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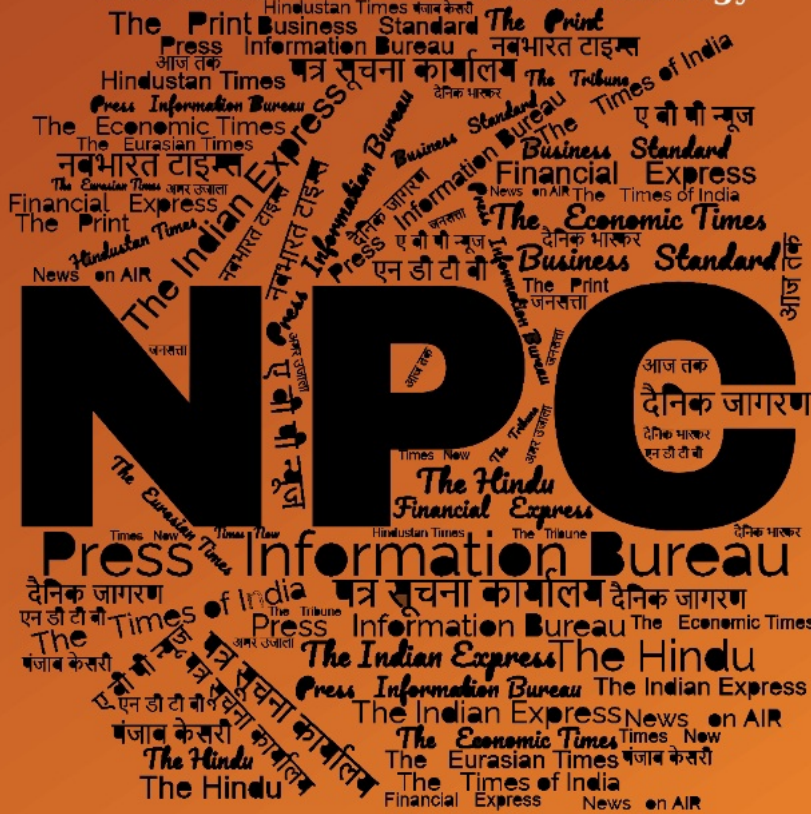
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# समाचार पत्रों के चयनित अंश Newspapers Clippings

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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Tue, 12 Nov 2024

## Explained: स्पेस के लिए सेना का महामिशन? भारत पहली बार कर रहा 'अंतरिक्ष अभ्यास'; ISRO और DRDO भी जुड़े

2024 की शुरुआत तक, 28 हजार से ज्यादा सैटेलाइट्स पृथ्वी की परिक्रमा कर रहे थे. यह पिछले साल की तुलना में लगभग 6.8% ज्यादा है. इस साल कई देशों की ऑफिशियल स्पेस एजेंसियों से इतर प्राइवेट कंपनियों ने भी तमाम सैटेलाइट अंतरिक्ष में भेजे. भारत, अमेरिका, चीन समेत कई देश चंद्रमा और मंगल पर मिशन भेजने की तैयारी में हैं. एलन मस्क जैसे आंत्रप्रेन्योर्स की वजह से प्राइवेट स्पेस ट्रिज्म ने भी जोर पकड़ा है. अंतरिक्ष अब सिर्फ रिसर्च का एरिया नहीं रहा, एक रणनीतिक क्षेत्र बन गया है. अंतरिक्ष में भारत के हित सुरक्षित रहें, उसी मकसद से रक्षा मंत्रालय ने तैयारी शुरू कर दी है.

सोमवार से नई दिल्ली में अपनी तरह का पहला अभ्यास शुरू हुआ. 'अंतरिक्ष अभ्यास - 2024' नाम के इस कार्यक्रम की अहमियत इस बात से समझिए कि चीफ ऑफ डिफेंस स्टाफ (CDS) जनरल अनिल चौहान खुद पहले दिन यहां मौजूद थे. यह 'अंतरिक्ष अभ्यास' क्या है और कैसे भारत अंतरिक्ष में अपने रणनीतिक हितों की सुरक्षा का खाका खींच रहा है, आइए समझते हैं.

### 'अंतरिक्ष अभ्यास 2024' क्या है?

रक्षा मंत्रालय ने एक बयान में बताया कि 'अंतरिक्ष अभ्यास - 2024' को 'हेडक्वार्टर्स इंटीग्रेटेड डिफेंस स्टाफ' की डिफेंस स्पेस एजेंसी आयोजित करा रही है. यह अभ्यास युद्ध के दौरान अंतरिक्ष-आधारित संपत्तियों और सेवाओं से जुड़े बढ़ते खतरों से निपटने के लिए है.

### अंतरिक्ष अभ्यास 2024 में कौन-कौन शामिल?

सेना के अधिकारियों के साथ-साथ डिफेंस स्पेस एजेंसी और उससे जुड़ी इकाइयों के अधिकारी 'अंतरिक्ष अभ्यास 2024' में हिस्सा ले रहे हैं. हेडक्वार्टर्स इंटीग्रेटेड डिफेंस स्टाफ के मातहत आने वाली स्पेशलिस्ट शाखाएं जैसे डिफेंस साइबर एजेंसी, डिफेंस इंटेलिजेंस एजेंसी और स्ट्रैटीजिक फोर्सिंग कमांड भी इस अभ्यास में सक्रिय रूप से भागीदारी करेंगे. भारतीय अंतरिक्ष अनुसंधान संगठन (ISRO) और रक्षा अनुसंधान एवं विकास संगठन (DRDO) के प्रतिनिधि भी 'अंतरिक्ष अभ्यास 2024' में हिस्सा लेंगे.

### क्यों हो रही ऐसी एक्सरसाइज?

अंतरिक्ष तेजी से भीड़भाड़ वाला, प्रतिस्पर्धात्मक और वाणिज्यिक होता जा रहा है. रक्षा मंत्रालय के मुताबिक, अपनी तरह के पहले अभ्यास से अंतरिक्ष में राष्ट्रीय रणनीतिक उद्देश्यों को सुरक्षित करने और सैन्य अभियानों में भारत की अंतरिक्ष क्षमता को एकीकृत करने में मदद मिलने की उम्मीद है.

### सीडीएस ने क्या कहा?

रक्षा मंत्रालय के बयान में सीडीएस जनरल अनिल चौहान के हवाले से कहा गया, 'अंतरिक्ष को कभी अंतिम सीमा माना जाता था, लेकिन अब यह भारत की रक्षा और सुरक्षा तंत्र का महत्वपूर्ण संबल है. अंतरिक्ष अन्वेषण और बढ़ती सैन्य

क्षमताओं की अपनी समृद्ध विरासत के साथ, भारत अंतरिक्ष-आधारित क्षमताओं के सामने आने वाली चुनौतियों से निपटने के लिहाज से अच्छी स्थिति में है।'

सीडीएस चौहान ने कहा कि अंतरिक्ष में राष्ट्रीय हितों को सुरक्षित करने के लिए सैन्य नेतृत्व ISRO, DRDO और शिक्षा जगत के साथ तालमेल बिठाकर नवाचार, अत्याधुनिक प्रौद्योगिकियों और अत्याधुनिक प्रणालियों के विकास को बढ़ावा दे।

<https://zeenews.india.com/hindi/explainer/antariksha-abhyas-2024-indian-army-space-force-isro-drdo-to-help/2510556>



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*Mon, 11 Nov 2024*

## **First Ever Space Exercise ‘Antariksha Abhyas – 2024’ hosted by Defence Space Agency begins in New Delhi**

India is well positioned to navigate the challenges posed to space based capabilities: CDS Gen Anil Chauhan

‘Antariksha Abhyas – 2024’, a three day Exercise to war-game the growing threats from and to Space Based Assets and Services, is being conducted by the Defence Space Agency of Headquarters Integrated Defence Staff from 11 - 13 Nov 24. Exercise Antariksha Abhyas is a first of its kind exercise being conducted and is expected to help secure national strategic objectives in space and integrate India’s space capability in military operations.

In his opening address, Chief of Defence Staff General Anil Chauhan said, “Space, once considered the final frontier is now the critical enabler of India’s defence and security apparatus. With its rich legacy of space exploration and growing military capabilities, India is well positioned to navigate the challenges posed to space based capabilities”. Highlighting that space was becoming increasingly congested, contested, competitive and commercial, the CDS impressed upon the military leadership to secure our national interests in space by fostering innovation and developing cutting edge technologies and state of the art systems in collaboration with DRDO, ISRO and Academia.

The Space Exercise aims to provide enhanced understanding of space based assets and services and to gain understanding of operational dependency on space segment between stakeholders. In addition, it intends to identify vulnerabilities in conduct of operations in the event of denial or disruptions of space based services. It will have participants from the Defence Space Agency and its allied units along with personnel from the Army, Navy and the Air Force. Specialist branches under Headquarters Integrated Defence Staff viz Defence Cyber Agency, Defence Intelligence Agency and Strategic Forces Command would also be active participants in conduct of the

exercise. Representatives from Indian Space Research Organisation and the **Defence Research & Development Organisation** will also take part in it.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2072518>



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## **Indigenous Development of Silicon Carbide Wafers and GaN HEMT based MMIC Technology up to X-band Applications**

**Solid State Physics Laboratory**, a DRDO laboratory, has successfully developed indigenous processes for growing and manufacturing 4-inch diameter Silicon Carbide (SiC) wafers and fabricating Gallium Nitride (GaN) High Electron Mobility Transistors (HEMTs) upto 150W & Monolithic Microwave Integrated Circuits (MMICs) up to 40W for applications up to X-band frequencies.

GaN/SiC technology is a critical enabler of next-generation applications across defence, aerospace, and clean energy sectors.

This advanced technology offers improved efficiency, reduced size and weight, and enhanced performance, making it essential for future combat systems, RADARS, electronic warfare systems, and green energy solutions.

With rising demands for lighter and more compact power supplies in future combat systems, GaN/SiC technology provides a vital foundation for communications, intelligence, reconnaissance, and unmanned systems for both military and commercial sectors, including electric vehicles and renewable energy.

Indigenous GaN on SiC based MMICs with limited production capability has been successfully established at GAETEC, Hyderabad. These state-of-the-art multifunctional MMIC cater to wide applications in next generation strategic systems, space, aerospace and 5G/satellite communications.

