

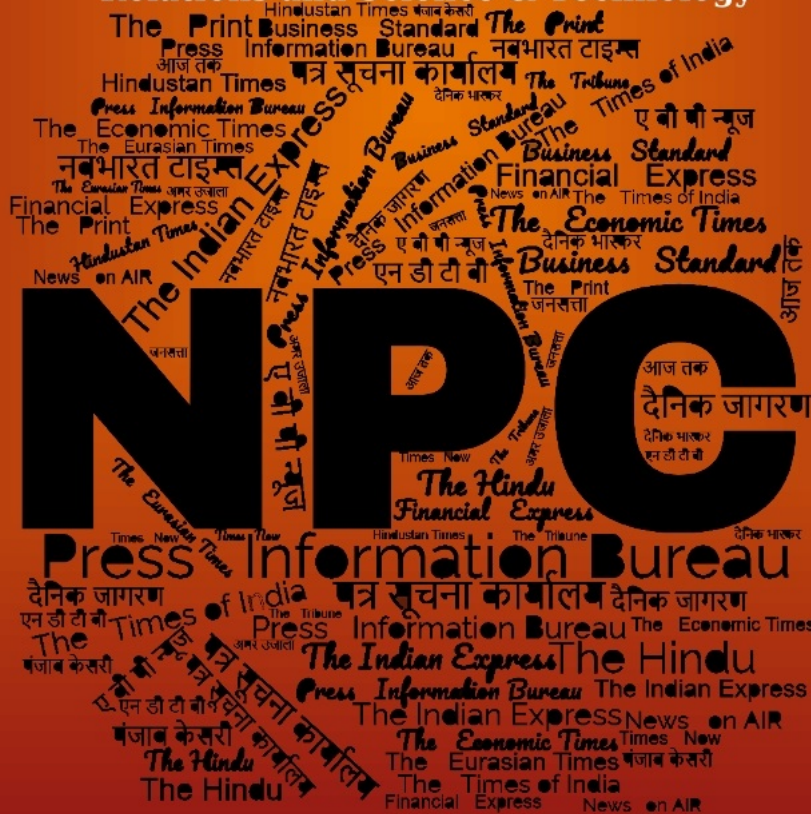
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# समाचार पत्रों से चयनित अंश Newspapers Clippings

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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## DRDO News

### DRDO's vision for self-reliance, innovation and focus on indigenous development

Source: ET Manufacturing, Dt. 15 Jan 2025,

URL: <https://manufacturing.economictimes.indiatimes.com/news/aerospace-defence/drdo-vision-for-self-reliance-innovation-and-focus-on-indigenous-development/117266803>

Dr. K. Rajalakshmi Menon, Director General of Aeronautical Systems at DRDO, in her inaugural address at the ET Aerospace & Defence Manufacturing Summit 2024 outlined India's ambitious path toward self-reliance in defence, with an emphasis on aerospace technologies. As India aspires to become a "Viksit Bharat" by 2047, Dr. Menon highlighted the country's growing focus on indigenous research, development, and manufacturing within the defence sector.



Bharat'," Dr. Menon stated, highlighting the importance of home-grown innovation. According to her, becoming a developed nation requires not only economic growth but also a significant enhancement of national security capabilities. Central to this vision is India's push to develop world-class technologies and move away from dependence on foreign imports. "The freedom from import should be our ultimate goal – much like the freedom struggle for independence."

Dr. Menon outlined key initiatives, including the establishment of defence corridors in Uttar Pradesh and Tamil Nadu, which have already attracted substantial investment in infrastructure, skill development, and manufacturing capabilities. These corridors are seen as critical enablers for fostering a robust defence ecosystem capable of meeting India's future security needs. "The defence sector is poised for growth, with future-ready systems that will ensure India's air dominance," she added, stressing the importance of capacity building across all levels of the defence supply chain.

### **Pioneering technologies and disruptive innovation**

At the heart of DRDO's strategy is the development of disruptive technologies that could revolutionise India's defence capabilities. Dr. Menon spoke extensively about the rapid advancement of next-generation fighter aircraft, unmanned aerial vehicles (UAVs), hypersonic glide vehicles, and advanced surveillance systems. "We must move from emerging to disruptive technologies," she said, pointing to innovations in quantum radar, stealth capabilities, and artificial intelligence as key areas for future development.

The focus on disruptive innovation is not only about technological advancements but also about enhancing operational capabilities. DRDO's success in delivering the indigenous airborne early warning systems, such as the Netra, to the Indian Air Force exemplifies how collaboration between academic institutions, defence public sector undertakings (DPSUs), and private industries is driving India's aerospace sector forward.

A significant part of the ongoing transformation, Dr. Menon explained, is the creation of a sustainable manufacturing ecosystem that supports innovation. With a focus on design and development within India, DRDO has been actively promoting partnerships with private industries through initiatives like the Technology Development Fund, which supports the growth of small and medium-sized enterprises (SMEs) in the defence sector. "Innovate in India for the world," she urged, highlighting the need for the aerospace sector to cater not just to national needs but to global markets as well.

The establishment of academic and industrial centres of excellence, Dr. Menon noted, is essential for nurturing the talent and skills required to drive the aerospace and defence sectors forward. India's challenge lies not only in creating cutting-edge technologies but also in developing an industry-ready workforce capable of sustaining long-term growth.

The address highlighted the need for a comprehensive, multi-pronged approach to make India self-reliant in defence. She emphasised that while progress has been significant, there is still much to be done. She urged industries to focus on areas like aircraft engines, critical manufacturing technologies, and obsolescence management to ensure the long-term sustainability of India's aerospace capabilities.

As India moves towards becoming a global leader in defence manufacturing, the path outlined by Dr. Menon signals a clear and strategic commitment to innovation, indigenous development, and collaboration across all sectors. The vision for 2047 is one of a technologically advanced, self-sufficient nation, able to assert its position on the global stage while ensuring the security and prosperity of its people.

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## Defence News

### Defence Strategic: National/International

#### **Prime Minister Shri Narendra Modi dedicates to the nation frontline naval combatants - INS Surat, INS Nilgiri & INS Vaghsheer - in Mumbai**

**Source:** Press Information Bureau, Dt. 15 Jan 2025,

**URL:** <https://pib.gov.in/PressReleasePage.aspx?PRID=2093018>

Prime Minister Shri Narendra Modi dedicated to the nation three frontline naval combatants - *INS Surat*, *INS Nilgiri* and *INS Vaghsheer* - on their commissioning at the Naval Dockyard in Mumbai, Maharashtra on January 15, 2025. Addressing the gathering, Shri Modi said that 15th January is commemorated as Army Day and saluted every brave warrior who would sacrifice his life for the safety and security of the nation. He congratulated all the brave warriors on this occasion.

Remarking that today was a big day for India's maritime heritage, the glorious history of the Navy and the Aatmanirbhar Bharat Abhiyan, the Prime Minister said that Chhatrapati Shivaji Maharaj gave a new strength and vision to the Navy in India. He added that today the Government had taken a major step towards empowering the 21st century Navy of India in the land of Shivaji Maharaj. "It is for the first time that the tri-commissioning of a destroyer, frigate and submarine was being done", highlighted the Prime Minister. He emphasised that it was also a matter of pride that all the three frontline platforms were made in India. He congratulated the Indian Navy, all the stakeholders involved in the construction work and the citizens of India for the achievement.

"Today's program links our glorious heritage with our future aspirations," exclaimed Shri Modi. He added that India has a rich history related to long sea voyages, commerce, naval defence and ship industry. Taking cue from this rich history, he remarked that today's India is emerging as a major maritime power in the world. He added that the platforms launched today displayed a glimpse of the same. The Prime Minister noted the launch of new platforms, including the *INS Nilgiri*, dedicated to the maritime prowess of the Chola dynasty, and the *Surat* warship, reminiscent of the era when Gujarat's ports connected India to West Asia. He also mentioned the commissioning of the *Vagsheer* submarine, the sixth in the P75 class, following the commissioning of the first submarine, *Kalvari*, a few years ago. These new frontier platforms, the Prime Minister stated, will enhance both India's security and progress.

"India is today recognised as a reliable and responsible partner globally, especially in the Global South," exclaimed the Prime Minister. He emphasised that India operates with a spirit of development, not expansionism. He remarked that India has always supported an open, secure, inclusive, and prosperous Indo-Pacific Region. He noted that when it came to the development of

coastal nations, India introduced the mantra of SAGAR (Security And Growth for All in the Region) and advanced with this vision. Highlighting India's leadership during its G20 presidency, promoting the mantra of 'One Earth, One Family, One Future', Shri Modi also mentioned India's vision of 'One Earth, One Health' during the global fight against COVID-19, underscoring India's belief in treating the world as one family and its commitment to inclusive development. He stated that India considers the defence and security of the entire region as its responsibility.

Emphasising the significant role of maritime nations like India in shaping global security, economics, and geopolitical dynamics, the Prime Minister highlighted the importance of protecting territorial waters, ensuring freedom of navigation, and securing trade supply lines and sea routes for economic progress and energy security. He stressed on the need to safeguard the region from terrorism, arms, and drug trafficking. Shri Modi stressed the importance of becoming global partners in making the seas safe and prosperous, enhancing logistics efficiency, and supporting the shipping industry. He also highlighted the need to prevent the misuse of ocean resources like rare minerals and fish stocks and to develop the capacity to manage them. Noting the importance of investing in new shipping routes and sea lanes of communication and expressing satisfaction that India is continuously taking steps in this direction, the Prime Minister remarked "India has emerged as the first responder in the Indian Ocean Region". He mentioned that in recent months, the Indian Navy has saved hundreds of lives and secured national and international cargo worth thousands of crores, increasing global trust in India, the Indian Navy, and the Coast Guard. The Prime Minister highlighted the strengthening of India's economic cooperation with ASEAN, Australia, Gulf countries, and African nations, attributing this to India's presence and capabilities in the Indian Ocean Region. He emphasised the dual importance of today's event from both military and economic perspectives.

