post-Doctoral Fellow (N-PDF) and Mr. Rahul Sonkar research scholar from IASST Guwahati was recently published in Nanoscale Advances, a peer-reviewed journal of the Royal Society of Chemistry, UK.

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Explainer: ISRO’s mission possible: Debris-free space

Source: The Tribune, Dt. 08 Apr 2025,
URL: https://www.tribuneindia.com/news/india/explainer-isros-mission-possible-debris-free-space/

The Indian Space Research Organisation (ISRO) has achieved a milestone by demonstrating sustainable space operations. On April 4, as part of India’s vision to ensure Debris-Free Space Missions (DFSM) by 2030, it brought back the rocket used for the Space Docking Experiment (SpaDeX) mission.

ISRO managed the successful disposal of the residual part of the PSLV-C60 rocket that was launched in December 2024. The specially configured upper stage of PSLV-C60 was brought back into the Earth’s atmosphere and descended into the Indian Ocean without leaving a trail of junk in space.

What is space debris

Space debris is any non-functional object humans leave in space. It can come from rocket-launching material and defunct satellites or from metal, screws, paint flakes, and other smaller items. The European Space Agency estimates that more than 1 million pieces of orbital debris a cm

or larger, and more than 30,000 pieces bigger than 10 cm, litter the low-Earth orbit (up to 2,000 km above the Earth's surface).

Potential risk

The orbital debris goes round the Earth at nearly 10 km per second and risks colliding with communication, monitoring and astronomy satellites. Experts say that even a single paint flake at that speed can damage or destroy a satellite.

Explosions in orbit, triggered by residual energy stored in fuel and batteries aboard spacecraft and rockets, are a significant source of debris. Spacecraft hit with debris can explode into thousands of shards and cascade the danger multiple times. Anti-satellite missile tests that destroy satellites also create such space debris.

Minimising damage

Increasing government and private space traffic is pushing up the combined mass and area taken up by space trash. Current attempts to minimise debris formation and prevent crashes revolve around re-entry burn up exercises for spent spacecraft, and debris avoidance manoeuvres for satellite launches.

India's commitment

The DFSM initiative was announced by Somanath S, the then chairman of ISRO, at the 42nd Annual Meet of the Inter-Agency Space Debris Co-ordination Committee (IADC) at Bengaluru on April 16, 2024. The ISRO System for Safe and Sustainable Space Operations Management (IS4OM) was the nodal point in implementing the DFSM with the support of other entities of the Department of Space.

Miscalculations

Re-entry into the atmosphere is calculated to maximise the chances of the final fall over oceans, but mishaps do take place occasionally. In March last year, a battery pack released from the International Space Station landed on a home in Florida, USA. According to NASA, the hardware, which should have burnt up, survived re-entry into the Earth's atmosphere.

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Breakthrough Prize 2025: What to know about the awards dubbed 'Oscars of Science'

Source: The Indian Express, Dt. 07 Apr 2025,
URL: https://indianexpress.com/article/explained/explained-sci-tech/breakthrough-prize-2025-oscars-of-science-9930224/

The 2025 Breakthrough Prize in Fundamental Physics was awarded to 13,508 physicists across four collaborative projects at CERN, the European particle physics laboratory near Geneva, Switzerland. Dubbed the "Oscars of Science", the award was announced on Saturday (April 5) as

part of the 11th annual Breakthrough Prizes. Six prizes worth $3 million each were announced in Life Sciences, Mathematics and Fundamental Physics.

The ceremony held in Santa Monica, California, featured Hollywood celebrities such as Leonardo DiCaprio, Jodie Foster and Zoe Saldana, and tech royalty like Facebook co-founder Mark Zuckerberg, Amazon founder Jeff Bezos and OpenAI CEO Sam Altman.

What are the Breakthrough Prizes?

The awards were established in 2013 by Mark Zuckerberg and his wife Priscilla Chan, former Google chief Sergey Brin, genomics company 23&Me founder Anne Wojcicki, and tech investor couple Yuri and Julia Milner.