The development of commercially viable SiC and GaN-based MMIC technology marks a milestone in India's journey towards 'Aatmanirbhar Bharat,' fostering self-reliance in semiconductor technology.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2072484>

## From DRDO, powerful step in India's biosecurity

The Defence Research and Development Organisation (DRDO) took a significant step in enhancing India's chemicalbiological defence capabilities with the inauguration of a new BSL-4 (Bio-Safety Level-4) laboratory and a Bio-detector, Test & Evaluation Facility at the **Defence Research and Development Establishment (DRDE)**, Gwalior.

This marked a key milestone in DRDE's mission to advance research in virology and biosecurity, positioning the establishment as a global leader in these critical fields. The inauguration ceremony, held on Nov 11, 2024, coincided with the opening of Virocon 2024, an international conference hosted by DRDE Gwalior and the Indian Virological Society (IVS) Dr Sameer V Kamat, chairman of DRDO, conducted the Bhoomi Pujan of the new BSL-4 facility at DRDE's Maharajpura Dang Campus.

He emphasised the facility's importance in combating biological threats and supporting high-level research on infectious agents relevant to national defence.

Speaking to an audience of scientists, DRDO officials, and researchers, Dr. Kamat underscored the need to strengthen India's biological defence capabilities in a world where emerging viral threats continue to evolve.

He highlighted the Hon'ble Prime Minister's vision for 2047, aiming for India to become a selfsufficient leader in defence technologies, including biological defence. Dr. Kamat also stressed the importance of global collaboration and international partnerships in ensuring DRDE Gwalior's continued prominence as a top-tier research institution.

This new BSL-4 laboratory, which is only the second of its kind in India, will provide advanced research facilities for working with dangerous pathogens, enhancing India's ability to respond to biological and chemical threats.

The Bio-detector facility, which was also inaugurated on the same day, is set to play a crucial role in the detection and evaluation of biological threats in the defence sector. Alongside Dr. Kamat, key figures from DRDO, including Dr. U.K. Singh, director general of biological sciences, Dr. Manu Korula, director general of resources and management, and Colonel Vishwajit Choubey, director of civil works and estates, participated in the event.

Dr. Kamat toured the new facilities, noting the world-class infrastructure that will enable cutting-edge research in biological safety and virology. On the heels of the BSL-4 lab inauguration and the bio-dector facility, DRDE Gwalior is also hosting Virocon 2024, a major international conference scheduled from Nov 11 to 13, 2024.

This conference, organised by DRDE in collaboration with the Indian Virological Society (IVS), brings together over 400 scientists, researchers, and scholars from across the globe. The event is focused on emerging viral diseases and biosecurity, with the theme "Emerging Viruses: Pandemic

and Biosecurity Perspectives." The conference will feature research presentations, panel discussions, and a poster exhibition, providing a platform for experts to share insights and collaborate on the latest developments in virology, including the management of viral diseases like dengue, chikungunya, swine flu, Nipah, CCHF, and SARS-CoV2.

<https://timesofindia.indiatimes.com/city/bhopal/drdo-boosts-indias-biosecurity-with-new-bsl-4-laboratory-and-detection-facility/articleshow/115191760.cms>

## हिन्दुस्तान

Mon, 11 Nov 2024

### रक्षा क्षेत्र में अग्रणी राष्ट्र बनाने में युवा दें योगदान: डॉ. रेड्डी

मोतीलाल नेहरू राष्ट्रीय प्रौद्योगिकी संस्थान (एमएनएनआईटी) के छह दिनी वार्षिक सांस्कृतिक उत्सव कलरव-अविष्कार का सोमवार को शुभारंभ हुआ। मुख्य अतिथि रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) के पूर्व अध्यक्ष और भारतीय एयरोस्पेस विज्ञानी डॉ. जी सतीश रेड्डी ने कार्यक्रम का उद्घाटन किया। डॉ. रेड्डी ने भावी टेक्नोक्रेट्स को प्रोत्साहित करते हुए कहा कि भारत ने पहली बार में ही सफल अग्नि मिसाइल बना ली थी। लेकिन अन्य देशों को यह नहीं लग रहा था। देश ने दुनिया को अपनी क्षमता दिखाई। इसलिए छात्र

अपने को कम न समझे। उन्होंने कहा कि आज के युवा वैज्ञानिकों का दायित्व है कि वे भारत को रक्षा प्रौद्योगिकी के क्षेत्र में एक अग्रणी राष्ट्र बनाने में योगदान दें। भारत अब रक्षा प्रौद्योगिकी, साइबर सुरक्षा, आर्टिफिशियल इंटेलिजेंस (एआई) और अंतरिक्ष अनुसंधान जैसे अत्याधुनिक क्षेत्रों में निरंतर अग्रणी बन रहा है।

उन्होंने कहा कि स्वदेशी तकनीक के विकास ने भारत की सुरक्षा और तकनीकी क्षमताओं को मजबूत किया है। स्वदेशी तकनीक ने भारत को वैश्विक स्तर पर स्थापित कर रहा है। उन्होंने शोध करने और नवीन समाधानों के विकास पर ध्यान देने की युवाओं से अपील की। इस दौरान प्रो. आरपी तिवारी, प्रो. पीतम सिंह, प्रो. अस्मि मुखर्जी और प्रो. समीर श्रीवास्तव ने भी संबोधित किया।

<https://www.livehindustan.com/uttar-pradesh/up-news-today-updates-12-november-prayagraj-uppsc-students-protest-yogi-adityanath-maharashtra-akhilesh-mayawati-weather-201731382658634.html>





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*Mon, 11 Nov 2024*

### **Indian & Sri Lankan Coast Guards hold 7th Annual High Level Meeting in Colombo to combat transnational maritime crime & promote regional cooperation**

Indian Coast Guard (ICG) and Sri Lanka Coast Guard (SLCG) conducted the 7th Annual High Level Meeting in Colombo on November 11, 2024. A four-member ICG delegation led by Director General DG S Paramesh and SLCG delegation headed by Director General Rear Admiral YR Serasinghe participated in the meeting which marked a significant milestone in the collaborative efforts between the two Coast Guards.

The meeting underscores the commitment of both the Coast Guards to jointly address maritime challenges while focusing on a range of regional maritime contemporary issues, including drug trafficking, marine pollution, safety of mariners, adoption of best practices, capacity-building programs and other collaborative arrangements.

The outcome of the meeting reiterated enhancing mutual cooperation in addressing these challenges, thereby strengthening the maritime safety and security framework in the region.

This annual meeting follows the institutionalised mechanism as outlined in the MoU signed between both the maritime agencies in May 2018. The 8th edition of the meeting will be hosted by ICG in 2025.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2072482>

## **Satellite images and documents indicate China working on nuclear propulsion for new aircraft carrier**

China has built a land-based prototype nuclear reactor for a large surface warship, in the clearest sign yet Beijing is advancing toward producing its first nuclear-powered aircraft carrier, according to a new analysis of satellite imagery and Chinese government documents provided to The Associated Press.

China's navy is already the world's largest numerically, and it has been rapidly modernizing. Adding nuclear-powered carriers to its fleet would be a major step in realizing its ambitions for a true "blue-water" force capable of operating in seas far from China in a growing global challenge to the United States.

"Nuclear-powered carriers would place China in the exclusive ranks of firstclass naval powers, a group currently limited to the United States and France," said Tong Zhao, a senior fellow at the Carnegie Endowment for International Peace in Washington, D.C.

"For China's leadership, such a development would symbolize national prestige, fueling domestic nationalism and elevating the country's global image as a leading power."

Researchers at the Middlebury Institute of International Studies in California said they made the finding while investigating a mountain site outside the city of Leshan in the southwest Chinese province of Sichuan, where they suspected China was building a reactor to produce plutonium or tritium for weapons. Instead they concluded that China was building a prototype reactor for a large warship. The project at Leshan is dubbed the Longwei, or Dragon Might, Project and is also referred to as the Nuclear Power Development Project in documents.

Neither China's Defense Ministry nor Foreign Affairs Ministry responded to requests for comment. Satellite images and public documents helped identify likely carrier project. There have long been rumors that China is planning to build a nuclear-powered aircraft carrier, but the research by the Middlebury team is the first to confirm that China is working on a nuclear-powered propulsion system for a carrier-sized surface warship.

"The reactor prototype at Leshan is the first solid evidence that China is, in fact, developing a nuclear-powered aircraft carrier," said Jeffrey Lewis, a professor at Middlebury and one of the researchers on the project.

"Operating a nuclear-powered aircraft carrier is an exclusive club, one that China looks set to join."

Drawing on satellite images and public documents including project tenders, personnel files, environmental impact studies - and even a citizen's complaint about noisy construction and excessive dust - they concluded a prototype reactor for naval propulsion was being built in the

mountains of Mucheng township, some 70 miles (112 kilometers) southwest of Sichuan's provincial capital Chengdu.

The reactor, which procurement documents indicate will soon be operational, is housed in a new facility built at the site known as Base 909, which houses six other reactors that are operational, decommissioned or under construction, according to the analysis. The site is under the control of the Nuclear Power Institute of China, a subsidiary of the China National Nuclear Corporation, which is tasked with reactor engineering research and testing.

Documents indicating that China's 701 Institute, formally known as China Ship Research and Design Center, which is responsible for aircraft carrier development, procured reactor equipment "intended for installation on a large surface warship" under the Nuclear Power Development Project as well as the project's "national defense designation" helped lead to the conclusion the sizable reactor is a prototype for a next-generation aircraft carrier.

Satellite mages from 2020 to 2023 have shown the demolition of homes and the construction of water intake infrastructure connected to the reactor site. Contracts for steam generators and turbine pumps indicate the project involves a pressurized water reactor with a secondary circuit - a profile that is consistent with naval propulsion reactors, the researchers say. An environmental impact report calls the Longwei Project a "national defense-related construction project" that is classified "secret."

"Unless China is developing nuclear-powered cruisers, which were pursued only by the United States and the Soviet Union during the Cold War, then the Nuclear Power Development Project most certainly refers to a nuclear-powered aircraft carrier development effort," researchers wrote in a detailed 19-page report on their findings shared exclusively with the AP. Jamie Withorne, an analyst at the Oslo Nuclear Project who was not involved in the research and reviewed the findings, said Middlebury's team made a "convincing argument."