Stressing on the importance of enhancing and modernising India's military capabilities in the 21st century, Shri Modi highlighted, "be it land, water, air, the deep sea or infinite space, India is safeguarding its interests everywhere". He remarked on the continuous reforms being undertaken, including the establishment of the Chief of Defence Staff. He noted that India is progressing towards the implementation of theatre commands to make the armed forces more efficient.

Acknowledging the adoption of Aatmanirbharta (self-reliance) by India's armed forces over the past decade, the Prime Minister lauded the commendable efforts to reduce dependence on other countries during crises. He remarked that the armed forces have identified over 5,000 items and equipment that will no longer be imported. He emphasised the enhanced confidence of Indian soldiers using domestically produced equipment. Shri Modi noted the establishment of the country's largest helicopter manufacturing factory in Karnataka and a transport aircraft factory for the armed forces. He highlighted the achievements of the Tejas fighter plane and the development of defence corridors in Uttar Pradesh and Tamil Nadu, which are accelerating defence production. The Prime Minister expressed satisfaction with the Navy's significant expansion of the Make in India initiative, acknowledging the crucial role of Mazagon Dockyard. He mentioned the inclusion of 33 ships and seven submarines in the Navy over the past decade, with 39 out of 40 naval vessels being built in Indian shipyards. This includes the majestic INS Vikrant aircraft carrier and nuclear submarines like INS Arihant and INS Arighaat. The Prime Minister congratulated the armed forces for propelling the Make in India campaign. He highlighted that India's defence production has

surpassed Rs 1.25 lakh crore and that the country is exporting defence equipment to over 100 nations. He expressed confidence in the rapid transformation of India's defence sector with continued support.

“The Make in India initiative is not only enhancing the capabilities of India's armed forces but also opening new avenues for economic progress,” said Shri Modi. He cited the shipbuilding ecosystem as an example, noting that experts say every rupee invested in shipbuilding has a positive impact of nearly double on the economy. The Prime Minister remarked that currently, 60 large ships are under construction in the country, valued at approximately Rs 1.5 lakh crore. He emphasised that this investment would result in an economic circulation of around Rs three lakh crore and a six-fold multiplier effect in terms of employment. Noting that most of the ship parts come from domestic MSMEs, Shri Modi remarked that if 2,000 workers are involved in building a ship, it creates around 12,000 jobs in other industries, particularly in the MSME sector.

Emphasising India's rapid progress towards becoming the world's third-largest economy, the Prime Minister remarked that there was continuous growth in manufacturing and export capacity, noting the future need for hundreds of new ships and containers. He added that the port-led development model will accelerate the entire economy and create thousands of new job opportunities. Citing an example of the increasing employment in the seafaring sector, mentioning that the number of seafarers in India has more than doubled from less than 1,25,000 in 2014 to nearly 3,00,000 today, the Prime Minister noted that India now ranks among the top five countries globally in terms of the number of seafarers.

The Prime Minister stressed that the third term of his government has begun with several major decisions and remarked on the rapid formulation of new policies and the initiation of new projects to meet the country's needs. He added that the goal was to ensure development in every corner and sector of the country, with the expansion of the port sector being a part of this vision. Shri Modi noted that one of the first major decisions in the third term was the approval of the Vadhavan Port in Maharashtra. He added that the construction of this modern port, with an investment of Rs 75,000 crore, has already begun, creating thousands of new job opportunities in Maharashtra.

Highlighting the unprecedented work done in the past decade on infrastructure connectivity related to borders and coastlines, Shri Modi mentioned the recent inauguration of the Sonamarg Tunnel in Jammu and Kashmir, which will facilitate easier access to border areas like Kargil and Ladakh. He remarked on the inauguration of the Sela Tunnel in Arunachal Pradesh last year, which is improving the army's access to the LAC. He also noted the ongoing rapid work on critical infrastructure projects like the Shinkun La Tunnel and the Zojila Tunnel. The Prime Minister said that the Bharatmala project was creating a network of excellent national highways in border areas, and the Vibrant Village Program is playing a crucial role in the development of border villages. The Prime Minister highlighted the focus of the Government on remote islands over the past decade, including regular monitoring and naming of uninhabited islands. He also mentioned the naming of underwater seamounts in the Indian Ocean, with five such locations named last year by an international organization at India's initiative. These include Ashoka Seamount, Harshavardhan Seamount, Raja Raja Chola Seamount, Kalpataru Ridge, and Chandragupta Ridge in the Indian Ocean, enhancing India's pride.



Emphasising the importance of both outer space and deep sea in the future, the Prime Minister highlighted India's efforts to enhance its capabilities in these areas. He remarked on the Samudrayaan project, which aims to take scientists to a depth of 6,000 meters in the ocean, a feat achieved by only a few countries. He stated that the government is leaving no stone unturned in exploring future possibilities.

Stressing the importance of moving forward with confidence in the 21st century by freeing India from symbols of colonialism, Shri Modi highlighted the leadership shown by the Indian Navy in this regard, noting that the Navy has linked its flag to the glorious tradition of Chhatrapati Shivaji Maharaj and redesigned the Admiral rank epaulettes accordingly. He remarked that the Make in India initiative and the campaign for self-reliance promote liberation from the colonial mindset. He expressed confidence that the nation will continue to achieve moments of pride and contribute to making India a developed country. He emphasised that while responsibilities may differ, the goal remains the same - Viksit Bharat. The Prime Minister concluded by stating that the new frontier platforms received today will strengthen the nation's resolve and extended his best wishes to all.

Speaking on the occasion, Raksha Mantri Shri Rajnath Singh described the commissioning of INS Surat, INS Nilgiri & INS Vaghsheer as historic, and a testimony to the growing strength of not just the Indian Navy, but the country as a whole in the Indian Ocean Region (IOR). Raksha Mantri highlighted the importance of IOR from a geo-strategic & economic point of view, and its growing relevance in today's rapidly changing environment.

Highlighting the importance of IOR from a geo-strategic & economic point of view, and its growing relevance in today's rapidly changing environment, Raksha Mantri said: "A large part of the world's trade and commerce passes through IOR. Due to geo-strategic reasons, the region is also becoming a part of the international power rivalry. Attempts are made for illegal activities such as drug trafficking, narcotics, smuggling, illegal fishing, human trafficking and terrorism. India has had geo-strategic and economic interests in IOR for a very long time. Even today, 95% of India's trade, in terms of volume, is linked to this region. In such a situation, the presence of a strong Indian Navy in IOR becomes our biggest priority. The commissioning of three modern platforms today is an important milestone towards achieving our goal."

Shri Rajnath Singh emphasised that strengthening the country's security system and achieving self-reliance in the defence sector has always been the priority of the Government under the leadership of Prime Minister Shri Narendra Modi. He stated that the Ministry of Defence is surging ahead by implementing the Prime Minister's mantra of 'Aatmanirbharta' in defence. "Over 75% of the content of INS Surat and INS Nilgiri has been developed in India itself. Indigenous content is also increasing continuously in other platforms being manufactured within the country," he added.

On defence modernisation, which is another focus area of the Government, Raksha Mantri asserted that the three Naval combatants are fully equipped with state-of-the-art systems/technologies, which makes these platforms fully capable of dealing with any situation. "On one hand, we are producing big platforms within the country, on the other, our focus is on low cost and high impact systems, which can make our Armed Forces more potent in a short time. Thus, in the process of rapid modernisation of our forces, we are bringing a balanced mix," he said.

On 2025 being declared the 'Year of Reforms' in the Ministry of Defence, Shri Rajnath Singh voiced the resolve to work on the reforms necessary for the Ministry and the three Services. He exuded confidence of implementing many reforms by the end of year, which would take India's defence sector to greater heights.

Raksha Mantri expressed gratitude to the engineers, machinists, contractors, workers and others associated with the three projects. "Your hard work and dedication have borne fruit. With your dedication, you have enhanced the strength of the Indian Navy. The country is proud of you," he said.

In his address, Chief of the Naval Staff Admiral Dinesh K Tripathi exuded confidence that these three platforms will enhance the capabilities of the Indian Navy and make it even more effective in safeguarding maritime interests. He described the commissioning ceremony as a result of the hard work and efficiency of every member of MDL, NHQ, Western Naval Command, Warship Overseeing Team and field units.

Upon his arrival, the Prime Minister was presented with a Guard of Honour. It was followed by the reading of Commissioning Warrants of the ships and submarine by respective Commanding Officers and hoisting of the Naval Ensign & Commissioning Pennants onboard the three vessels accompanied by National Anthem, which marked the formal commissioning of the three vessels. The Prime Minister toured the three combatants and formally unveiled the Commissioning Plaques onboard.

Governor of Maharashtra Shri CP Radhakrishnan, Chief Minister Shri Devendra Fadnavis, Chief of Defence Staff General Anil Chauhan, Flag Officer Commanding-in-Chief, Western Naval Command Vice Admiral Sanjay J Singh, CMD, Mazagon Dock Shipbuilders Ltd Shri Sanjiv Singhal and several other dignitaries from the Centre and State governments & industrial partners attended the event.