As part of its mission, the prize celebrates individual achievements and honours scientists as the heroes of society, aims to inspire the next generation of scientists, and pursues “science for the benefit of all as a global, apolitical organization.”

Breakthrough Prize In Life Sciences

The award in this category was given to three groups of scientists:

01. Weight-loss drugs

Five scientists who contributed to the development of the weight loss drugs, Ozempic and Wegovy, were awarded the Breakthrough Prize in Life Sciences. Daniel J. Drucker, Joel Habener, Jens Juul Holst, Lotte Bjerre Knudsen and Svetlana Mojsov were awarded the Prize for discovering and characterising the GLP-1 hormone, which aided the creation of drugs treating diabetes and obesity.

02. Multiple Sclerosis treatment

Multiple Sclerosis is an unpredictable chronic disease caused by the immune system attacking the protective sheath that covers nerve fibres of the central nervous system.

Alberto Ascherio and Stephen L. Hauser were awarded the Prize for identifying the role of the B-cells of the immune system in Multiple Sclerosis (MS) and devising treatments targeted at the same. The duo also established the Epstein-Barr virus infection as the leading cause of MS.

03. Gene-editing technologies

David R Liu was awarded the Prize for developing the base editing and prime editing technologies widely used to edit the DNA of living organisms. These are significant as they can edit the DNA without cutting its double helix, and rewrite entire stretches of defective DNA with a corrected version.

Breakthrough Prize In Fundamental Physics

The Breakthrough Prize in Fundamental Physics was awarded to four collaborations at the Large Hadron Collider (LHC) in CERN – ALICE, ATLAS, CMS and LHCb. The LHC is the world’s largest and most powerful particle accelerator, causing protons to accelerate and collide, thus helping scientists study the properties of matter. The four collaborations studied the Higgs boson, considered as elementary as electrons, photons or neutrinos. The Higgs boson, also known as the

'God Particle', is known to impart mass to every other particle, and is believed to help explain how the Big Bang happened 13.7 million years ago.

Thus, the collaborations studied the Higgs boson to understand how they impart mass to fundamental particles. They also discovered new types of particles to understand the strong nuclear force, and tested fundamental theories by discovering new processes to understand why matter exists in the universe.

According to the award citation, the $3 million prize was awarded for their "detailed measurements of Higgs boson properties confirming the symmetry-breaking mechanism of mass generation, the discovery of new strongly interacting particles… and the exploration of nature at the shortest distances and most extreme conditions at CERN's Large Hadron Collider".

The ATLAS and CMS collaborations will receive $1 million each, while ALICE and LHCb will receive $500,000 each. The award recognises the 13,508 co-authors of publications based on LHC Run-2 data released between 2015 and July 15, 2024. The prize funds will be awarded in their entirety to the CERN & Society Foundation for the collaborations, to award grants to doctoral students from member institutes researching at CERN.

Breakthrough Prize In Mathematics

The Mathematics Breakthrough Prize was awarded to Dennis Gaitsgory for "his central role in the proof of the geometric Langlands conjecture." The Langlands program is described as a broad research program spanning several fields of mathematics, which grew out of a series of conjectures proposing precise connections between seemingly disparate mathematical concepts. The award recognises Gaitsgory's dedication of over three decades to this research, having developed new mathematical tools in derived algebraic geometry to prove a major foundational conjecture within that field.

Other Awards

The Breakthrough Prize Foundation also announced six New Horizons Prizes, each worth $100,000, to honour eight early-career physicists and mathematicians. Additionally, the foundation awarded the Maryam Mirzakhani New Frontiers Prize to three women mathematicians pursuing their PhD, each with a $50,000 cash award.

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ESA's satellite to monitor forests: Everything you need to know about the upcoming Biomass mission

Source: The Indian Express, Dt. 08 Apr 2025,
URL: https://indianexpress.com/article/explained/explained-sci-tech/esa-monitor-forests-biomass-9930561/

The European Space Agency's (ESA's) new mission, which will map the world's forests, will launch later this month. Known as the Biomass mission, it will provide information about the state

of the planet's forests and how they are changing, which will help expand the knowledge about the role forests play in the carbon cycle.