"From the identifying reports, co-location with other naval reactor facilities, and correlating construction activity, I think it can be said that it is likely the Longwei Project is housed at Base 909, and it could potentially be located at the identified building," she said.

The research does not, however, provide clues as to when a Chinese nuclear-powered carrier could be built and become operational, she said. Sarah Laderman, a senior analyst with Open Nuclear Network, a program of the U.S.-based NGO PAX sapiens foundation, said the findings were "carefully conducted and thoroughly researched."

"Given the evidence presented here, I see a compelling case made that China seems to be working towards building a nuclear propulsion system for its naval surface ships (likely aircraft carriers) at this location," said Laderman, who is based in Vienna and was not involved in Middlebury's research.

Pursuit of a nuclear-powered carrier China's first carrier, commissioned in 2012, was a repurposed Soviet ship, and its second was built in China but based upon the Soviet design. Both ships - named the Liaoning and the Shandong - employ a so-called "ski-jump" type launch method, with a ramp at the end of a short runway to help planes take off.

The Type 003 Fujian, launched in 2022, was the country's third carrier and its first to be indigenously designed and built. It employs an electromagnetic launch system like those developed and used by the U.S. Navy. All three carriers are conventionally powered.

Sea trials hadn't even started for the Fujian in March when Yuan Huazhi, political commissar for China's People's Liberation Army Navy, confirmed the construction of a fourth carrier. Asked if it would be nuclear-powered, he said at the time that would "soon be announced," but so far it has not been.

There has been speculation that China may begin producing two new carriers at once - one Type 003 like the Fujian and one nuclear-powered Type 004 - something that it has not attempted before but that its shipyards have the capacity to do. Matthew Funaiole, senior fellow at the Center for Strategic and International Studies' China Power Project, said he doubts China's next carrier will be nuclear-powered.

Instead, he said, he would expect the People's Liberation Army Navy's fourth carrier to focus on optimizing the existing design of the Fujian carrier with "incremental improvements." Nick Childs, senior fellow for naval forces and maritime security at the International Institute for Strategic Studies, said the Chinese "have taken an incremental approach to their carrier development with a number of ambitions that will evolve over time."

"For now, their deployments have been relatively cautious, remaining largely within range of shore support, but projecting influence and to some extent coercion within their near waters." Eventually, however, "larger carriers more akin to their U.S. counterparts will give them more options to project power," Childs said.

It takes several years to build a carrier and bring it into operation, but developing nuclear propulsion for its next generation of warships would eventually give China more power to run advanced systems, such as electromagnetic launchers, radars and new technology weapons, Childs said.

"As well as obviating the need for the ship to refuel regularly and therefore giving it much greater range, nuclear power means that without the need to carry fuel oil for the ship there will be room aboard for fuel and weapons for its aircraft, extending their capabilities," Childs said.

"Much will depend on what overall size the next carrier is, but the addition of nuclear power will represent a significant step further in China's carrier development with a vessel more comparable to the U.S. Navy's carriers."

Zhao, of the Carnegie Endowment for International Peace, said nuclear-powered carriers would provide the Chinese military "with greater flexibility and endurance to operate around strategic hotspots, especially along the First Island Chain, where most territories disputed by China are located," said Zhao. The First Island Chain includes the self-governed island of Taiwan, which China claims as its own and vows to annex it by force if necessary. The U.S. is obligated by a domestic law to supply Taiwan with sufficient weapons to deter invasion, and it could provide assistance to the island from its bases in the Pacific in the event of an invasion or blockade. Tensions also have risen in the South China Sea between China and neighboring nations over territorial disputes and maritime claims.

"These carriers could also extend Chinese operations deeper into the Western Pacific, further challenging the U.S. military's ability to 'intervene' in regional matters that China views as best resolved by countries from the region only," Zhao said.

U.S.-China rivalry Chinese President Xi Jinping has tasked defense officials with building a "first-class" navy and becoming a maritime power as part of his blueprint for the country's rejuvenation.

The country's most recent white paper on national defense, dated 2019, said the Chinese navy was adjusting to strategic requirements by "speeding up the transition of its tasks from defense on the near seas to protection missions on the far seas."

The People's Liberation Army Navy is already the world's largest navy with more than 370 ships and submarines. The country also boasts powerful shipbuilding capabilities: China's shipyards are building many hundreds of vessels each year, whereas the U.S. is building five or fewer, according to a U.S. congressional report late last year. However, the Chinese navy lags behind the U.S. Navy in many respects. Among other advantages, the U.S. currently has 11 carriers, all nuclear powered, allowing it to keep multiple strike groups deployed around the world at all times, including in the Indo-Pacific. But the Pentagon is growingly increasingly concerned about China's rapid modernization of its fleet, including the design and construction of new carriers.

That aligns with China's "growing emphasis on the maritime domain and increasing demands" for its navy "to operate at greater distances from mainland China," the Defense Department said in its most recent report to Congress on China's military. And China's "growing force of aircraft carriers extend air defense coverage of deployed task groups beyond the range of land-based defenses, enabling operations farther from China's shore," the report said.

<https://economictimes.indiatimes.com/news/defence/satellite-images-and-documents-indicate-china-working-on-nuclear-propulsion-for-new-aircraft-carrier/articleshow/115165081.cms>

## THE ECONOMIC TIMES

*Mon, 11 Nov 2024*

### **BDL signs MoU with Russia's Rosoboronexport for collaboration on Pantsir air defence systems**

Bharat Dynamics Limited (BDL) on Friday announced that it has signed a Memorandum of Understanding (MoU) with Russia's Rosoboronexport (ROE) to collaborate on the Pantsir air defence missile-gun systems.

The agreement was signed by BDL's Chairman and Managing Director, A Madhavarao (Retd), and Kovalenko German, Deputy Director General of the Naval Department at ROE, during the 5th India-Russia Inter-Governmental Commission (IRIGC) subgroup meeting in Goa. BDL, via a post on X, said, "Bharat Dynamics Limited and Rosoboronexport (ROE), Russia entered into MoU for cooperation on Pantsir variants, air defence missile-gun system.

The MoU was signed by Cmde A Madhavarao, (Retd), CMD, BDL and Mr Kovalenko German, DDG, Naval Dept, ROE on the sidelines of the 5th IRIGC Subgroup at Goa."

The Pantsir-S1 system is a mobile, short-range air defence system equipped with both missile and gun capabilities. Describing the system, Rosoboronexport in a prior statement said, "Pantsir-S1 Air Defence Missile and Gun System: Perfect protection for any object."

Further, Rosoboronexport states on its official website that the system has been designed for the air defence of small military, industrial, and administrative facilities and can defend against a wide range of air threats, including fixed- and rotary-winged aircraft, cruise missiles, and high-precision weapons.

The Pantsir-S1's capabilities include engaging targets within a range of 1,200 to 20,000 meters using missiles, and 200 to 4,000 meters with gun weapons. The altitude range for missiles is from 15 to 15,000 meters, while guns can engage targets between 0 to 3,000 meters. It can also handle up to four targets simultaneously and engage objects moving at speeds of up to 1,000 meters per second.

BDL's collaboration with Rosoboronexport follows India's ongoing defence partnership with Russia, including the high-profile acquisition of the S-400 Triumf air defence missile systems.

The S-400 agreement with India, managed by Rostec State Corporation, is one of the largest defence contracts in Russia's history and a milestone in Indo-Russian defence relations.

At the time of signing, Rostec's Head Sergey Chemezov had said, "The S-400 supply agreement with India is a new landmark in the history of military-technical cooperation between our countries.

The deal demonstrates the highest level of trust and understanding between India and Russia." India's S-400 acquisition deal is the "biggest-ever deal" in the company's history according to Rosoboronexport. In a related development, the Indian Army issued a Request for Information (RFI) in August for carrier air defence tracked (CADET) vehicles.

<https://economictimes.indiatimes.com/news/defence/bdl-signs-mou-with-russias-rosoboronexport-for-collaboration-on-pantsir-air-defence-systems/articleshow/115180882.cms>

**THEWEEK**

*Mon, 11 Nov 2024*

## **Is dual carrier operation by China in South China Sea a threat to India? Navy chief doesn't think so**

Chief of Naval Staff Admiral Dinesh K. Tripathi recently said India has no reason to be concerned about the dual carrier operation by China in the South China Sea and added that India has done these dual carrier operations for many years now.

Speaking after the grand finale of THINQ 2024, a nationwide quiz competition organised by the Indian Navy on Friday at the Ezhimala Naval Academy in Kerala, Tripathi said India keeps a "close watch" on activities in its "area of interest".

On China's growing influence in the region through its cooperation with Sri Lanka, he said, "What China does in any part of the globe, let them do it. What they do in our area of interest, we are keeping a close watch. Nothing happens in our part of the world which we do not know."

He said India has a highly effective mechanism for monitoring the oceans, known as maritime domain awareness, and is fully aware of "who is where and who is doing what" to ensure the country's interests are not compromised.

"When their units, whether military or non-military, operate in the Indian Ocean region, we do ensure that our national interests are not compromised. We have got a fantastic organisation to keep the oceans under watch, which is maritime domain awareness, and we know exactly who is where and who is doing what."

<https://www.theweek.in/news/defence/2024/11/11/is-dual-carrier-operation-by-china-in-south-china-sea-a-threat-to-india-navy-chief-doesnt-think-so.html>

**THEWEEK**

*Mon, 11 Nov 2024*

## **China's high-altitude CH-7 stealth drone: A threat to Western defences in Asia-Pacific?**

After images of China's land-based medium-weight stealth fighter Shenyang J-35A and the upgraded variant of its Shenyang J-15 carrier-borne fighter jet J-15T went viral recently, a new set of pictures of another Chinese military asset—the long-endurance unmanned combat aerial vehicle (UCAV) CH-7—is doing the rounds on the internet.

The high-altitude CH-7 stealth drone, developed by China Aerospace Science and Technology Corporation (CASC), is suited for intelligence, reconnaissance, and surveillance (ISR) missions apart from strike missions. The drone was originally unveiled at the 2018 edition of the China Air Show.

The CH-7 stealth drones are understood to be capable of going deep into the enemy airspace and can operate for longer periods of time without being detected because of the low-observable (stealth) design and its ability to fly at high altitudes. Its flying-wing configuration reduces radar detection and lowers acoustic detectability, making it ideal for stealth missions.