### **Background**

The commissioning of three major naval combatants marks a significant leap forward in realising India's vision of becoming a global leader in defence manufacturing and maritime security. INS Surat, the fourth & final ship of the P15B Guided Missile Destroyer Project, ranks among the largest and most sophisticated destroyers in the world. It has an indigenous content of 75% and is equipped with state-of-the-art weapon-sensor packages and advanced network-centric capabilities.

INS Nilgiri, the first ship of the P17A Stealth Frigate Project, has been designed by the Indian Navy's Warship Design Bureau and incorporates advanced features for enhanced survivability, seakeeping, and stealth, reflecting the next generation of indigenous frigates. INS Vaghsheer, the sixth and final submarine of the P75 Scorpene Project, represents India's growing expertise in submarine construction and has been constructed in collaboration with the Naval Group of France.

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## **Govt is transforming the Armed Forces into a modern warfare machine in view of dynamic geopolitical world order: Raksha Mantri Shri Rajnath Singh at 77th Army Day celebrations in Pune**

**Source: Press Information Bureau, Dt. 15 Jan 2025,**

**URL: <https://pib.gov.in/PressReleasePage.aspx?PRID=2093181>**

“Government is leaving no stone unturned to transform the Armed Forces into a modern warfare machine in view of the dynamic geopolitical world order and the constantly-changing character of warfare,” said Raksha Mantri Shri Rajnath Singh during his address at ‘Gaurav Gatha’, an event organised in Pune on January 15, 2025 as part of the 77th Army Day celebrations. Raksha Mantri highlighted the increasing use of unconventional and asymmetrical methods in today’s warfare, and exhorted the Armed Forces to always remain vigilant and ready to face any challenge.

“Conflicts and wars will become more violent & unpredictable. The emergence of non-state actors in many countries and their resorting to terrorism is also a matter of concern. Due to the rapid technological advancements, future wars witness a change to a great extent. Cyber and space domains are rapidly emerging as new war zones. Along with this, a war of narrative as well as perception is also being fought all over the world. The military must focus on holistic capacity building and reforms,” said Shri Rajnath Singh. Raksha Mantri emphasised on the need of a robust security system, strong military and secure borders to realise Prime Minister Shri Narendra Modi’s vision of *Viksit Bharat* by 2047. He asserted that the Ministry of Defence (MoD) is constantly striving to bolster the strength of the Armed Forces by equipping them with latest weapons & platforms, and the focus is on modernisation through self-reliance.

“India is currently going through a phase of transition. We are moving forward from being a developing country to a developed one. To become *Viksit Bharat*, every section of society will have to contribute. But their contribution will only be meaningful when our security apparatus is fool-proof & borders are safe. The security system will be robust only when our military is strong. No nation can develop unless its military is powerful,” said Shri Rajnath Singh. Raksha Mantri echoed the Government’s emphasis on the fact that a strong military is a must to ensure peace. He highlighted that India has always prioritised ‘Buddha’ over ‘Yuddha’, and the Armed Forces have, time-and-again, proved that peace is not a weakness, but a sign of strength.

Highlighting the giant strides made towards attaining ‘Aatmanirbharta’ in defence manufacturing, Shri Rajnath Singh stated that without self-reliance, India cannot achieve strategic autonomy. “A country like India cannot depend on other countries for its security. Today, we are not only manufacturing military equipment on Indian soil, but are exporting them. Domestic defence production touched the record figure of Rs 1.27 lakh crore in the last financial year, while defence exports, which were around Rs 2,000 crore a decade ago, crossed the record figure of Rs 21,000 crore,” he said.

Raksha Mantri enumerated the steps taken by the Government to promote self-reliance, including the notification of positive indigenisation lists of over 5,500 items. He stated that MoD is moving

ahead at an unprecedented pace and in a planned manner towards making the defence sector strong and 'Aatmanirbhar'. On 2025 being declared as the Year of Reforms in MoD, Shri Rajnath Singh stated that efforts will be made to bring-in reforms which will ensure modernisation of the Armed Forces. He exuded confidence that with concerted efforts, India will soon become *Viksit Bharat* and its military one of the strongest in the world. Raksha Mantri paid tributes to the country's brave soldiers who made the supreme sacrifice in the service of the motherland while safeguarding the borders with unmatched valour & commitment. He commended the Indian Army personnel for protecting the nation from external threats, and playing a crucial role in dealing with internal challenges & natural disasters.

"The might of our Armed Forces is such that the adversary does not dare to wage war against India. But, natural disasters are not in our control. Whenever disasters occur, our forces play an active role in the relief and rescue efforts. And, this is not only limited to India. In other countries too, our military is the first responder. It acts as a representative of the Indian value of helping others in the times of trouble," said Shri Rajnath Singh.

On the occasion, Raksha Mantri virtually laid the foundation stone for the Army Paralympic Node, which will be established at Dighi, Pune. He expressed confidence that the Node will inspire the Divyang soldiers of the Indian Army to participate in international events such as Paralympics, Commonwealth & Asian Para Games and bring laurels to the nation. Shri Rajnath Singh also launched the Bharat Ranbhoomi Darshan App, through which the people of the country will be able to visit historical war zones easily and learn about them. A commemorative medallion marking the 352<sup>nd</sup> Coronation of Shivaji, along with a special day cover, was also released.

In a heart-warming moment, Raksha Mantri also felicitated eight Veer Naris and the next of kin of brave soldiers, acknowledging their sacrifice and courage. Chief of Defence Staff General Anil Chauhan, Chief of Army Staff General Upendra Dwivedi and various civil & military personnel were present on the occasion. The event, organised at the Bombay Engineers Group and Centre, was a magnificent tribute to the valor and rich legacy of the Indian Army. It featured an awe-inspiring amalgamated display of lights, sounds and live actions, celebrating the evolution of the Yodha, from its mythological roots to its present-day, modern avatar - the Indian Army. It was a visual and emotional journey that captivated all in attendance. The entire event, a successional depiction, encompassed seven distinct sections, each showcasing different facets of the Indian Army's remarkable journey:

- **Yudh Kala (Martial Arts and Combat Skills):** Highlighting the scientific principles of Dhanurveda, this segment focused on India's rich tradition of martial arts. Featured were martial arts like Gatka, Khukri Hath, Tang-Ta, Kalaripayattu, and Mallakhamb, each a vital part of India's military culture and traditions.
- **Yudh Pradarshan (Battle Demonstrations):** This thrilling demonstration depicted a tactical raid on a terrorist hideout, showcasing the Indian Army's technological prowess and tactical expertise. The display included a simulated battle scenario using advanced military equipment, underscoring the Army's operational readiness and its commitment to upholding its ethos of 'Naam, Namak, and Nishan' (Name, Honor, and Symbol).

- **Pracheen Ranneeti (Ancient Warfare Strategies):** This section brought forth the military culture of India through the historic periods from the Ramayana and Mahabharata. It showcased prominent strategic thinkers and legendary warriors whose unique & successful strategies have been imbibed into Indian Army and have been instrumental in shaping it.
- **Yudh Parivartan (Evolution of Warfare):** The evolution of warfare was explored from close-quarter combat during ancient times, through the introduction of cavalry and elephants, to the use of explosives and firearms and further fomenting into trench warfare, and mechanized warfare.
- **Shaurya Gatha (Tales of Valour):** The section honoured key battles like the Battle of Badgam (1947-48), Battle of Asal Uttar (1965), Battle of Longewala, and the Battle of Tololing, celebrating the bravery of leaders such as Major Somnath Sharma, CQMH Abdul Hamid, Major Kuldip Singh Chandpuri, amongst others.
- **Samarth Bharat Saksham Sena:** This section entailed a comprehensive clip of the Indian Army's contribution in not only upholding India's security and territorial integrity but also in nation building. A tableau depicting the tech prowess and the latest equipment of the Army was also displayed.

Shri Rajnath Singh also interacted with soldiers of the Indian Army, Nepal Army, NCC Cadets, Women Agniveers of Indian Army and Youths of Mission Olympic Wing exchanging thoughts and acknowledging their dedication towards Nation. He also presented awards to several distinguished participants and teams:

- **Best Marching Contingent of 77<sup>th</sup> Army Day Parade:** Awarded to the top contingent for their outstanding display of discipline and pride during the parade. The award was given to Bombay Engineers Group and Centre.
- **Nepali Army Band:** Recognised for their participation in the 77<sup>th</sup> Army Day Parade for the first time ever, adding a new dimension to the celebrations and to the relations India shares with Nepal.
- **NCC Girls Contingent:** Awarded for being part of the Army Day Parade marching contingents for the first time, symbolising the progress of women empowerment in the Indian Armed Forces.
- **Team of the Mission Olympics Tableau:** Acknowledged for their excellent presentation that celebrated India's Olympic achievements.
- **Gaurav Kalash by Cyclothon Team:** The team, which traversed 750 kms across Maharashtra, collected water from various Forts of Shivaji, symbolizing the strong connection between India's military heritage and the present. The water in the Gaurav Kalash was handed over to the Raksha Mantri, who further passed it to the Director of the National Museum.

Additionally, a heartfelt Mouth Painting was presented to the Raksha Mantri by Airman Mridul Ghosh, a paraplegic resident from the Paraplegic Rehabilitation Centre, showcasing the resilience and creativity of individuals overcoming physical challenges.