The mission will lift off on April 29 aboard the Vega C rocket from Europe's spaceport in French Guiana. It will be placed in a sun-synchronous orbit (SSO) — a type of orbit in which satellites are in sync with the Sun — at an altitude of around 666 km.

The Biomass is ESA's seventh Earth Explorer mission. Under the Earth Explorer programme, the space agency has launched satellites to observe different aspects of the planet's system.

What will the Biomass mission do?

Forests are an essential part of the world's carbon cycle as they store huge amounts of carbon. Scientists estimate that forests absorb around 16 billion metric tonnes of carbon dioxide (CO2) per year, and currently hold 861 gigatonnes of carbon in their branches, leaves, roots, and soils.

However, there is a lack of forest above-ground biomass — the total mass of living organisms located above the forest vegetation — and forest height data on a wide geographical scale. As a result, there is a limited understanding of the state of the forests, their contribution and impact on the carbon cycle and climate. The primary aim of the Biomass mission will be to tackle this knowledge gap.

Importantly, the mission will also allow scientists to more accurately measure how carbon levels are changing as humans continue to cut down trees and increase CO2 levels in the atmosphere. In 2023, there was a loss of 3.7 million hectares of tropical forests, equivalent to around ten soccer fields of forest lost every minute, according to a report by the World Resources Institute. "This forest loss produced roughly six percent of estimated global carbon dioxide emissions in 2023," the report said.

Simonetta Cheli, director of Earth Observation Programmes for ESA, told the Observer, "We need to know the health of our tropical forests… We need to know the quality and diversity of its vegetation and the amount of carbon stored there. To get that information we are going to create 3D images of them — from the top of the forest canopy to the roots of its trees."

Beyond forest monitoring, the Biomass mission will observe the movement of ice sheets in Antarctica, and generate digital models of terrains covered by dense vegetation.

How will the Biomass mission monitor forests?

To fulfil its objectives, the mission will use a synthetic aperture radar (SAR) — a satellite imaging technique which uses radar waves to map the Earth's surface. This SAR sensor will operate in the long-wave P-band frequency range, with a wavelength of 70 cm. Therefore, unlike other shorter-wave SAR sensors, the P-band SAR will be able to peer down through forest canopies to assess how much carbon is stored on the floor and branches of the trees in the world's forests and to assess how levels are changing. The sensor will also estimate the amount of forest biomass.

Notably, Biomass is the first satellite in the world to host a P-band SAR. The satellite is fitted with a huge 12 m antenna which will be deployed as it begins its sweep over the Earth.

Shaun Quegan, a researcher at Sheffield University (England) and the head of the Biomass science team, told The Guardian, “What the mission will do, effectively, is weigh the forests it studies… We know half that weight must be made up of carbon. So we are going to be able to weigh the carbon content of the world’s… forests from space and, crucially, work out how much these are changing over time. We will then know the balance of carbon that is flowing to and from the atmosphere. That is enormously important.”

What is the Earth Explore programme?

The satellites launched under this programme are meant to provide essential information about Earth’s interior, cryosphere (frozen parts), hydrosphere, atmosphere, ionosphere (home to all the charged particles in the atmosphere) and land surface.

The first spacecraft — the gravity field and steady-state Ocean Circulation Explorer (GOCE) mission — took off in 2009 and worked till 2013. The mission helped further research in areas of ocean circulation, physics of Earth’s interior, etc.

The most recent one was the Earth Cloud Aerosol and Radiation Explorer (EarthCARE) mission, which was launched in May 2024. It contributes to a better understanding of Earth’s radiative balance in climate, among other things.