CH-7, powered by a single turbofan engine, can fly at altitudes up to 13,000 meters with a maximum speed of Mach 0.75. According to Bulgarianmilitary.com, the aerodynamic properties of the drone help CH-7 have enhanced stability and efficiency at high speeds.

The development of CH-7 is in line with China's efforts to augment its inventory with versatile, high-tech equipment suitable for multi-domain operations.

According to media reports, the drone has design similarities to the B-21 Raider of the United States, which can “penetrate the toughest defenses to deliver precision strikes anywhere in the world.” Weapon systems like the CH-7—a valuable asset for China's military strategy in the Asia-Pacific region—help China position itself competitively against Western nations in terms of UAV technology and military capabilities.

Chinese media released videos and stills of the drone, seen on an unidentified runway. However, it is also possible that these could be computer-generated images.

<https://www.theweek.in/news/defence/2024/11/11/china-high-altitude-ch-7-stealth-drone-a-threat-to-western-defences-in-asia-pacific.html>



*Mon, 11 Nov 2024*

## **Pakistan flight tests high-precision 'SMASH' SBLM missile. Should India be worried?**

Pakistan has recently announced that it successfully carried out a test flight of an indigenously developed ship-launched ballistic missile (SBLM), capable of engaging targets in sea and land with great precision. The weapon system, which is equipped with a state-of-the-art navigation system and maneuverability features, has a range of 350km, significantly enhancing the defensive and offensive capabilities of the Pakistan Navy. The advanced navigation system of the missile allows for mid-flight adjustments in speed and trajectory, making them tough to detect.

Chief of the Naval Staff, senior officers of the Pakistan Navy, and scientists and engineers witnessed the test flight, according to a Pakistan Navy statement. A video released by the Pakistan Navy showed the word 'SMASH' on the missile, which was launched from a Zulfiqar-class frigate. According to media reports, the missile shares similarities with China's CM-401 Anti-Ship Ballistic Missile (ASBM), suggesting Chinese technological influence in its development.

According to IDRW, the missile is designed to be compatible with various launch platforms, offering it the necessary operational flexibility. This missile is expected to enhance Pakistan's deterrent capabilities in the Indian Ocean. This development is also significant considering Pakistan's long-standing tensions with India.

The move is expected to bring in a more balanced power dynamic in the region, even as India is exponentially increasing its naval strength with the addition of advanced aircraft carriers and submarines. It is likely that the flight test of the missile by Pakistan may prompt India to accelerate its own military modernisation efforts.

<https://www.theweek.in/news/defence/2024/11/11/pakistan-flight-tests-high-precision-smash-sblm-missile-should-india-be-worried.html>



## **From Su-57 stealth fighter of Russia to J-35A and 'Killer Whale' what to look out for at 15th Airshow of China**

The Chinese military is set to unveil some of its latest warplanes, including J-35A stealth fighter, HQ-19 anti-ballistic missile, and a large drone ship known as the Killer Whale, at its annual airshow in Zhuhai city which will begin on Tuesday. The event will go on till Sunday.

The People's Liberation Army (PLA) displays its capabilities and weapons at the airshow, which is a biennial event. Drones, weapons systems, aircraft, and electronic warfare technologies will be on display at the event.

Russia has flown its most advanced fighter jet, the SU-57, to Zhuhai for its first airshow abroad. Here's what is to look forward to at China's biggest civil and military airshow.

### **J-15T fighter jet**

The PLA Navy will display its J-15T fighter jet designed to be operated from China's third aircraft carrier, the Fujian, which is equipped with an electromagnetic catapult unlike the other two carriers, Liaoning and Shandong. The design of the J-15T is based on the baseline type of the J-15 and was modified to allow it to be launched by an aircraft carrier's catapult system. J-15T can also be deployed on Liaoning and Shandong, both of which have a ski jump method for launching fixed-wing aircraft.

### **J-35A stealth fighter**

The twin-engine multi-role fighter, which bears a striking resemblance to F-35 Lightning II of the US will also be on display at the air show. Described as a “medium-sized stealth multi-role fighter” this fighter jet, modeled J-31 stealth fighter, has several advantages in terms of “first detection, first strike” capabilities. It is equipped with modern avionics and targeting systems, including an electro-optical targeting system.

### **J-20 stealth fighter**

The fifth-generation twin-engine stealth fighter aircraft Chengdu J-20, also known as the Mighty Dragon, will be on display at the event. Designed primarily for air superiority and precision strike missions, this fighter jet can now rival F-22 Raptor of the US, which combines stealth, speed, agility, and situational awareness, and long-range air-to-air and air-to-ground weaponry. J-20 is equipped with advanced avionics, including the Type 1475 AESA radar, which enables beyond-visual range (BVR) engagements.

### **Killer Whale**

A large drone ship, known as the Killer Whale, will be on display at the air show. The Killer Whale has a dual diesel and electric propulsion system, which allows it to reach a maximum speed of more than 40 knots (74km/h) with a range of more than 4,000 nautical miles (7,400km). It is

capable of operating on the open sea for a long time. It has been described as an all-round warrior that can carry a range of weapons including rockets, anti-ship missiles, and ship-to-air missiles; and is equipped with a take-off and landing pad for helicopters at the rear. It can be independently deployed and carry out patrols, anti-submarine operations and air defence, as well as rescue operations.

### **Su-57 stealth fighter**

The fifth-generation twin-engine, stealth multirole fighter aircraft, developed by Russia's Sukhoi company, will also be on display at the show. This is Su-57's first air show abroad and its presence at the show can be perceived as a sign of the growing ties between China and Russia. It is equipped with advanced avionics and is capable of supercruising at speeds up to Mach 1.3 and can reach a maximum speed of Mach 2.0.

### **Z-20 armed helicopter**

The Harbin Z-20 is a medium-lift utility helicopter, designed to meet the operational needs of the People's Liberation Army (PLA). It has a fly-by-wire flight control system and features a five-bladed main rotor. The helicopter has a maximum takeoff weight of around 10 tonnes and can operate effectively at high altitudes, making it suitable for diverse terrains.

There will be displays of air assault operations by the Z-20J shipborne helicopter and Z-8C transport helicopter, carrying naval marine units and related equipment, according to news agency Xinhua.

The Z-9F shipborne anti-submarine helicopter and Y-8 anti-submarine patrol aircraft will also be on display, besides several shipborne weapon systems and maritime rescue and survival equipment.

<https://www.theweek.in/news/defence/2024/11/11/from-su-57-stealth-fighter-of-russia-to-j-35a-and-killer-whale-what-to-look-out-for-at-15th-airshow-of-china.html>

**#SWARAJYA**

*Mon, 11 Nov 2024*

## **India's Russian Frigates To Set Sail, But S-400s And Nuclear Attack Submarine Drift In Delay**

The status of the nuclear-powered attack submarine leased from Russia in 2019 remains uncertain, with its arrival unlikely before 2028.

India is on track to receive the first of its two new guided-missile frigates from Russia, ending a long wait complicated by the ongoing Russia-Ukraine conflict. Set for delivery at the end of this month, this nearly 4,000-tonne frigate will soon be in the hands of over 200 Indian officers and sailors stationed at the Yantar Shipyard in Kaliningrad, Russia, for months now.

Once handed over, it will be commissioned as INS Tushil and make the journey to Indian waters. Its sister ship, INS Tamal, will follow early next year. In 2018, India and Russia signed a \$500 million contract for the construction of two stealth frigates at Goa Shipyard. An additional deal, valued at nearly \$1 billion, was signed later for the import of two other frigates built in Russia. Both agreements are part of a 2016 deal New Delhi reached with Moscow to procure four Admiral Grigorovich-class frigates.

The other two frigates in the deal are being built at Goa Shipyard, with the first, named Tripud, launched in July this year. The Grigorovich-class frigates, known as Project 11356, have already proven their capability, with three currently in service in Russia's Black Sea Fleet.

Russia initially planned six of these frigates under 2010 and 2011 contracts, with the keel for the first ship, Admiral Grigorovich, laid in December 2010 and launched in March 2014. Two additional ships followed by 2015.

However, the remaining three ships were left incomplete at the Yantar Shipyard in Kaliningrad due to a critical issue: the lack of propulsion systems. The Grigorovich-class frigates, along with other Russian Navy surface vessels, are powered by M90FR (or M7N.1E) gas turbines.

These engines were produced by Zorya-Mashproekt, the Soviet Union's primary gas turbine manufacturing complex, established during the Second World War. Following the Soviet Union's breakup in 1991, this complex came under Ukraine's control, with Russia dependent on supplies from Kyiv.

Russia's access to these engines ended after its relations with Ukraine deteriorated, beginning with the political crisis in 2013 and culminating in Moscow's annexation of Crimea in 2014, and the invasion of Ukraine in 2022. In response, Ukraine banned the supply of gas turbines and other critical equipment to Russia. Before the ban, Russia had acquired only three M90FR gas turbines, which were installed on the first three Grigorovich-class frigates. As a result, the remaining frigates, left without engines, stayed in dry dock.

This is where India's involvement became pivotal. In 2016, Ukraine agreed to supply India with M90FR gas turbines in the form of 12 "spare tool and accessory kits." This arrangement enabled India to procure two of the incomplete Grigorovich-class frigates, whose hulls had already been fabricated at the Yantar Shipyard.

India's familiarity with Ukrainian engines was also a factor; according to Ukraine's state-owned arms export agency, Ukroboronprom, around 30 Indian Navy ships are already equipped with engines produced by Zorya-Mashproekt. The arrangement was that Ukraine would sell the kits to India, which would then pass them on to Russia to fit onto the stalled frigates.

India's decision to proceed with this purchase makes strategic sense, as the Indian Navy already operates six Talwar-class frigates, which Russia built in two batches between 2003 and 2013. The 3,620-ton Admiral Grigorovich-class is an upgraded variant of the Talwar-class, and the addition of these four new Grigorovich-class frigates will bring India's fleet of Krivak-class-derived ships to a total of ten.

These frigates will be commissioned between 2022 and 2027, around the same time as the delivery of the P17A frigates currently under construction at Mazagon Dockyard and Garden Reach

Shipbuilders & Engineers. The first of the P17A frigates, INS Nilgiri, is undergoing sea trials and is slated for commissioning in December.