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## **Chief of Defence Staff compliments Indian Army for its outstanding professionalism & commitment to nation building, on 77th Army Day**

**Source: Press Information Bureau, Dt. 15 Jan 2025,**

**URL: <https://pib.gov.in/PressReleasePage.aspx?PRID=2092959>**

Chief of Defence Staff Gen Anil Chauhan has extended his greetings and best wishes to all ranks of the Indian Army on the occasion of the 77<sup>th</sup> Army Day on Jan 15, 2025. In his message on the solemn occasion, CDS said, the day is a celebration of the unwavering dedication, courage, indomitable spirit and professionalism that define the Indian Army, an institution that continues to stand as the bedrock of India's security and unity.

Gen Anil Chauhan stated that the Indian Army's legacy is built on its credible ability to adapt to challenges, uphold sovereignty and serve the nation selflessly. "The relentless efforts of the personnel of Indian Army in maintaining a high state of readiness, excelling in operational domains and ensuring safety and well-being of our citizens, under all circumstances are commendable," he underscored.

Highlighting the changing dynamics of warfare and the growing use of technology, CDS said that Modern warfare is evolving rapidly, driven by advancements in technology, and shifting geo-political dynamics. Conflicts are increasingly expanding into new domains, including Cyber, Space and Cognitive arenas.

He further said, "New age technologies and concepts such as Automation powered by Artificial Intelligence and Data Centric Architecture, Celerity Centric Warfare bolstered by Stealth and Hypersonic technologies, and Robotics driven by Autonomous Vehicles are transforming how future wars will be fought."

Stressing that no wars in the future would be fought like the last one, and the very raison-d'état for any Army is to win wars, Gen Anil Chauhan said that Indian Army will need to adapt and equip technologically and continually upgrade its Tactics, Techniques and Procedures to remain ahead of the adversaries. Empowering men with higher technical acumen with infusion of improved Information and Communications Technology is the need of the hour, he added.

CDS concluded his message by paying homage and expressing his gratitude to the brave hearts, who made the supreme sacrifice and laid down their lives in the Line of Duty.

"As we mark this special day, every soldier must resolve to uphold the glorious traditions of the Army, while embracing the challenges of the future with determination and pride. May the Army continue to bring greater success and glory to our motherland and contribute indefatigably towards Nation Building," he said.

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## **Indian Armed Forces to conduct Exercise Devil Strike from January 16-19**

**Source:** The Economic Times, Dt. 15 Jan 2025,

**URL:** <https://economictimes.indiatimes.com/news/defence/indian-armed-forces-to-conduct-exercise-devil-strike-from-january-16-19/articleshow/117274448.cms>

The Indian Armed Forces are set to conduct Exercise Devil Strike from January 16 to 19, a joint exercise involving the elite airborne soldiers from the Indian Army and the Indian Air Force, a press release said.

The exercise will occur at the training areas and firing ranges, validating critical drills and enhancing operational readiness in a challenging environment.

The exercise comprises complex airborne operations on various aircraft including troop and equipment insertion in hostile terrain. The exercise focuses on assessment and refinement of the logistic sustenance strategies ensuring troops remain well-equipped and operational in extremely challenging conditions, it added.

Advanced technologies and state of the art equipment that allows highly accurate and efficient delivery of airborne forces to remote locations has been integrated in the exercise, the release said.

Exercise Devil Strike underscores the Indian Armed Forces' commitment to maintaining operational excellence and adaptability in the ever-evolving military landscape. The Exercise will enhance the readiness of both services, preparing them for future challenges, it said.

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## **India's BSF, Bangladesh's BGB hold talks to strengthen bilateral relations**

**Source:** The Economic Times, Dt. 15 Jan 2025,

**URL:** <https://economictimes.indiatimes.com/news/defence/indias-bsf-bangladeshs-bgb-hold-talks-to-strengthen-bilateral-relations/articleshow/117275034.cms>

A Sector Commander-level Border Coordination meeting was held at the Petrapole-Benapole International border on Wednesday between Sector Headquarters of Border Security Force (BSF) Kolkata and BGB Khulna to strengthen bilateral relations and ensure safety and sanctity of the international border. Meanwhile, BSF arrested three Bangladeshi smugglers from Nadia district, foiled a major smuggling attempt on India-Bangladesh border and drove back 13 illegal intruders.

“The meeting deliberated upon important issues of mutual interest including development projects in border areas, implementation of Single Row Fence (SRF), effective measures to combat cross border crime including cattle smuggling, human trafficking and illegal immigrants, BSF said in a statement.

The BSF delegation was led by BSF DIG (Sector Headquarters- Kolkata) Tarni Kumar while the Border Guard Bangladesh (BGB) delegation was headed by Colonel Mehedi Hasan Chowdhury.

Chowdhury is the Sector Commander of Sector Headquarters-BGB Khulna. The delegation comprised respective Battalion Commanders and Staff Officers of both the forces.

The BSF South Bengal Frontier spokesperson N K Pandey said that "The high level meetings are testimony to the unbreakable partnership between India and Bangladesh. Through open dialogue and cooperation, both forces have reaffirmed their commitment to maintain the sanctity of the international border while addressing shared concerns. The BSF is steadfast in its mission to faithfully guard its borders and promote harmony with its neighbours."

### **Three Bangladeshi smugglers arrested by BSF**

The BSF South Bengal Frontier arrested three Bangladeshi cattle smugglers and thwarted multiple smuggling and illegal infiltration attempts along the India-Bangladesh international border in West Bengal. In an operation in Nadia district, BSF apprehended three Bangladeshi cattle traffickers with three cows in their possession. The operation was conducted under the Krishnanagar sector of BSF troops from BOP Noonaganj, in collaboration with the local police.

The arrested cattle smugglers were handed over to Hanskhali police station while the seized contraband was transferred to the concerned authorities for legal proceedings, BSF said. The rescued cattle, after being e-tagged, will be handed over to the Dhyan Foundation for care and rehabilitation, a BSF official said.

BSF troops has also pushed back 10 illegal Bangladeshi infiltrators in North 24 Parganas and three in Malda district. Interrogations revealed that these individuals were attempting to enter India to seek various kinds of jobs including housekeeping in Mumbai and Bengaluru, people in the know told ET. In a series of anti-narcotics operations, BSF troops seized a total of 1,236 bottles of banned Phensedyl, a cough syrup which is often misused as a narcotic.

In Nadia, Murshidabad and Malda districts, BSF troops have pushed back 13 illegal Bangladeshi intruders and seized 1,236 bottles of banned Phensedyl. They also rescued 18 cattle and apprehended red-handed. Pandey said that BSF is taking strict measures to stop smuggling on the India-Bangladesh border. The officer further said that we will not allow smuggling from our area under any circumstances.

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## **Armenia to tow Indo-French artillery gun system**

**Source: The Economic Times, Dt. 15 Jan 2025,**

**URL: <https://economictimes.indiatimes.com/news/defence/armenia-to-tow-indo-french-artillery-gun-system/articleshow/117275292.cms>**

A major defence system, developed jointly by India and France, has bagged an export order from a third nation, showcasing the potential of co-development and Indian low-cost manufacturing. It is learnt that Trajan 155 mm towed artillery gun system has been chosen for induction by Armenia that has been steadily modernising its forces over the past few years. Armenia has selected India as a major partner that can supply guns, rockets, radars and missile systems.

Developed jointly by L&T and KNDS France, the artillery system has been tested by the Indian Army and has met all qualitative requirements, including operations in varied terrains - from marshy plains to high-altitude cold deserts. However, it was not ordered by the Army after an earlier procurement plan was abandoned.

The 52-caliber towed gun system is made in India and several subsystems have been developed indigenously, including the auxiliary power unit, control panel and rolling gear assembly. While the order value has not been disclosed, it is learnt that the gun systems will be delivered in the coming months. These artillery guns will add to a growing number of Indian-origin armaments with Armenia, which already includes multi-barrel rocket launchers, artillery guns and a range of ammunition. The indigenous advanced towed artillery gun systems have already been pressed into service by Armenia.

Similarly, supplies of first launchers and associated equipment of the Pinaka multi-barrel rocket launcher system have also arrived in Armenia. These systems operate a variety of ammunition, including guided rockets and area denial munitions. Orders have also been bagged for Akash anti-air systems that are manufactured by Bharat Dynamics Limited. The system has an indigenous content of 82% and around 60% of the project cost is awarded to the private industry, including MSMEs, to maintain a supply chain for the weapon system.

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## **Russia pushes to add India as Quad plus member on Afghanistan**

**Source: The Economic Times, Dt. 16 Jan 2025,**

**URL: <https://economictimes.indiatimes.com/news/defence/russia-wants-india-included-in-grouping-on-afghanistan/articleshow/117274890.cms>**

Amid India's growing engagements with Taliban, Russia has called for India's inclusion in the Quad grouping on Afghanistan, which comprises China, Pakistan, Iran and Russia. Addressing a briefing on Tuesday, Russian foreign minister Sergei Lavrov said, "It is more important to strengthen trust within the SCO [Shanghai Cooperation Organisation], within the format that is currently working on Afghanistan (Russia, China, Pakistan, Iran). We are confident that the inclusion of India would be the right step".

This proposal comes days after the meeting between the Indian foreign secretary and the acting foreign minister of Afghanistan in Dubai. At the meeting, Foreign Secretary Vikram Misri assured support for Afghan refugees being forced out of Pakistan as well as development projects in Afghanistan. The Quad on Afghanistan last met at the foreign ministers' level in November 2024 on the sidelines of the UN General Assembly. Besides Lavrov, Iranian foreign minister Seyed Abbas Araghchi, Chinese foreign minister Wang Yi and Pakistani defence minister Muhammad Asif were present at the meeting.