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Sriharikota, we have a situation. Limited budget, manpower are stifling India’s space ambitions

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URL: https://theprint.in/science/sriharikota-we-have-a-situation-limited-budget-manpower-are-stifling-indias-space-ambitions/2579925/

India wants to land its first citizen on the Moon by 2040, build an International Space Station-like docking hub by 2035, and bring back lunar samples in the next five years. But Sriharikota, we have a situation. While it is reaching breathlessly for the stars, the Indian space agency only has about 13,000 employees and a limited budget. Add to that youngsters jumping ship for better opportunities and the picture becomes clearer.

After the success of the Chandrayaan-3 mission in 2023, which confirmed India’s landing near the lunar south pole—a feat never before accomplished—the government’s focus turned even more towards space. Overnight, the Indian space agency became the pride of the nation, “with every child of India seeing their future in ISRO,” as Prime Minister Narendra Modi stated following Chandrayaan-3’s triumph. And rightfully so.

While India’s interest and aspirations in the country’s space programme have grown, the same cannot be said about the resources being invested in the sector. Space enthusiasts and independent experts have criticised this misplaced priority of the government. In October last year, Gareeb Scientist, a science communicator, posted on X that ISRO’s annual budget was only worth what Indian Railways spent on cleaning gutka stains every year. “Entire ISRO budget worth spent on cleaning gutka stains,” the handle wrote.

In the Union Budget 2025-26, the Department of Space was allocated Rs 13,416.20 crore, only slightly higher than what it was in the previous year—Rs 13,042.75 crore. This figure too was revised downwards to Rs 11,725.75 crore in the revised estimate. On the other hand, the Railways in a press statement in 2021 to announce the setting up of kiosks for spittoon pouches said it spent around Rs 12,000 crore each year on cleaning gutka stains.

Gareeb Scientist's post, which has since garnered 2.19 lakh views, more than 1,771 likes, and at least 239 reposts, triggered a larger debate on the need to channel more resources into the space sector. While there has been a year-on-year increase in the budget allocated to ISRO in recent years, the hike is still minuscule and insufficient to fund India's big-ticket missions. The result—missions stalled for years, delays in technology development leading to dependence on outdated tech, and the inability to attract a specialised workforce.

The tag of frugal missions

Comparisons like the one by Gareeb Scientist were made earlier this year too. When Christopher Nolan's magnum opus Interstellar was re-released in India in February, Indians were reminded about how this big-budget Hollywood blockbuster was made at twice the cost India spent to land a spacecraft near the lunar south pole.

The 2014 sci-fi movie was made with a budget of USD 165 million, while the entire Chandrayaan-3 mission was conceived with a shoestring budget of only USD 75 million. The comparisons have surprised the world, with even Elon Musk making a mention. "Good for India," he wrote on X, with an emoji of the Indian flag, right after India landed on the Moon. And India wore this as a badge of honour.

Former ISRO chairperson S. Somanath said India is basing its space programme on "frugal innovations". "We have shown the world that big-ticket space missions do not depend on large budgets. Frugal innovations are our speciality," Somanath told ThePrint.

But on many fronts, this frugality is being forced on ISRO. It amounted to making a virtue out of adversity. "In India's GDP, the space department contributes to nearly seven percent of earnings, but it only gets 0.6 percent of the budgetary share," an ISRO official, who wished not to be named, told ThePrint.

And this has irked space enthusiasts.

An X profile called ISRO Spaceflight, which posts the latest developments of the Indian space agency, pointed out that the Rs 13,416 crore allotted to the Department of Space in the Union Budget is only expected to decrease in the revised budget. "Keep in mind that this is only the promised budget, and the amount of funds ISRO will actually receive in the end (i.e. the revised budget) will be lower than this amount (like every year)," it posted.

The post continued, "ISRO had been projecting a considerable increase in their budget given the addition of projects such as Chandrayaan-4, Shukrayaan, NGLV, and BAS (which were approved in 2024). However, that is not reflected in this Union Budget."

A senior ISRO official, who wished not to be named, told ThePrint that getting budgets approved, especially for big-ticket missions, is a lengthy process. After ISRO prepares an estimate for each

mission, it is assessed by the Space Commission, as well as for missions of national importance by the tri-forces, before it is finalised. “Since most missions continue for a long period, the projections do not always align with the actual budget we receive. The amount gets carried to the next year,” the official explained.