However, The delivery of the fourth and fifth squadrons of S-400 surface-to-air missile systems, under the \$5.43 billion (Rs 40,000 crore) contract signed with Russia in 2018, is expected only by 2026. India has asked Russia for faster delivery, but it looks difficult because Russia's entire defence-industrial production is geared toward the Ukraine war.

The IAF has deployed the first three S-400 squadrons — capable of detecting and destroying hostile bombers, jets, spy planes, missiles, and drones within a 380 km range — in northwest and east India to counter both China and Pakistan. Similarly, the status of the nuclear-powered attack submarine (SSN) that India leased from Russia under a \$3 billion agreement signed in 2019 remains uncertain. The submarine, leased for a period of 10 years, is unlikely to arrive before 2028.

India has previously operated two SSNs leased from Russia. The first, INS Chakra, was a Charlie-class nuclear-powered cruise missile submarine, which served in the Indian Navy from 1988 to 1991. The second, also named Chakra, was an 8,140-tonne Project 971 (Akula-class) nuclear-powered attack submarine. Its construction began in Russia in 1993 but was halted due to funding shortages.

India sponsored the remaining construction and sea trials, with the condition that the submarine be leased to the Indian Navy for a decade. Commissioned as INS Chakra in 2012, the submarine was returned to Russia in June 2021 after an accident, before the lease period concluded. Amid uncertainty over the third SSN leased from Russia, the Cabinet Committee on Security has cleared the indigenous project to build two SSNs for Rs 40,000 crore, but it will take at least a decade for the first of these to roll out.

<https://swarajyamag.com/defence/indias-russian-frigates-to-set-sail-but-s-400s-and-nuclear-attack-submarine-drift-in-delay>



*Mon, 11 Nov 2024*

## **Navigating the Future: How Technology is Transforming the Indian Navy**

Driven by the Atmanirbhar Bharat (Self-Reliant India) vision, the Indian Navy is rapidly integrating technologies like artificial intelligence (AI), autonomous systems, and cybersecurity, thus emerging as a technologically advanced maritime force. This transformation, highlighted by the Navy's commitment to innovation and self-sufficiency, is enabling India to fortify its maritime interests in the Indo-Pacific.

For India, whose extensive coastline provides strategic access to these waters, maintaining control over the Indian Ocean Region (IOR) is essential for both regional security and global commerce. Recognising the complexities of modern maritime security, the Indian Navy is advancing towards technological self-reliance, placing India on a transformative path in the global defence landscape.

### **Artificial Intelligence in Naval Operations**

A significant development within the Indian Navy is the integration of AI in the Combat Management System (CMS). Acting as the central intelligence hub on modern warships, the AI-enhanced CMS processes vast amounts of data from radar, sonar, and other sensors, creating real-time situational awareness and a faster response to threats. This capability allows the Navy to detect, classify, and track potential risks with increased precision, making the CMS an invaluable asset for maritime operations.

AI also underpins predictive maintenance, a shift from traditional maintenance to a proactive approach where equipment health is continuously monitored, and repairs are predicted before malfunctions occur. This predictive capability minimises mission downtime and ensures ships remain operationally ready during critical patrols in the IOR, reinforcing India's position in safeguarding these strategic waters.

### **Autonomous and Unmanned Systems**

The Navy's adoption of unmanned systems exemplifies its technological evolution. The Neerakshi Autonomous Underwater Vehicle (AUV), developed by Garden Reach Shipbuilders & Engineers (GRSE) in collaboration with private industry, exemplifies how autonomous systems reshape naval operations. Neerakshi is designed for underwater surveys and mine detection, making it a critical component for Intelligence, Surveillance, and Reconnaissance (ISR) missions. The Navy enhances its operational capacity by using these autonomous systems without placing personnel at risk.

Developing a 15-meter Autonomous Fast Interceptor Boat further showcases the Navy's advancements in unmanned systems. Equipped with high-speed patrolling and surveillance capabilities, this vessel's autonomy enables continuous monitoring across vast, challenging waters, supporting the Navy's efforts in secure regional waters. Additionally, the Navy's work on drone swarms and unmanned aerial systems is steadily expanding its scope of operations, providing comprehensive maritime surveillance and operational agility.

### **Enhanced Surveillance and Communication Technology**

Secure communication is fundamental to coordinated naval operations, and advancements in the Navy's communication networks are reinforcing this foundation. Software-defined radio (SDR) technology, now deployed across Indian warships, enables real-time, encrypted communication across different frequency bands. This adaptability supports interoperability within the Navy and with allied forces, enhancing the Navy's operational flexibility.

The Link II Next Generation (Link II NG) data link system strengthens this communication framework, facilitating high data throughput and redundancy to ensure uninterrupted information flow across ships, submarines, aircraft, and shore stations. This infrastructure supports Network-

Centric Operations (NCO), allowing the Navy to coordinate its response rapidly and effectively in the face of emerging threats.

### **Swavlamban 2024: Fostering Indigenous Defence Technology**

The Navy's commitment to self-reliance was displayed at Swavlamban 2024, its flagship innovation and indigenisation event in New Delhi. Under the theme "Strength and Power through Innovation and Indigenisation," the event gathered defence, government, and industry leaders to reinforce India's transition from defence dependency to an innovation-driven ecosystem.

Spearheaded by the Naval Innovation and Indigenisation Organisation (NIIO), Swavlamban 2024 highlighted pioneering products developed under the SPRINT initiative (Supporting Pole-Vaulting in R&D through Innovations for Defence Excellence). This initiative has already facilitated the creation of over 75 new defence products, from AI-driven systems to dual-use items, by partnering with Indian startups and MSMEs.

Chief of Naval Staff Admiral Dinesh K Tripathi and Defence Minister Rajnath Singh stressed the Navy's alignment with the Atmanirbhar Bharat vision. The event introduced new challenges under the Acing Development of Innovative Technologies with iDEX (ADITI 3.0) and the Defence India Startup Challenge (DISC 13), which include advanced challenges across AI, autonomous bots, and military communications. The success of these initiatives highlights the Navy's drive toward technological autonomy and a burgeoning partnership with India's private sector to foster a resilient defence ecosystem.

### **Cybersecurity and Quantum Technology**

Cybersecurity has become a critical focus as the Navy's dependence on digital infrastructure increases. The Weapons and Electronics Systems Engineering Establishment (WESEE) has developed military-grade encryption tools like Linkryptor and sDrive, which secure the Navy's communications against evolving cyber threats. In anticipation of future security challenges, WESEE is also developing quantum-safe algorithms to protect communications from decryption by quantum computing—a critical step in safeguarding the Navy's digital assets amid an evolving technological landscape.

### **Overcoming Challenges and Charting Future Goals**

While significant progress has been made, challenges remain in achieving complete self-reliance in defence technology. Scaling domestic production of advanced technologies requires policy support, funding, and cooperation across industries. To meet these demands, the Navy has introduced accelerated procurement policies to streamline defence contracting, particularly for startups and smaller firms working on innovative technologies.

International collaborations also play a crucial role in establishing India as a global player in indigenous technology. Through initiatives like the US-India Critical and Emerging Technology (iCET) partnership, the Navy aims to bring Indian defence products to the international market, thus bolstering its own capabilities while enhancing India's strategic influence. These collaborations create pathways for exports, positioning India as a capable defence provider and reinforcing its naval capabilities.

Swavlamban 2024 captured India's commitment to defence self-sufficiency, showcasing the Indian Navy's robust steps toward building indigenous capabilities across AI, autonomous systems, and cybersecurity. This transformation reflects the broader Atmanirbhar Bharat vision, enhancing India's defence readiness while strengthening its position as a rising power in regional security. By embedding cutting-edge technologies in naval operations and fostering an innovation-driven ecosystem, the Navy is securing India's maritime future in the Indo-Pacific.

Through initiatives like SPRINT, the Navy is paving the way for strategic autonomy and self-reliance, supported by an increasingly capable domestic defence industry. Swavlamban 2024 was more than an exhibition; it was a testament to India's strides toward a robust and self-reliant defence framework, positioning India as a formidable player in the global defence landscape. The Indian Navy's advancements shape India's role in regional security, safeguarding national interests, and affirming India's commitment to a self-reliant future in an increasingly complex world.

<https://www.financialexpress.com/business/defence-navigating-the-future-how-technology-is-transforming-the-indian-navy-3661871/>



*Mon, 11 Nov 2024*

## **India's Defence Procurement Pivot: Balancing Strategic Partnerships with Domestic Ambitions**

As India intensifies efforts to bolster its defence capabilities, two significant procurement decisions are generating considerable interest: the ongoing deliberations over Embraer's C-390 Millennium for India's Medium Transport Aircraft (MTA) requirements and the revived Multi-Role Fighter Aircraft (MRFA) program, now attracting international bidders from Boeing to Saab. These procurements highlight India's ambitions for a robust and modernised military force, even as the nation carefully navigates the geopolitical implications of its choices.

### **C-390 Millennium: Boosting Transport Capacity with Indigenous Collaboration**

Earlier this year, Embraer and Mahindra Defence Systems entered into an agreement to produce the C-390 Millennium transport aircraft locally. The deal marked a strategic alignment with India's Atmanirbhar Bharat, or "self-reliant India" initiative, a directive aimed at reducing the country's dependence on foreign defence suppliers and fostering domestic production capabilities. Embraer's C-390, a versatile multi-mission aircraft known for its efficient cargo and medevac capabilities, is viewed as a potential replacement for India's aging fleet of Soviet-origin aircraft.

The partnership with Mahindra Defence enables India to capitalise on advanced foreign technology while maintaining a level of sovereignty in production, offering Embraer the opportunity to solidify its presence in one of the world's fastest growing defence markets. If successful, this collaboration could set a precedent for future foreign partnerships that align with

India's Make in India strategy, reinforcing the country's ability to manufacture and maintain critical defence assets.

### **MRFA Program: A High-Stakes Decision in Multi-Role Fighter Selection**

India's MRFA program, revived with fresh momentum, represents one of the most ambitious fighter procurement efforts globally, potentially bringing in 114 new aircraft to replace its retiring MiG-21 fleet. Contenders include Boeing with the F-15EX and F/A-18 Super Hornet, Lockheed Martin's F-21 (an India-specific variant of the F-16), Sweden's Saab Gripen, Dassault's Rafale, and even Russia's MiG-35.