SCO had an Afghanistan Contact Group, which had all members including India, but the group has become defunct since Taliban took power in 2021. India has been part of the Moscow format meeting on Afghanistan. India had opened a 'technical office' in Kabul in 2022 and since has had

engagement with the Taliban government in Kabul, while not recognising it. During the last two years, engagement with the Taliban has increased with New Delhi encouraging Kabul to utilise the Chabahar Port. India is coordinating with Russia and Central Asian states to counter the threat of ISIS and other terror groups in the region.

But Afghan Quad was not the only reference to Quad that Lavrov made in his briefing. He alleged that the US was on a mission to turn the Quad comprising India, Japan, Australia and the US into a political and military bloc. He added that his "Indian friends" were fully aware of the US' plans. Lavrov also strongly batted for India's entry into the UNSC as a permanent member.

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## **Top Bangladesh Army officer meets Pakistan Army Chief**

**Source: The Economic Times, Dt. 16 Jan 2025,**

**URL: <https://economictimes.indiatimes.com/news/defence/top-bangladesh-army-officer-meets-pakistan-army-chief/articleshow/117275555.cms>**

A top-ranking Bangladesh army general has met the Pakistan army chief in Islamabad. Lt Gen SM Kamr-ul-Hassan, principal staff officer (PSO) of the armed forces division of Bangladesh, who is also the second-in-command of Bangladesh army, is the first top Bangladeshi general to have travelled to Islamabad in many years, signalling stepping up of defence engagement between the two countries.

The Bangladesh army officer held separate meetings with Pakistan's chief of army staff Gen Syed Asim Munir and chairman joint chiefs of staff committee Gen Sahir Shamshad Mirza on Tuesday, according to Pakistan military's media wing. Lt Gen Hassan held extensive discussions with the Pakistan army chief on the "evolving security dynamics in the region and explored further the avenues for enhancing the bilateral military cooperation", according to Inter-Services Public Relations (ISPR) of Pakistan.

Without naming India, both gET had reported last month that the Pakistan army is planning to launch training programmes for its Bangladesh counterpart from February on Bangladesh soil. Generals underscored the importance of a "stronger defence relationship", emphasising that the enduring partnership between the two nations must remain "resilient against external influences".

ET had reported last month that the Pakistan army is planning to launch training programmes for its Bangladesh counterpart from February on Bangladesh soil.

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## **Games of drones**

**Source: The Times of India, Dt. 15 Jan 2025,**

**URL: <https://timesofindia.indiatimes.com/blogs/toi-editorials/games-of-drones/>**

In a setback for the armed forces' ongoing plans for induction of military drones, a medium-altitude long endurance (MALE) drone called Drishti-10, assembled in India by Adani Defence and Aerospace under licence from Israel, crashed in the pre-acceptance trial. Both army and navy



had ordered the satcom-enabled drone, which costs around ₹120cr. But such setbacks are not out of the ordinary. The armed forces need at least 150 new MALE drones, aside from high-altitude long endurance (HALE) drones like American Predators – New Delhi has already inked a ₹32,350cr contract for 31 of these.

There's no denying that drones have assumed military salience in the last few years, especially after their effective deployment in the Azerbaijan-Armenia conflict and the Ukraine war. The latter, in particular, has taken drone warfare to a whole new level. In 2024, domestically produced Ukrainian drones accounted for 96% of all UAVs used by Ukrainian troops. This included over 1.5mn FPV drones that are no more than seven inches in size.

The point is innovation is the name of the game in drone warfare. Hence, what is needed for India is to create a robust drone manufacturing ecosystem comprising both private and public players. Towards this end, GOI has done well to include all categories of drones – barring strategic ones – in the negative list for imports. But that's step one. Given that investment in R&D is vital here, GOI's policy of selecting the lowest bidder needs to be reviewed. For, private players can best innovate when they have more financial elbowroom, which in turn can bring down prices. Each Ukrainian FPV drone costs around \$500 or less.

Third, as the induction of an array of drones into the armed forces picks up pace, there is a need to create a specialist corps to operate the drones or specialist drone subunits. This will not only streamline integration and operation of drones, but will also see drone warfare emerge as a key pillar of defence strategy. The bottom line: no matter the setbacks, GOI and armed forces must keep investing in drone supply chains, R&D and procurement. Twenty-first century warfare demands this.

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## **China solves big riddle for very high-power microwave weapons**

**Source: The Week, Dt. 15 Jan 2025,**

**URL: <https://www.theweek.in/news/defence/2025/01/15/china-solves-big-riddle-for-very-high-power-microwave-weapons.html>**

China may have overcome the big challenge to build high-power microwave (HPM) weapons after having solved the riddle of generating electromagnetic pulses—that are akin to energies released by nuclear explosions—without any damage to the device releasing these pulses. HPM guns fire bursts of 'microwave bullets' at the speed of light that melt electronic circuitry rendering lethal and deadly incoming missiles useless, destroy computers and communication networks, blind radars, wreak havoc on communication systems, stop vehicles on their tracks, and make aircraft and ships go awry.

There is an ongoing race among the world's major military to develop HPM weapons that can be a colossal force-multiplier in military capability especially in countering anti-radiation missiles, destroying electronic systems, aircraft, drone swarms, salvos of missiles and even satellites on low

earth orbits. The Hong Kong-based South China Morning Post reported: “Inside a power divider the size of a household pedestal fan, the electric field strength exceeds 80,000 volts per metre—comparable to the electromagnetic pulses generated by nuclear weapon explosions.”

The report adds that the electromagnetic waves generated by the compact Directed Energy Weapon (DEW) device can even exceed a total power of one gigawatt. While the technology is being developed, the deployment of such HPM weapons by China may still take time.

The weapon uses “phased-array transmission technology instead to ‘precisely focus energy, increasing its effective range and enhancing damage effects, enabling simultaneous attacks on multiple targets’”.

The development is due to the “breakthrough” achieved by a joint team of military researchers from the National University of Defence Technology in Changsha and the Northwest Institute of Nuclear Technology in Xian.

The Chinese government has primarily mandated the Xian-based Northwest Institute of Nuclear Technology with the development of HPM weapons. DEWS are of two types—high power lasers (HPL) and high power microwaves (HPM). While the narrow means of HPLs can cover only a smaller target area, HPM weapons, because of their wider coverage area, can devastate salvos of missiles or drone swarms.

China has already developed HPL weapons. A US defence department report said: “By the mid-to-late-2020s, China may field higher power systems that extend the threat to the structures of non-optical satellites”. China has already developed a system (LW-30) that can take out unmanned aircraft systems and precision-guided weapons. This was first unveiled at the International Aerospace Exhibition in Moscow in 2019.

It is commonly believed that while nuclear weapons and missiles held primacy during the Cold War, satellites and communication technology are the dominant military tools at present times, but the future military technology will be dependent on DEWs to a large extent.

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## **"Reflection of our longstanding defence partnership of trust": French Embassy on induction of INS Vagsheer**

Source: ANI News, Dt. 15 Jan 2025,

URL: <https://www.aninews.in/news/world/asia/reflection-of-our-longstanding-defence-partnership-of-trust-french-embassy-on-induction-of-ins-vagsheer20250115203934/>

The Embassy of France in India on Wednesday highlighted collaborative effort between France's Naval Group and India's Mazagon Dock Shipbuilders, after INS Vaghsheer, the sixth and final submarine of the Scorpene-class project was inducted in the Indian Navy.

The Embassy in a post on X wrote, "Proud to see PM Narendra Modi dedicating to India INS Vaghsheer - the 6th and final Scorpene class submarine - built with a France Naval Group and

Indian Mazagon Dock Shipbuilders collaboration. A reflection of our longstanding defence partnership of trust & our common quest for strategic autonomy."

This event marks a significant milestone in the defence partnership between India and France, reflecting years of collaboration and shared aspirations for strategic autonomy. The Scorpene-class submarine project, executed with the joint efforts of France's Naval Group and India's Mazagon Dock Shipbuilders, showcases a high degree of trust and synergy in bilateral ties.

Notably, INS Vagsheer submarine, the sixth among a French licence-built Kalvari (Scorpene)-class conventional diesel-electric submarines, is aimed at replacing aging Indian underwater platforms and plugging serious capability gaps in existing ones. India now has a total of 16 submarines. The P75 Scorpene submarine project represents India's growing expertise in submarine construction in collaboration with the Naval Group of France.

Earlier this month, India's INS Mormugao and aircraft from the Indian Air Force participated in a Maritime Partnership Exercise with the French Carrier Strike Group (CSG) off India's western coast. This exercise, which included advanced maritime drills and joint air operations, highlighted the professionalism and interoperability between the naval forces of both countries. In addition, French naval ships FS Forbin and FS Alsace, part of the same Carrier Strike Group, visited Kochi, Kerala, as part of their ongoing mission.

The visit featured discussions between the ships' Commanding Officers and senior officials at the Southern Naval Command, focusing on strengthening defence cooperation. Professional exchanges such as cross-deck visits and Subject Matter Expert Exchanges (SMEE) further enhanced mutual understanding and operational collaboration, underscoring the deepening ties between the Indian and French navies.

India and France's defence partnership, established in 1998, has been strengthened through joint military exercises, including Shakti (land), Varuna (sea), and Garuda (air). The partnership also benefits from regular operational stopovers, with 16 port calls by French Navy vessels since 2022. As resident states of the Indian Ocean, both nations actively collaborate to ensure maritime security, reinforcing their roles as key contributors to regional stability.