High attrition, poor specialisation

When a 31-year-old former ISRO employee first received the news that he had cleared the centralised recruitment exams to get into the Indian space agency back in 2017, his parents organised a full day of prayers at their village temple. Relatives were promptly informed, and after every other sentence, his father, a retired engineer, made sure to mention, “He is my son, after all.” But that’s where the awe ended.

“After five years, when you see your classmates earning 10 times more than you are, and you are not even getting intellectually challenged, you get frustrated,” the scientist said.

He quit ISRO in 2023. In recent years, despite the badge of honour attached to ISRO, many like him have left for better opportunities. And the pit is deeper than it looks. ISRO data shows that the attrition rate in the organisation is around two to three percent, but a closer look reveals that most scientists quit ISRO at the entry level. Data shows that between 2012 and 2017, as many as 289 scientists left 25 institutes run by ISRO.

The situation has remained the same since, with a minor decline in 2023 and 2024 after the launch of missions like Chandrayaan-3 and Aditya-L1—India’s first mission to study the Sun. Between 2018 and 2022, as many as 381 scientists across ISRO centres resigned, and from 2023 to May 2024, around 38 scientists quit the space agency for greener pastures. Data also shows that as of 2023, ISRO had 9,337 group A or tier-1 scientists, 2,303 group B scientists, and 1,141 group C scientists, apart from its administrative staff.

For ISRO, it is not just about retaining its scientists. It is also struggling to hire the brightest scientific minds of the country. This is no secret, and top ISRO officials agree. At an event at IIT-Madras, Somanath said ISRO, despite being India’s apex space centre, is unable to hire graduates from top institutes like the Indian Institutes of Technology (IITs). He pointed out that currently, less than one percent of ISRO’s employees are from IITs. “We go to recruit from IITs, and the moment they hear the package, the room gets empty,” the former ISRO chief said, while stressing that the Indian space agency was not getting the best talent of the country.

In a speech in Parliament, Thiruvananthapuram MP Shashi Tharoor too mentioned the absence of graduates from premier institutes of the country in ISRO’s space missions. “If IITians went to Silicon Valley, CETians (College of Engineering, Thiruvananthapuram) took us to the Moon,” Tharoor said as he mentioned that among the scientists who worked on Chandrayaan-3, most were alumni of CET—a lesser-known government college in Kerala. At least five current and former ISRO scientists ThePrint spoke to said that low pay and the lack of challenging research opportunities were the primary reasons behind youngsters opting for private opportunities.

After holding their cards close to their chests for decades, the government, in 2020, created the Indian National Space Promotion and Authorization Centre (IN-SPACe) to facilitate private

companies' participation in the space sector. In 2023, it went on to formulate the Indian Space Policy 2023, which also facilitated an increased role of private players in the industry.

This became an avenue for young talent to explore opportunities in the private space sector. Many who enter India's space agency are now looking at using the platform to build contacts and capabilities over a few years before using it as a launchpad to set up their own space startups. Latest data shows that India has nearly 200 registered space startups.

Curiously, among all the ISRO centres, the Vikram Sarabhai Space Centre in Thiruvananthapuram and the Space Applications Centre in Ahmedabad—both among the most coveted centres of ISRO—recorded the highest attrition. It is UR Rao Space Centre (URSC) in Bengaluru that saw the lowest resignations. However, while the disparity in attrition rates from various ISRO centres could depend on different factors, such as work environment, salaries, and work opportunities, former ISRO officials highlighted that in the URSC, the work is so specialised and niche that employees with domain mastery become unemployable anywhere outside ISRO. The URSC continues to operate in areas that are still niche and not explored by the nascent private space industry in India. "In some of the specialised centres, scientists work not out of choice but due to a lack of opportunities," another former ISRO official said.