The competition, while reminiscent of India's previous Medium Multi-Role Combat Aircraft (MMRCA) contest, has gained fresh geopolitical dimensions. Lockheed's F-21 pitches are centered on India-US defence ties, promising a capable platform with extensive operational history. Lockheed's proposal further leverages America's industrial strengths, including joint ventures and offsets to ensure high domestic content. In addition, the F-21's compatibility with the Indian Air Force's existing systems and infrastructure could reduce logistical complexities and long-term costs.

Conversely, Saab's Gripen has positioned itself as a more cost-effective choice, offering technology transfers and localised production. The Gripen's compact design and agility, along with advanced avionics, have appealed to the IAF's tactical needs, while Sweden's neutral geopolitical stance could offer India an additional layer of strategic flexibility. Sweden's recent decision to select the C-390 for its own transport needs may also strengthen defence ties, providing a foundation for potential cross-sector collaboration.

### **The Geopolitical Calculus: Balancing Defence and Diplomacy**

Amid this competitive landscape, India's decision-making is increasingly influenced by broader political factors. The nation's strategic pivot towards stronger partnerships with the U.S. has underpinned discussions on procuring American platforms, while longstanding defence relations with Russia add further complexity. The MRFA and MTA procurements are not just about technical specifications or costs; they are also about sustaining defence partnerships that bolster India's regional security posture.

The unpredictable trajectory of U.S. foreign policy, with potential changes in administration in the near future, complicates matters. Former U.S. President Donald Trump's administration saw a closer alignment with India, but his uncertain future in U.S. politics leaves India weighing the stability of its ties with American defence companies against possible shifts in policy. Saab's Gripen, by contrast, is less exposed to the vicissitudes of U.S. domestic politics, but Sweden's defence industry lacks the same global production scale and logistical support as Lockheed or Boeing.

### **India's Path Forward: Towards Strategic Autonomy**

India's drive for defence self-sufficiency has seen it balancing foreign collaborations with an increasing focus on indigenous manufacturing. The Indian government has announced policies to encourage domestic defence production, aiming to ensure that up to 60% of the components for any imported system are sourced locally. Initiatives such as the development of the Advanced



Medium Combat Aircraft (AMCA) underscore India's desire to become self-reliant in critical defence technology over the next decade.

The question now facing Indian defence officials is whether they can achieve a balance between indigenous development and foreign partnerships that maximizes capability without compromising on autonomy. If India opts for the C-390 and the Gripen, it could strengthen its independent production capabilities while expanding ties with non-aligned nations. Conversely, opting for Boeing or Lockheed platforms might expedite modernisation but bind India more closely to U.S. supply chains, with potential trade-offs in strategic autonomy.

### **An Era of Strategic Decisions**

For India, the stakes are high. As geopolitical tensions continue to rise in the Indo-Pacific and beyond, the nation's procurement choices will resonate beyond the confines of military capability. These decisions will shape India's role as a regional power, its ability to safeguard its borders, and its strategic autonomy in an increasingly multipolar world. Both the Embraer-Mahindra partnership and the MRFA contest illustrate India's nuanced approach to defence modernisation—a journey of balancing partnerships, fostering local industry, and safeguarding sovereignty.

<https://www.financialexpress.com/business/defence-indias-defence-procurement-pivot-balancing-strategic-partnerships-with-domestic-ambitions-3661969/>



*Tue, 12 Nov 2024*

## **Indian Navy's HADR operations showcase India's growing influence**

The Indian Navy is not new to India's projection of power in the Indian Ocean and beyond, but with each passing year, it has increased its foray and ability to deliver. One of the most pivotal moments in the past has been the Indian Navy's role in thwarting the coup in the Maldives in 1988 when it had deployed frigates Godavari and Betwa which intercepted mercenaries under Operation Cactus. The Time Magazine had a front page cover with the Indian Naval Ship Godavari with the header "Super India: The Next Military Power".

Building on the successes, the Indian Navy has been executing a range of high-stakes humanitarian missions—from Search and Rescue (SAR) to Non-Combatant Evacuation Operations (NEO) and Humanitarian Assistance and Disaster Relief (HADR). The missions reflect India's commitment to global humanitarian assistance and regional security. These are part of India's larger strategic objectives, including the SAGAR (Security and Growth for All in the Region) doctrine and the "Neighborhood First" policy. Policies that are key to creating goodwill and trust in the region and beyond.

Among the key roles the Indian Navy has played in the first few years of this century was during the 2004 tsunami. That year, the Indian Navy responded rapidly, delivering life-saving aid and relief to affected nations, including Sri Lanka, Indonesia, and the Maldives. This elevated India's role as the first responder in the region. Since then, from the COVID crisis (2020) to Typhoon Yagi (2024), the role has significantly increased as Indian Navy assets play an important role in implementing Delhi's foreign policy objectives.

Under Mission Sagar, the Indian Navy extended its reach to deliver COVID-19 assistance to countries like the Maldives, Mauritius, Madagascar, Comoros, and Seychelles which included medical assistance teams, food aid, and other essential supplies. In the backdrop of Typhoon Yagi, under Operation Sadbhav, the Indian Navy delivered relief materials to Myanmar. Overnight loading of HADR pallets, including essentials like drinking water, rations, and medicines, was done onto an Indian naval ship destined for Yangon. This rapid mobilization showcased the Navy's capability to respond swiftly to regional humanitarian crises, in a short time frame.

Former Navy Chief Admiral (Retd) Karambir Singh has noted that these missions serve “dual purposes”—fostering regional stability while also enhancing India's stature as a security provider.

The Navy has also executed high-stakes missions, & operations like Sukoon (2006) and Raahat (2015). Under Operation Sukoon, the Navy successfully evacuated Indian, Sri Lankan, and Nepali nationals from war-torn Lebanon while in Operation Raahat, saw the swift evacuation of over 4,600 Indian and foreign nationals from conflict-ridden Yemen. Amid the volatile situation in Gulf of Aden with Houthi attacks (2023-ongoing), the Indian Navy not only rescued Indian nationals, but nationals of countries like the Philippines, & Pakistan.

Vice Admiral (Retd) Biswajit Dasgupta, former Eastern Naval Command Chief, emphasised that the Navy's humanitarian missions reinforce “universal values of compassion and neutrality, critical elements of soft power.”

The integration of satellite-based communication systems, UAVs, and real-time coordination networks ensures that India's SAR, NEO, and HADR missions are swift and highly efficient. One of the standout innovations is the use of advanced water purification systems aboard naval vessels, allowing them to produce potable water from seawater. These capabilities, coupled with real-time intelligence sharing and international collaboration, position the Indian Navy at the forefront of global humanitarian efforts.

<https://www.wionews.com/india-news/indian-navys-hadr-operations-showcase-indias-growing-influence-775365>



*Tue, 12 Nov 2024*

## **C-295 aircraft simulator facility launched at Agra station**

The Indian Air Force (IAF) on Monday inaugurated a C-295 Full Motion Simulator (FMS) facility at the Air Force Station in Agra. The state-of-the-art military aircraft simulator enables simulation

of high threat situations that can be encountered in actual operations, thus enabling pilots to be battle ready, according to a press note. The statement issued on Monday stated that Air Marshal Ashutosh Dixit inaugurated the C-295 FMS facility.

“The simulator enables pilots to train in near realistic environment by simulating various missions like tactical shift, paradropping, paratrooping, medical evacuation and disaster relief. This facility will significantly enhance the operational capability of the C-295 fleet,” claimed Defence officials.

“C-295 aircraft marks a milestone for Aatmanirbhar Bharat in the private sector production of transport aircraft in India. The induction of this aircraft into the IAF and its subsequent production will be a fillip to the aerospace system of the country,” claimed officials.

<https://www.hindustantimes.com/cities/others/skilled-water-police-from-go-kolkata-maharashtra-to-guard-sangam-waters-101731351857757.html>



*Tue, 12 Nov 2024*

## **HIMARS vs PINAKA: How Does Indian Multi-Barrel Rocket Launcher System Stack-Up Against U.S. Counterpart?**

Indians have often touted their indigenous Pinaka Multi-Barrel Rocket Launcher System (MBRLS) as being at par with American HIMARS. Now, a NATO country, France, has openly expressed interest in New Delhi’s home-grown long-range artillery rocket system. On a visit to India, French Army’s Brigadier General Stephane Richou revealed that Paris is evaluating the Pinaka system for its forces.

“We are evaluating Pinaka because we need a system like that and evaluating this among the other systems of the highest countries... This is much more than a business partnership; this is cooperation,” Brigadier Richou told an Indian news agency.

Incidentally, in February this year, French Chief of Army Staff General Pierre Schill witnessed firsthand the power of the Pinaka system at the Pokhran ranges in the Thar desert. While France is still evaluating Pinaka, another country, Armenia, has already ordered it and received its delivery via Iran in 2023. While Pinaka and HIMARS are both long-range artillery rocket systems, they have some crucial differences and also offer some critical advantages over each other.

### **HIMARS**

With the war in Ukraine grinding on and Kyiv’s extensive use of HIMARS on the frontline, this American long-range artillery rocket system has become a popular name among military analysts. HIMARS stands for High Mobility Artillery Rocket Systems.

The HIMARS consists of a medium-sized tactical truck loaded with six 227-millimeter GPS-guided rockets. It boasts a range of more than 43 miles [69 km]. The rocket is thirteen feet long and known as the Guided Multiple Launch Rocket System (GMLRS).

Each rocket has a 200-pound, high-explosive warhead, and GPS guidance ensures each rocket can land within 16 feet of the designated aiming point. As per Lockheed Martin, the tactical missile range of the HIMARS is 69 to 499+ km, including the GMLRS, which has a range of 69 km, the Extended-Range Guided MLRS (ER GMLRS), which has a range of 150 km, the Precision Strike Missile (PrSM), which has a range of 499 km, and the Army Tactical Missile System (ATACMS), that has a range of 300 km.

These tactical missiles are mounted on a wheeled chassis and thus offer what is classically known as “shoot and scoot” capability to avoid counter-battery fire. Lockheed Martin has delivered over 400 HIMARS launchers to the Army, Marine Corps, and international customers.