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## **India, Spain agree to strengthen defence coop: MEA**

**Source: The Tribune, Dt. 16 Jan 2025,**

**URL: <https://www.tribuneindia.com/news/india/india-spain-agree-to-strengthen-defence-coop-mea/>**

More than two months after Prime Minister Narendra Modi and his Spanish counterpart Pedro Sanchez inaugurated India's first private-sector military aircraft manufacturing facility — the C295 plant in Vadodara — the Ministry of External Affairs (MEA) announced on Wednesday that the two countries have "agreed to further strengthen cooperation" in the defence sector.

The MEA statement followed External Affairs Minister S Jaishankar's visit to Spain on January 13 and 14. During the visit, Jaishankar met Spanish Defence Minister Margarita Robles and

highlighted the significance of the C295 aircraft assembly line in Vadodara, describing it as a milestone that has elevated defence and security cooperation between the two nations.

“The two sides agreed to further strengthen cooperation in the defence sector,” the MEA noted. The C295 military aircraft is being manufactured by Tata Advanced Systems Limited (TASL) in collaboration with European aerospace giant Airbus. The main C295 production facility is located in Seville, Spain. A total of 56 aircraft are being produced under the project at a cost of Rs 21,935 crore. Of these, 16 aircraft will be delivered directly by Airbus from Spain, while the remaining 40 will be assembled in India.

The first aircraft from the Vadodara facility is expected to roll out in September 2026, with the remaining 39 scheduled for delivery by August 2031. The next major project in the pipeline is the Indian Navy’s plan to acquire six next-generation stealth submarines.

Spanish company Navantia is among the contenders for this project. The Ministry of Defence requires an Indian bidder to tie up with a foreign manufacturer for making these submarines that are equipped with Air-Independent Propulsion systems.

In April 2023, Indian firm Larsen & Toubro (L&T) signed a Memorandum of Understanding (MoU) with Navantia for this programme. Meanwhile, Mazagon Dock Limited (MDL) signed an MoU with German company Thyssenkrupp Marine Systems in June 2023.

During his visit to Madrid, Jaishankar held discussions with his Spanish counterpart, Foreign Minister José Manuel Albares, reviewing the full spectrum of bilateral cooperation. They also explored opportunities for collaboration in emerging areas such as digital technology, artificial intelligence, renewable energy and space. Jaishankar also had separate meetings with King Felipe VI of Spain and Spanish President Pedro Sanchez in Madrid on Tuesday.

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## भारत से 'ब्रह्मोस' खरीदेगा इंडोनेशिया, राष्ट्रपति प्रबोवो सुबिआंतो के साथ हो सकती है डील

Source: Aaj Tak, Dt. 15 Jan 2025,

URL: <https://www.aajtak.in/defence-news/story/india-indonesia-brahmos-deal-in-final-stages-announcement-likely-during-indonesian-presidents-republic-day-visit-ntc-rpti-2143861-2025-01-15>

इंडोनेशिया के राष्ट्रपति प्रबोवो सुबिआंतो गणतंत्र दिवस समारोह में मुख्य अतिथि होंगे. प्रबोवो सुबिआंतो की भारत यात्रा के दौरान भारत इंडोनेशिया के साथ ब्रह्मोस डील फाइनल हो सकती है. सूत्रों के अनुसार, इंडोनेशिया के रक्षा मंत्रालय ने 450 मिलियन डॉलर के ब्रह्मोस मिसाइल सौदे के संबंध में जकार्ता में भारतीय दूतावास को एक आधिकारिक संदेश भेजा है. जिसके बाद ये कयास लगाए जा रहे हैं कि इंडोनेशियाई राष्ट्रपति की नई दिल्ली यात्रा के दौरान इस पर अंतिम मुहर लगेगी.

भारत इस सौदे को इंडोनेशिया के लिए सुविधाजनक बनाने के लिए भारतीय स्टेट बैंक और अन्य भारतीय राष्ट्रीय बैंकों के माध्यम से इंडोनेशिया को ऋण देने की बात कर रहा है। ऐसा कहा जा रहा है कि ऋण की प्रक्रियाओं को अंतिम रूप देने के लिए चर्चा चल रही है।

### **भारत को एक नई पहचान मिलेगी**

इंडोनेशिया के साथ अगर ये सौदा होता है, तो उससे भारत को वैश्विक रक्षा निर्यात बाजार में एक नई पहचान मिलेगी। इससे पहले भारत ने फिलीपींस के साथ ऐतिहासिक रक्षा समझौता अप्रैल 2023 में किया था। फिलीपींस के साथ 375 मिलियन डॉलर के सौदे में 290 किलोमीटर की रेंज और 2.8 मैक की गति वाली तीन मिसाइल शामिल थीं। जिससे फिलीपींस की रक्षा क्षमता में इजाफा हुआ।

### **दोनों देशों के बीच संबंध और मजबूत होंगे**

ब्रह्मोस मिसाइल का सौदा भारत और इंडोनेशिया के बीच रक्षा संबंधों को और मजबूत करेगा। इंडोनेशियाई राष्ट्रपति की भारत यात्रा के दौरान अगर ये डील हो जाती है, तो ये दोनों देशों के बीच द्विपक्षीय संबंधों को मजबूत करेगा।

साथ ही रक्षा व्यापार में भारत के लिए एक नया मानक भी स्थापित करेगा। इसके अलावा इस डील से प्रौद्योगिकी निर्यात के रूप में भारत की स्थिति Indo-Pacific क्षेत्र में और मजबूत होगी। बता दें कि इंडोनेशिया जनवरी 2024 में ब्रिक्स में शामिल हुआ था।

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## **China ‘Drills’ With Exoskeletons, Robot Dogs & High-Power Laser Drones Close To Indian Border – Reports**

**Source: The EurAsian Times, Dt. 15 Jan 2025,**

**URL: <https://www.eurasiantimes.com/pla-latest-drills-near-lac/>**

The PLA Army said in a statement on January 13 that a regiment under the PLA Xinjiang Military Command used a manned-unmanned collaborative model to enhance combat unit support during a recent logistics support exercise in an undisclosed plateau region, state-owned publication Global Times reported. Faced with obstacles that impeded the convoy’s movement, the troops used all-terrain vehicles and unmanned vehicles to push forward with the mission.

In simulating an exigency where the roads were sabotaged, the unit members of the PLA Army unloaded the supplies from vehicles and used exoskeletons and aerial drones to navigate around the damaged areas and reach their destination. Exoskeletons are wearable devices that enhance human strength and reduce physical strain. One of the photographs released with the PLA statement showed a soldier with a robot dog carrying two supply boxes. The use of robot dogs by PLA troops has been widely documented, especially in military drills at home and with overseas partners. Using these robots for logistics reduces pressure on troops and makes the mobilization of supplies easier in difficult terrains, particularly in mountainous regions.

While the PLA did not disclose the exact “plateau location” of the drills, reports in the Indian media suggested that they were likely conducted close to the Line of Actual Control (LAC), the disputed border with India, which remains sensitive five years after the 2020 border stand-off.



A report in an Indian publication stated: “China’s logistics support exercise underscores its strategic intent to enhance operational readiness in high-altitude environments, particularly in the Xinjiang region, which borders Ladakh. The inclusion of cutting-edge technologies, such as unmanned vehicles and drones, reflects Beijing’s focus on modernizing its military capabilities for asymmetric warfare.”

The report emphasized that these exercises serve as strategic posturing, demonstrating China’s capability to gather and maintain troops in disputed areas quickly. With these training drills, the PLA wanted to iterate and establish that its soldiers could overcome the physiological difficulties of high-altitude combat by using exoskeletons.

Intriguingly, the drills come ahead of India’s Army Day on January 15. In a recent press interaction, India’s Chief of Army Staff General Upendra Dwivedi said that the two countries are still locked in a “degree of standoff” and the Indian Army was considering diplomatic negotiations to resolve the situation. The two sides recently carried out complete disengagement in the last remaining areas in Eastern Ladakh, paving the way for the diffusion of tensions. However, that has failed to drastically alter the dynamics in the region.

“As far as the status of the standoff (with China) is concerned...we have to see what all has changed since April 2020. Has the terrain been doctored over a period of time? Yes, both sides have doctored the terrain. Have both sides carried out constructions? Yes. Both sides have carried out some stocking, deployment? Yes. Therefore, what it means is that there is a degree of standoff,” General Dwivedi said. General Dwivedi described the situation along the border with China as “stable but sensitive.”

Moreover, the timing of these drills is particularly significant as it comes days after China announced the establishment of two new counties in Hotan prefecture of Xinjiang. One of these counties includes a large portion of Aksai Chin, the Indian territory that remains under illegal occupation of China, according to India. As per officials and experts, the move aims to buttress China’s control over the occupied territory. Experts noted that these recent drills emphasize that it is crucial for India to continue to be vigilant and to advance its own military modernization initiatives in Ladakh. On its part, the Indian Army also practiced winter combat in order to thwart any possible Chinese attack. However, the technological innovation in the PLA, as seen in the latest drills, maybe a cause of concern for the Indian Army.

### **PLA Going Hi-Tech Must Worry Its Adversaries**

In a separate development, the PLA Northern Theater Command’s navy maritime defense engineering unit conducted an exercise on disposing of explosive ordnance at a shooting range on an island in Bohai Bay. For this, the PLA troops used a drone that was fitted with a high-power laser. First, the drone was deployed to search for the said explosive and mark its coordinates. This was followed by the deployment of a high-power laser to dispose of the explosives.