Limited technology developments

A workday at the Satish Dhawan Space Centre in Sriharikota is as predictable as it gets. When a mission launch date is finalised, the Centre springs into action, covering every aspect from design to testing and operation, right down to the details. Most of the launch vehicles, such as ISRO's trusted Polar Satellite Launch Vehicle (operational since the 1990s) and the Geosynchronous Satellite Launch Vehicle (operational since the early 2000s), have been operational for several decades.

Nearly two decades after building its last launch vehicle, ISRO developed the Small Satellite Launch Vehicle (SSLV), which took its maiden flight in 2022. The launcher, however, failed to place the satellites in orbit back then. But corrections to this technology have been made since. ISRO scientists have mastered its technology to every tiny detail; and unless something goes horribly out of plan, every launch works like clockwork.

While this confirms the bankability of ISRO's technology, it also raises questions about the agency's lack of latest innovations and research. Many technological developments and research initiatives that the space agency had initiated over the last few years have either been halted or have moved at a snail's pace. India's Reusable Launch Vehicle (RLV), Pushpak—a sustainable technology for launch vehicles that the space agency committed to developing way back in 2010—is still not ready.

This is after government and private space agencies across the world have already mastered the technology. Musk's SpaceX developed the reusable technology for its Falcon 9 rocket in the 2010s. RLVs don't just allow launch agencies to reuse the rockets for multiple missions, they also significantly reduce the cost of missions.

Advancements in developing heavier launch vehicles, capable of accommodating higher payloads, have also been an area of struggle for the agency. Although ISRO has presented various designs of

the Next Generation Launch Vehicles (NGLV) at various forums, a launch with the new rocket is still far away.

But despite these shortcomings, ISRO scientists are not giving up. They are confident that if the Indian space programme can chart the long and tedious journey from pushing rocket parts on bicycles in 1963 to becoming the first in the world to land near the lunar south pole, it can brave minor gaps in the system.

The next big mission, which aims to launch the first Indians to space—Gaganyaan—awaits. What the agency lacks in resources, staff and technology, it will make up for in intellect and determination.

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Cracking the Quantum Code: 40-Year Entanglement Mystery Solved

Source: SciTech Daily, Dt. 07 Apr 2025,
URL: https://scitechdaily.com/cracking-the-quantum-code-40-year-entanglement-mystery-solved/

A long-standing puzzle in quantum physics has just been cracked: scientists have finally pinned down the exact scope of quantum entanglement in one of its most iconic experiments.

This breakthrough not only deepens our understanding of quantum mechanics but could also supercharge the validation of quantum devices, shaping the future of quantum technologies from computing to sensing.

Cracking a 40-Year Quantum Mystery

In a new paper published in Nature Physics, Victor Barizien and Jean-Daniel Bancal of the Institute of Theoretical Physics (IPhT) have solved a 40-year-old open question about the reach of quantum entanglement.

Quantum entanglement is a central feature of the so-called second quantum revolution, enabling technologies like quantum sensors and quantum computers. Yet, even in well-known experimental setups like Bell tests, highlighted by the 2022 Nobel Prize in Physics, the exact role and limits of entanglement have remained unclear. This new theoretical work is the first to clearly define the full scope of entanglement in such experiments.

Decoding the Hidden Patterns

Entangled systems involve two components that are deeply interconnected. When measurements are made on these components, their connection shows up in the patterns, or frequencies, of the results. These patterns are a hallmark of quantum mechanics and form the backbone of quantum information science. Until now, however, the statistical data from entangled measurements defied complete analysis. By identifying all the frequencies needed to fully describe the measured quantum system, the researchers provide the first explicit and comprehensive characterization of a set of quantum statistics.

Pushing Quantum Boundaries

This result has both fundamental and applied significance. Indeed, the type of reconstruction obtained forms the basis of the most advanced validation methods for quantum devices. This work paves the way for new, more comprehensive test procedures for quantum devices. At the same time, by determining the extent of quantum statistics, this result identifies the limits of quantum physics itself. It thus informs us about the scope of quantum theory and offers new perspectives for better understanding it.

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