HIMARS has expanded its global presence and begun serving the international market, including countries such as Jordan, Singapore, Australia, and the United Arab Emirates. In August, the US State Department approved Norway’s acquisition of HIMARS. However, HIMARS’s current reputation in the international market is cemented owing to the combat experience it has gained in the ongoing Russia-Ukraine war.

The U.S. sent the first four HIMARS to Ukraine in early June 2022, and by late July, Ukrainian forces had claimed to have struck more than 100 “high-value” military targets. Seeing its success against Russian military targets, the U.S. has, according to Pentagon documents, so far donated over 40 HIMARS to Ukraine. On its part, Russia has claimed to have destroyed six HIMARS. However, the Kremlin has provided video evidence of only one such strike on HIMARS. Regardless of such claims, the utility of such High-Mobility Artillery Rocket Systems in a protracted war remains beyond dispute.

### **Pinaka – The Bow Of Lord Shiva**

Pinaka Mk-1 is a free-flight artillery rocket area bombardment system with a range of 38 kilometers, quick reaction time, and a high rate of fire. A single Pinaka system fires 12 rockets from a multi-barrel launcher in 44 seconds, while a battery can fire 72 rockets. The 214mm bore Pinaka Mk-1 rocket has a payload of 100 kilograms and can be fitted with various warheads, such as anti-tank mines and blast-cum-pre-fragmented high explosives.

Thus, a battery can deliver 7.2 tons of payload to a range of 38 kilometers and neutralize a target area of 1000 meters by 800 meters. India developed the Pinaka system as a replacement for the Russian GRAD BM-21. For an MBRLS to survive in a drone-saturated battlefield, it must be able to shoot and then disappear quickly. The Pinaka Mk-1 has precisely that ability.

The launcher’s Shoot-and-Scoot capability enables it to escape the counter-battery fire. Pinaka support vehicles share similar mobility and logistics. Designed by the Indian Defense Research and Development Organisation (DRDO), the multiple rocket launcher is already in service with the Indian Army. It has been deployed along the borders with China and Pakistan. The Pinaka rocket system, named after Lord Shiva’s divine bow, gained its first combat experience in the 1999 Kargil

conflict against Pakistan. The battles in the frigid Himalayan mountain ranges saw Pinaka neutralize Pakistani positions on mountain tops.

“The best feature of the Pinaka system is that one regiment can launch as many as 12 rockets in under a minute in multiple directions, and then the regiment can be re-located within minutes,” an official familiar with the system told the EurAsian Times.

The Pinaka MBRL system consists of six launcher vehicles, each equipped with 12 rockets, six loader-replenishment vehicles, two command post vehicles integrated with a fire control computer, and a DIGICORA MET radar. The Pinaka MBRLS export contract with Armenia in 2023 was India’s first export contract of a genuinely indigenous system with near-zero import content. In the past, major weapon systems exported by India, such as the Dhruv helicopter and Brahmos missile, have featured major foreign OEM assemblies. Export earnings were split between India & the OEMs.

While the Pinaka Mk-1 has a range of 38 km, enhanced Pinaka rockets (Pinaka-ER) have a range of 45 km. The new rockets’ trials were successfully conducted at Balasore and Pokhran in August 2022. Meanwhile, the DRDO is also developing an enhanced guided version of the rocket system, Pinaka Mk-II, with a range above 60 kilometers. The DRDO has been testing the guided version of Pinaka, which has a range of 75 kilometers. Going ahead, the DRDO plans to enhance its range to over 200 kilometers.

“The enhanced Pinaka has demonstrated a range of 75 km and an ability to strike within 10 meters of where it is aimed, allowing the army to destroy a terrorist camp, or an enemy post, logistics dump or headquarters, without needing to send soldiers across the border,” an Indian defense analyst commented. Ahead of the Indian Army’s Regiment of Artillery’s 198th raising day in September this year, Regiment Director General Lt Gen Adosh Kumar said, “The indigenous Pinaka Multi-Barrel Rocket Launch (MRLS) system is being widely exploited, and their ability is second to none.”

“We are looking at extending the range of the Pinaka rockets, and a lot of work is going on, first to double and then to almost four times the present range. The Defence Research and Development Organisation (DRDO) is confident of achieving it.”

Even at the Eurosatory 2024 Defence Show in Paris in June this year, many European and Southeast Asian countries had shown interest in the Pinaka systems. “Some of the European and South East Asian countries have shown interest in the Netra AEW&C aircraft and the Pinaka rocket launcher systems. We are hoping to progress the discussions with the possible customers for these products,” a defense official familiar with the matter had told Indian news agency ANI.

The Indian defense industry, including the public and private sectors, has significantly invested in establishing a production capacity for over 5,000 Pinaka rockets annually. Thus, India can easily meet export orders for Pinaka rockets without compromising domestic defense requirements.

### **HIMARS vs PINAKA**

A quick comparative analysis between HIMARS and Pinaka will show that HIMARS has a considerably longer range. The HIMARS systems provided to Ukraine have a range of 70

kilometers. However, other rockets in HIMARS can extend their range up to 499 kilometers. The Precision Strike Missile (PrSM) in HIMARS has a range of 499 km.

Pinaka Mk-1, on the other hand, has a modest range of 38 kilometers, and the enhanced Mk-II version will have a range of above 60 kilometers. Thus, HIMARS has an advantage over Pinaka when it comes to range.

Pinaka Mark 1 is a free-flight rocket of caliber 214 mm, as opposed to the guided HIMARS of 227 mm. This will imply higher accuracy for the HIMARS. However, as discussed, DRDO is testing a guidance kit for the Pinaka Mk-II rocket to improve accuracy. Once guided rockets are integrated into Pinaka systems, they will be at par with HIMARS. Pinaka carries a warhead of 100 kg as opposed to the 91 kg warhead of the HIMARS. The mobility of both systems is at par with each other.

However, Pinaka might have a cost advantage over HIMARS. In August, the US State Department notified Congress of a HIMARS sale to Australia valued at a whopping US\$975 million (\$1.529 billion) for 22 launchers and associated rockets. Indian Pinaka could cost substantially less.

<https://www.eurasiantimes.com/can-indian-pinaka-trounce-u-s-himars/>

## Science & Technology News



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*Mon, 11 Nov 2024*

### **IIT Ropar Develops Patented Mechanical Knee Rehab Device, Revolutionizing Post-Surgical Therapy with Affordable, Off-Grid Solution**

In a significant breakthrough for post-surgical knee rehabilitation, researchers at IIT Ropar have unveiled an innovative solution to make continuous passive motion (CPM) therapy more accessible and affordable. The team at IIT Ropar has developed a Completely Mechanical Passive Motion Machine for Knee Rehabilitation that has been awarded a patent (No. 553407).

Unlike traditional motorized CPM machines, which are expensive and depend on electricity, the newly developed device is entirely mechanical. It utilizes a piston and pulley system, which stores air as the user pulls a handle, enabling smooth and controlled motion to aid in knee rehabilitation. This simple yet effective design eliminates the need for electricity, batteries, or motors, making it both lightweight and portable.

The mechanical CPM machine offers a promising alternative to costly electric machines that are often out of reach for many patients, especially in rural areas with unreliable electricity supply. By reducing the reliance on electricity, it makes continuous passive motion therapy feasible even in off-grid locations.

Additionally, its portability allows for patients to use it in the comfort of their homes, reducing the need for prolonged hospital stays and rehabilitation visits. Continuous passive motion is an important therapy for patients recovering from knee surgeries, helping to improve joint mobility, reduce stiffness, and speed up recovery. The introduction of this mechanical machine offers a cost-effective and eco-friendly alternative, opening up new possibilities for affordable healthcare solutions in knee rehabilitation.

The development of this innovative device marks a significant step towards improving access to healthcare for all, particularly in regions where resources are limited. The team's work is expected to have a lasting impact on the way knee rehabilitation is approached, both in India and globally.

“This device has the potential to revolutionize knee rehabilitation in India, where access to advanced medical technology can be limited, particularly in rural areas,” said Dr. Abhishek Tiwari, the lead researcher, along with his team comprising Mr. Suraj Bhan Mundotiya and Dr. Samir C. Roy. “It’s designed to be a low-cost, sustainable solution that not only aids in recovery but also helps reduce the environmental impact associated with motorized devices”, he added.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2072411>



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## **Scientists discover a new fire-resilient, dual-blooming species of Dicliptera in the Northern Western Ghats of India**

A new fire resilient dual blooming species experiences a burst of flowering triggered by the grassland fires and has an inflorescence structure that is rare in Indian species has been discovered in the Western Ghats which is known to harbour many yet-to-be-discovered species. The Western Ghats, one of India's four global biodiversity hotspots, has long been a focus of exploration by the Agharkar Research Institute (ARI), Pune, an autonomous institute under the Department of Science & Technology (DST). Over the past few decades, ARI scientists have been intensively studying the region's rich biodiversity.

A recent discovery by a team led by Dr. Mandar Datar, including Talegaon-Dabhade based botanist Aditya Dharap and Ph.D. student Bhushan Shigwan, has added a new species to the genus Dicliptera, which they have named Dicliptera polymorpha. The species was collected from Talegaon- Dabhade, which is known region for its grasslands and fodder markets.

*Dicliptera polymorpha* is a distinctive species, notable for its fire-resilient, pyrophytic habit and its unusual dual-blooming pattern. In addition to its typical post-monsoon flowering, the species exhibits a second, vigorous burst of flowering triggered by the grassland fires commonly set by locals in the region. This species is taxonomically unique, with inflorescence units (cymules) that develop into spicate inflorescences. It is the only known Indian species with this spicate inflorescence structure, with its closest allied being found in Africa.

The species was named *Dicliptera polymorpha* to reflect its diverse morphological traits. The first specimens were collected during the 2020 monsoon, and the population was monitored by Aditty Dharap for next few years to confirm the consistency of its characteristics. The species' novelty was confirmed by leading global expert Dr. I. Darbyshire from Kew Botanic Garden, London. A research paper detailing this species was recently published in the prestigious journal *Kew Bulletin*.

*Dicliptera polymorpha* thrives on slopes in open grasslands of the northern Western Ghats, an area exposed to extreme climatic conditions such as summer droughts and frequent human-induced fires. Despite these harsh conditions, the species has adapted to survive and bloom twice a year. The first flowering phase occurs from post-monsoon (early November) to March or April, while the second flowering phase in May and June is triggered by fires. During this second phase, the woody rootstocks produce dwarf flowering shoots, leading to a more abundant but shorter flowering period.