A unit member told Chinese state broadcaster CCTV that high-power lasers offer a safer and more effective way to dispose of explosives because they can be used remotely from a distance of several hundred meters. The power is increased threefold, and the time required to dispose of an explosive is shortened by one-fifth. China’s use of lasers is not unheard of. In fact, with drone

warfare gaining prominence worldwide, mounting lasers on drones is fast becoming popular. In particular, laser-directed energy weapons (LDEWs) have the potential to revolutionize warfare. They provide an innovative way to combat both conventional and asymmetric threats owing to their accuracy, quick targeting, scalability, affordability, and capacity to reduce collateral damage.

Laser beams have been used in combat for a long time. Their primary functions include precision aiming, distant sensing, and target tracking. However, they are increasingly being employed for disruptive missions. Integrating lasers on drones would enhance pinpoint precision. China's efforts to develop sophisticated laser weapons range from low-powered tactical beam emitters that can stop hostile drones to high-energy strategic systems that can destroy adversary satellites and missiles.

The country has frequently made headlines for launching military-grade lasers or dazzlers at fighter jets and warships. However, the development of high-energy laser weapons has captured the imagination in recent years. China is said to have developed multiple laser guns and is now arming warships with laser weapons. Chinese military expert Song Zhongping pointed out that the PLA is using unmanned technology for non-combat activities, including logistics assistance and explosives disposal, in addition to using them for actual combat missions.

“In the past, these support missions could be difficult and required manpower, but the deployment of intelligent equipment has made them more efficient,” he told the Global Times. He stressed the employment of unmanned systems is growing quickly because they can effectively lower casualties and improve the performance of other military assets. EurAsian Times has reported on China's deployment of robots for logistics and combat on multiple occasions. In November 2024, for instance, China unveiled the “Lynx” advanced quadruped robot designed for rugged, off-road environments.

As per reports, it can navigate extreme terrain at high speeds and perform stunts like backflips and sharp turns, enhancing its utility in real-world applications like disaster response, combat situations, as well as exploration. These features make it suitable for various tactical and logistical operations in military contexts, from reconnaissance missions in complex environments to providing logistical support in combat zones.

In another instance, Chinese troops deployed a machine-gun-toting “robodog” for the China-Cambodia war games that were held in May 2024. The armed “robodogs” came equipped with remote-controlled drone soldiers with back-mounted machine guns and demonstrated exceptional mobility, even though no live-fire test was conducted.

The PLA has been put through a groundbreaking modernization drive since President Xi Jinping came to power in 2013, with the integration of cutting-edge technology and automation in combat forming a major part of this effort. This high-tech military force is only expected to become bigger and better, as evidenced by the recent drills.

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## Science & Technology News

### CSIR-NIScPR's 4th Foundation Day & 'STiG-2025' International Conference Kicks Off to Refine R&D Indicators

Source: Press Information Bureau, Dt. 15 Jan 2025,

URL: <https://pib.gov.in/PressReleasePage.aspx?PRID=2093140>

The two-day International Conference being organized by CSIR-National Institute of Science Communication and Policy Research (NIScPR) on “Aligning Science-Technology-Innovation (STI) Indicators for Effective R&D Governance” (STiG-2025) & commemoration of its 4<sup>th</sup> Foundation Day was inaugurated on January 14<sup>th</sup> 2025 at Vivekananda Hall of CSIR-NIScPR.

Prof. Ranjana Aggarwal, Director, CSIR-NIScPR during her inaugural address welcomed all the delegates and dignitaries and thanked them for their presence for this two-day event. She gave the overview of the conference and highlighted the significance of the foundation day of NIScPR (earlier NISCAIR and NISTADS) which has a combined legacy of more than 100 years. She elucidated the history of NIScPR which was formed 4 years ago after merging of CSIR-NISTAD and CSIR-NISCAIR. Prof. Aggarwal mentioned CSIR-NIScPR as the youngest and one of the most dynamic labs of CSIR & its role as think tank of Science communication and STI policy research. She also discussed about divisions and missions of CSIR-NIScPR like SVASTIK, TRL, NETRA, Creating livelihood opportunities in rural areas, ISSN, journals Publication division etc. She also remembered the role of Prof. Ashutosh Sharma while he was secretary of DST in 2020 in formulating STI policy around the country.

The guest of honor Dr. Suman Kumari Mishra, Former Director, CSIR-CGCRI, Kolkata and Adjunct Professor, IIT Ropar in her address thanked the NIScPR family for organizing conference on this important topic of Science Technology Innovation (STI) indicators. She also highlighted the role of NIScPR in societal development in S&T and memorize the role of NIScPR's popular science magazines 'Vigyan Pragati' and 'Science Reporter' in disseminating science information to public since decades. She also said that “We have ample room for innovation, and scientists are willing to take risks”.

Prof. Sachin Chaturvedi, Director General, Research and Information System (RIS) for Developing Countries and Guest of Honor in the inaugural session of the conference, presented 'Foundation Day Lecture' under the theme “Reimagining Science, Technology and Innovation Indicators: Towards Development Agenda for Viksit Bharat at 2047”. He said that the world is changing, and new development priorities and targets are essential, so we must prepare for STI globalization. He also emphasized the role of Inclusion and Sustainability as key R&D indicators. Along with many aspects of STI, he said that the role of ethics, sustainable development goals, green growth, MSME connectivity, Wellbeing-related parameters, qualitative parameters and others should be included in indicators.

Prof. Ashutosh Sharma, President, INSA, Institute Chair Professor & C. V. Seshadri Chair Professor, IIT Kanpur and the Chief Guest of the conference during his address said, NIScPR's years of expertise have yielded excellent results in science communication and policy research. We need knowledge that impacts society through STI and it is not just about new technologies, but about cultural behavior towards science in society, therefore we require indicators to address this too. He added that the impact of AI and newer technologies is essential for future and in this regard, he highlighted the example of various multibillion industries that failed because they could not catch up with the advances of science like digital photography and personal computing. During his address, he also put key emphasis on translation of knowledge and wisdom into monetary terms or wealth and thus asked to add this parameter as an important indicator of evaluation.

After the insightful addresses, the dignitaries on the dais released the conference souvenir, three books, one special issue of Science Diplomacy newsletter and a special issue of Journal of Intellectual Property Right, all published by NIScPR. During the closing remarks of inaugural address, Shri Mukesh Pund, Chief Scientist, CSIR-NIScPR and Co-Chairperson, STiG 2025 thanked all the participants. Prof. Sujit Bhattacharya, Chief Scientist, CSIR-NIScPR & Chairperson, STiG 2025 and other team members of core organizing team to make this event happen successfully.

As a memoir, tree plantation under "Ek Ped Maa Ke Naam" initiative was also organized in which national and international experts planted trees in CSIR-NIScPR campus.

There were eight different sessions on the day one of the conference, some of which were parallelly organized in Vivekanand Hall and committee room. Session Chair, Prof. Akhilesh Gupta, Former Secretary of Science and Engineering Research Board (SERB) and Senior Advisor at Department of Science and Technology, Government of India, featured an engaging thematic overview of the session 1 on STI Indicators for R&D Governance.

Insightful keynote address from distinguished speaker like Prof. Sujit Bhattacharya, Chief Scientist at CSIR-NIScPR, highlighted the critical need to align STI indicators with foresight and governance mechanisms and Prof. Oleg G. Golichenko, from CEMI Russian Academy of Sciences and Department of Industrial Organisation, Russia presented his keynote address on "Mesotrajectories of Technological Development: Aligning Science-Technology-Innovation Indicators".

Prof. Vivek Kumar Singh, Senior Advisor (Science and Technology) at NITI Aayog, Government of India, delivered a talk on "Towards Performance-Based Research Funding: Institutional Expertise and Diversity Assessment." Prof. Singh emphasized the importance of robust STI indicators in driving performance-based funding models, which leverage institutional strengths and embrace diversity to enhance research output.

The 2nd session of Poster Presentations chaired by Dr. Charu Verma, Chief Scientist, CSIR-NIScPR and total 17 posters were presented in the session.

The 3<sup>rd</sup> session was on the theme "Measuring the Social Impact of R&D". It was Chaired by Prof. Brajesh Pandey, Executive Director, INSA in which Dr. Ismael Rafols, Senior Researcher, Leiden

University gave invited talk and paper presentations were given by Dr Shiv Narayan Nishad and others integrating with the theme of session.

A 4<sup>th</sup> panel discussion session on the theme "STI Indicators for R&D and Society" took place in which the scientists like Dr. Nadia Asheulova from Russian Academy of Sciences, Dr. Naresh Kumar, Chief Scientist, CSIR-NIScPR and others had discussion on the proposed theme. The session was chaired by Prof. Vivek Kumar, Head, CRDT, IIT Delhi and moderated by Ms. Sandhya Wakdikar, CSIR-NIScPR & Dr. N K Sahoo, Scientist, CSIR-NIScPR.

The panelists discussed the implementation of new protocols for research evaluation, need to evaluate individual scientists, rather than just organizational units and the need for careful consideration of SCI indicators at the international and national levels, especially with the emergence of new technologies like AI among others.

In the 5<sup>th</sup> session which has the theme Connecting R&D and social media, an invited talk by Dr. Pit Pichhapan, Digital Information Research Labs, Chennai, India was given on "The impact of measuring large vs small aggregate of research units" and papers were presented which were followed by questions and answers. The session was chaired by Prof. Madhav Govind, CSSP, Jawaharlal Nehru University.