The discovery of *Dicliptera polymorpha* holds important conservation implications. The species' unique adaptation to fire and its limited habitat range in the Western Ghats highlight the need for careful management of grassland ecosystems. Frequent human-induced fires, while part of the species' life cycle, must be balanced to prevent habitat degradation that could threaten its survival. Protecting the grasslands from overuse and ensuring that fire management practices support biodiversity are crucial steps in conserving this newly discovered species. This discovery underscores the importance of preserving the Western Ghats' delicate ecosystems, which harbour many yet-to-be-discovered species with unique adaptations.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2072410>



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## **Nano material coating developed can increase efficiency of fertilisers by slowing down their release**

A mechanically stable, biodegradable, hydrophobic nanocoating material can enhance the nutrient use efficiency of chemical fertilizers by tuning them for slow release, thereby limiting their



interaction with the rhizosphere soil, water and microbes. This coating made of nanoclay-reinforced binary carbohydrates can reduce the recommended fertiliser dose and maintaining enhanced crop production.

Since the last 50 years as a part of the green revolution, frequent chemical fertilizer input practices have been used to maintain soil nutrient such that higher plant productivity can be achieved. The frequent and excessive application, pose risk on global sustainable development. Researchers are constantly on the lookout for ways to use fertilisers more efficiently.

Scientists from Institute of Nano Science and Technology (INST), Mohali, an autonomous institution of Department of Science and Technology, coated muriate of potash (KCl), which serves 80% of potassium fertilizer needs, with binary carbohydrates, namely, chitosan and lignin using anionic clay as a reinforcement agent that favours stable coordination bonds.

B. K. Sahu, K. Swami, N. Kapoor, A. Agrawal, S. Kataria, P. Sharma, P. Kundu, H. Thangavel, A. Vattakkuniyil, O. P. Chaurasia and V. Shanmugam used drum rotor method to coat the fertilizer in a uniform manner and improve the use efficiency.

The nanomaterial used for the uniform coating were nature derived low-cost material like the nano-clay, chitosan and starch and so on. The research has been published in the journal Environmental Science: Nano.

Tuning the hydrophobicity of nano coating material, switched the release kinetics of the chemical fertilizers as per crop requirement.

Additionally, the biodegradability and life cycle assessment of the developed product ensured the sustainability over conventional chemical fertilizers. Further, the mechanical performance of the coated fertilizer guarantees its industrial application during transportation and supply chain.

The 3D nanostructure of nature inspired polymers offers a potential platform for various applications with the advantage of its biocompatibility and biodegradability.

The properties of natural waste polymer like irreversible denaturation, self-assembled amyloid fibril formation and thermos-responsiveness were exploited for assembling of hydrophobic nanomaterial for the slow release of the chemical fertilizers. Further, the customized rotary drum system with sand air gun enabled the uniform coating of chemical fertilizers with an excellent mechanical performance.

The slow-release fertilizer can be the potential alternative over the conventional fertilizer to enhance the nutrient use efficiency. The reduced recommended dose with increased yield of rice and wheat facilitates more output from lesser input. Overall, the socio-economic condition of the farmer and the economy of the country will improve as compared to conventional fertilizer applications.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2072407>

## **IIT Guwahati researchers develop new method to remove ammonium from wastewater**

Researchers from the Indian Institute of Technology (IIT) Guwahati have developed a groundbreaking method to remove ammonium from wastewater by using a combination of microalgae and bacteria. The approach not only offers a sustainable solution but also drastically cuts down on energy consumption compared to traditional wastewater treatment methods, said the team led by Prof. Kannan Pakshirajan at IIT Guwahati.

Ammonium in wastewater, derived from sources like domestic sewage, industrial waste, agricultural runoff, and landfills, poses serious environmental and health risks.

It can lead to harmful algal blooms, increased water acidity, and oxygen depletion in aquatic ecosystems. Traditional ammonium removal methods involve oxygenation, which accounts for up to 90 per cent of a treatment plant's energy consumption.

Pakshirajan's team designed a photo-sequencing batch reactor (PSBR), where microalgae produce oxygen during photosynthesis, which is then utilised by nitrifying bacteria to convert ammonium into nitrate, followed by denitrification under anoxic condition using denitrifying bacteria to form nitrogen as the end product.

This eliminates the need for external oxygen aeration, making the process significantly more energy-efficient. "Our system offers a sustainable solution for treating wastewater while cutting down on energy costs.

The research, published in the prestigious Chemical Engineering Journal, combines scientific modelling with real-world data to ensure high ammonium removal rates under various conditions. The system demonstrated an energy savings of up to 91.33 per cent in comparison to conventional aeration methods used in wastewater treatment plants, making it an eco-friendly and cost-effective alternative.

This innovative method marks a significant step forward in sustainable wastewater treatment, offering practical applications for reducing the environmental impact of wastewater across industries.

<https://www.lokmatimes.com/technology/iit-guwahati-researchers-develop-new-method-to-remove-ammonium-from-wastewater-1/>

## **IIT, ISRO ink MoU to set up centre for research in thermal sciences**

IIT Madras and the Indian Space Research Organisation (Isro) signed an MoU on Monday to establish a Centre of Excellence for research in “Fluid and Thermal Sciences”. It aims to be a nodal centre for spacecraft and launch vehicle-related thermal management research activities of Isro, which has provided a seed funding of ₹1.83 crore.

Thermal problems regarding design, analysis and testing of various components could be performed by leveraging the expertise of IIT Madras faculty, according to a statement from the institute.

Manu Santhanam, dean (Industrial Consultancy and Sponsored Research), IIT Madras and Victor Joseph T, director, Directorate of Technology Development & Innovation (DTDI), Isro, in the presence of Project coordinator Professor Arvind Pattamatta, department of Mechanical Engineering, IIT Madras, and other stakeholders from IIT Madras and Isro.

The statement said: “The centre will serve as a key research hub for Isro, focusing on spacecraft and launch vehicle thermal management challenges. The fund for the centre will also cover essential infrastructure and equipment, and for future projects in fluid-thermal sciences.”

The projects will cover critical areas, including spacecraft thermal management, combustion instability in hybrid rockets, and cryo-tank thermodynamics. The centre will also enhance collaboration between ISRO scientists and IIT Madras faculty, in innovation in fluid and thermal sciences, the statement stated.

“This Centre of Excellence will foster a unique industry-academia interface, allowing Isro scientists and IIT Madras faculty and students to collaboratively advance research in critical areas of thermal science,” Pattamatta said.

“By addressing complex thermal engineering challenges, we aim to contribute significantly to the nation’s space program and strengthen India’s self-reliance in space technologies”

<https://www.hindustantimes.com/india-news/iit-isro-ink-mou-to-set-up-centre-for-research-in-thermal-sciences-101731352280395.html>

## Scientists find protein that allows animal viruses to jump to humans

Since 2000, a number of zoonotic viruses have jumped to humans from animals, leading to outbreaks of SARS, swine flu, MERS, Ebola, zika, COVID-19 and monkeypox, among others. Adenoviruses, coronaviruses, orthomyxoviruses and filoviruses are among the virus populations that can potentially make the jump to humans.

Researchers have now identified a protein that could allow a family of viruses known as arteriviruses to make the jump to humans. The protein essentially welcomes the arteriviruses into human cells.

The researchers also discovered a monoclonal antibody that binds to the protein to protect cells from infections. In 1964, an arterivirus called the simian hemorrhagic fever virus was discovered after a deadly outbreak among macaque monkeys at a primate quarantine facility in Maryland, USA.

Many natural hosts of arteriviruses have no signs of diseases, but strains can cause hemorrhagic fever or encephalitis when they jump animal populations. Arteriviruses have the unusual ability of maintaining long-term infections, becoming more virulent when they encounter new hosts.

This gives the arteriviruses time to evolve and improve on their transmission strategies. The researchers aimed to better understand the mechanisms of arterivirus infections, with the goal of protecting human populations from spillover from wild animals.

### Zoonotic virus outbreaks poised to increase in the future

A paper describing the findings has been published in Nature Communications. Coauthor of the paper, Cody Warren says, “It’s important to consider that since we have no known arteriviruses infecting people that we’re essentially immunologically naïve, so we can’t rely on preexisting immunity to help us”.

Zoonotic virus outbreaks are only expected to increase in the future, with deforestation bringing wild and domestic animal populations closer together. Shifts in animal populations because of climate change and extreme weather events are also expected to increase the number of zoonotic disease outbreaks in the future.

<https://www.news9live.com/science/scientists-find-protein-that-allows-animal-viruses-to-jump-to-humans-2747511>

## Scientists probe quantum black holes

A team of researchers have advanced the scientific understanding of quantum black holes and their properties, discovering strong evidence of a mathematical inequality that applies to black holes after taking into account quantum effects.

The rule is called the quantum Penrose inequality, and is related to the cosmic censorship conjecture that suggests that singularities, or points of infinite density where spacetime and the laws of physics breaks down, cannot exist on their own and be exposed or ‘naked’.

Singularities have to necessarily contained within black holes. This is the first time that the effects of quantum mechanics has been applied to the cosmic censorship conjecture in three dimensions. The paper also presents strong evidence of the amount of entropy a black hole can contain when quantum mechanics are accounted for.

Entropy is the degree of disorder or randomness in a system. The resulting rule is called the quantum Reverse Isoperimetric Inequality, and generalises a classical rule of black hole entropy to include quantum effects.

The advancement is crucial for understanding the thermodynamic properties of black holes. The inequalities were tested against advanced theoretical models. The research also helps in the quest to reconcile general relativity with quantum mechanics, by describing the effects of gravity on the smallest scales.

### **The Quantum Penrose Inequality**

The research has been published in Physical Review Letters in a paper titled ‘Quantum Inequalities for Quantum Black Holes’.

Coauthor of the paper, Antonia Frassino says, “Blending gravitation with quantum mechanics has been the holy grail of high energy theoretical physics for many decades. We are now extending well-understood concepts and results in classical gravity to incorporate quantum effects, providing a stepping stone for the new developments in the field.”

The researchers hope that the quantum Penrose Inequality will be a crucial component of a new quantum cosmic censorship conjecture.

<https://www.news9live.com/science/scientists-probe-quantum-black-holes-2747495>