Another 6<sup>th</sup> session, panel discussion was arranged on the theme STI Indicators for R&D and social media. The discussion was chaired by Prof. Ki-Seok Kwon, Hanbat National University, South Korea and moderated by Dr. Yogesh Suman, Chief Scientist, CSIR-NIScPR. During the panel discussion the panelist like Dr. Jagvir Singh, Head, Outreach & SAGE-NCS Ministry of Earth Sciences; Dr. Nisha Mendiratta, Executive Director, IUSSTF; Dr. (Mrs) Rama Swami Bansal, Head, ISTAD, CSIR-HQ; Dr. Geeta Vani Rayasam, Head, CSIR-HRDG; Dr. Rashmi Sharma, Head, NCSTC Division, DST; Dr. Hemant Kumar, DSSTIP, Central University of Gujarat; Dr. G. Mahesh, Head, DGED, CSIR-HQ; Dr. Anukrati Sharma Director, Skill Development Center, University of Kota, Rajasthan discussed the pros and cons of Altmetrics in research, funding decisions, societal development and other important aspects of policy making.

They concluded that social media is important aspect and efficient way to connect, research should be evaluated based on local needs and language-based science policy should be made to broaden access to research activities.

The last two sessions (session 7 and 8) were both based on the theme Methods, Approaches and Practices in Performance Evaluation. They were parallel sessions which were chaired by Dr. Arvind C Ranade, Director, National Innovation Foundation (NIF) and Dr. Vipin Kumar, Chief Scientist, CSIR-NIScPR. During the sessions, around 13 presentations were made where leading experts discussed cutting-edge strategies and metrics on how social media and R&D together can impact the society in various ways. Overall, the 1<sup>st</sup> day of the conference witnessed high enthusiasm and excitement among the participants, which was evident by their active participation and involvement with the speakers and panelists.

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## **ISRO docks satellites, India takes first step towards entering elite club of nations**

**Source: The Times of India, Dt. 16 Jan 2025,**

**URL: <https://timesofindia.indiatimes.com/science/isro-docks-satellites-india-takes-first-step-towards-entering-elite-club-of-nations/articleshow/117283124.cms>**

In a milestone for India's space capabilities, Isro completed its first-ever satellite docking manoeuvre early Thursday (January 16), marking a crucial step toward multiple future missions — including Chandrayaan-4 and the country's own space station — in the pipeline. Multiple sources confirmed that the docking attempt was a success. No official announcement about the same was done at the time of writing this report.

With this, India has taken the first step towards joining an elite club of nations — the US, Russia and China — that boast of such technology. Isro will need several more docking tests before claiming mastery over the technology. The Space Docking Experiment (SpaDeX), launched on December 30, saw two satellites that were launched separately unite at an orbital altitude of approximately 475km, with the final commands executed from Isro Telemetry, Tracking and Command Network (Istrac) in Bengaluru.

“We didn't completely automate everything. Since the launch there have been five to six stages, and at each stage, we were monitoring from the ground and giving a go-ahead before proceeding to the next,” M Sankaran, director URSC, had told TOI explaining the process. Isro employed a petal-based docking system, aligned with international standards including the International Docking System Standard (IDSS).

The space agency had taken a cautious approach to the entire operation, including ground simulations based on an abort scenario that on January 6 identified the need for further validation. This crucial input saw Isro postpone the docking procedure from January 7 to January 9, only to postpone it again.

By Jan 11, the two satellites achieved a distance of 230m from the distance of 1.5km. “Arrested at Inter Satellite Distance (ISD) of 230 m, all sensors are being evaluated. Spacecraft's health is normal,” Isro had said. A day before that Isro had said spacecraft were at a distance of 1.5 km and on hold mode. “Further drift to 500 m is planned to be achieved by tomorrow (January 11) morning.” Isro had said. On January 9, the space agency had put the satellites on a slow drift course after it was forced to put off the docking on the day.

After the launch on December 30, Isro has been preparing for the docking, which requires multiple steps/stages, each of which was monitored from the ground and given a go-ahead before proceeding to the next. However, it has had to postpone its docking attempt multiple times. On January 6, a day before the first docking attempt was scheduled, Isro had found that the docking process required further validation through ground simulations based on an abort scenario it identified on the day. And the docking was rescheduled for January 9.

And, on January 8, Isro said: “While making a maneuver to reach 225m between satellites the drift was found to be more than expected, post non-visibility period. The planned docking for tomorrow



(January 9) is postponed. Satellites are safe.” The space agency had initiated the drift on the chaser spacecraft — the two satellites are designated chaser and target — late on January 8.

On January 9, a day after the drift between satellites caused Isro to postpone SpaDeX for the second time, the space agency managed to put the spacecraft in a slow drift course. “...The drift has been arrested and spacecraft put in a slow drift course to move closer to each other. By tomorrow (January 10), it is expected to reach initialisation conditions,” Isro said Thursday.

And on January 12, it carried out a trial to reach up to 15m and further to 3m and then the satellites were moved to a safe distance. Docking in space is a complex process and so far, only three other countries have mastered it.

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## Private US, Japanese lunar landers launch on single rocket

Source: The Hindu, Dt. 15 Jan 2025,

URL: <https://www.thehindu.com/sci-tech/science/private-us-japanese-lunar-landers-launch-on-single-rocket/article69100034.ece>

One rocket, two missions: lunar landers built by US and Japanese companies launched their "rideshare" to the Moon on Wednesday, showcasing the private sector's growing role in space exploration. On board the SpaceX Falcon 9 rocket that took off from the Kennedy Space Centre in Florida were Firefly Aerospace's Blue Ghost and ispace's Resilience from Japan, which will also deploy a micro rover.

Both uncrewed missions aim to build on the success of Texas-based Intuitive Machines, which last year became the first company to successfully touch down on the earth's celestial neighbour. Until recently, soft landings on the Moon were achieved only by a handful of well-funded national space agencies, starting with the Soviet Union in 1966.

Now, however, several emerging US companies are attempting to replicate this feat under NASA's experimental Commercial Lunar Payload Services program, designed to cut costs and stimulate a lunar economy. The US plans to establish a sustained human presence on the Moon later this decade under the Artemis program, leveraging commercial partners to deliver critical hardware at a fraction of the cost of government-led missions.

"Each milestone we complete will provide valuable data for future missions and ultimately keep the United States and our international partners at the forefront of space exploration," Firefly Aerospace CEO Jason Kim said Tuesday. "Firefly is a go for launch. Let's go ghost riders in the sky!"

### Staying upright

On the Japanese side, Tokyo-based ispace's first attempt to land on the Moon ended in an unsalvageable "hard landing" in April 2023.

"It's important to challenge ourselves again, after enduring failure and learning from it," ispace founder and CEO Takeshi Hakamada said last week.

"Today, we're going back to the Moon," a post on the ispace X account said Wednesday, adding in a promotional video: "Today, we prove our resilience".

Blue Ghost is stacked atop Resilience inside the Falcon 9, SpaceX executive Julianna Scheiman said, and will be deployed first, followed by Resilience nearly 30 minutes later. The two spacecraft have different timelines for reaching the Moon. Blue Ghost aims to complete its journey in 45 days, gradually lifting its orbit around the earth before entering lunar orbit and touching down near Mons Latreille, a volcanic feature in Mare Crisium on the Moon's northeast near side.

"With 10 NASA instruments on this flight, we're conducting scientific investigations... from characterising the earth's magnetosphere to understanding lunar dust and the Moon's interior structure and thermal properties," NASA scientist Maria Banks said. Blue Ghost also carries technology demonstrations focused on navigation and computing in the Moon's harsh radiation environment.

### **'Moonhouse' art**

Meanwhile, Resilience will take four to five months to reach its destination in Mare Frigoris, on the Moon's far north. Its payloads include scientific instruments, but the centerpiece is Tenacious, a micro rover developed by ispace-Europe, a Luxembourg-based subsidiary.

The four-wheeled robot features a high-definition camera and will attempt to scoop up regolith -- the Moon's loose surface material. It also carries on its front a small red "Moonhouse" created by Swedish artist Mikael Genberg.

These ambitious goals hinge on achieving a successful soft landing -- a task fraught with challenges. Spacecraft must navigate treacherous boulders and craters and, in the absence of an atmosphere to support parachutes, rely entirely on thrusters for a controlled descent.

A final hurdle, as recent missions have shown, is remaining upright. When Intuitive Machines' Odysseus landed in April 2024, it tipped over, limiting the investigations it could perform. Similarly, Japan's SLIM lander, which touched down in March 2024, landed at a wonky angle, leaving its solar panels poorly positioned, similarly curtailing its operational lifespan.

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## **'Strange' particle found to have mass when moving in one direction, not another**

Source: The Hindu, Dt. 16 Jan 2025,

URL: <https://www.thehindu.com/sci-tech/science/particle-found-to-have-mass-when-moving-in-one-direction-not-another/article69092319.ece>

Since the start of the 20th century, physicists have discovered a veritable zoo of subatomic particles. Matter can be both wave and particle. If you take the particle route, these subatomic particles are what you could say the universe and everything in it is made of. There are many ways to further categorise them.

A common one is as fermions and bosons: fermions make up matter and bosons mediate the forces between matter. For example, electrons and protons are fermions whereas photons are bosons.

Fermions can be further classified as Dirac or Majorana fermions. Dirac fermions are fermions that may or may not have mass but are always different from their anti-particles. Majorana fermions are fermions that are also their own antiparticles (neutrinos are suspected to be Majorana fermions).

### **The zoo smells funny**

Even if these distinctions seem too fine, they're of considerable interest to physicists. They know something's up in the subatomic zoo. Some animals that should obviously be there are missing, like the particle for the force of gravity. Some animals are much heavier than they should be (Higgs bosons and neutrinos). One enclosure, dark matter, remains empty even though physicists have been looking for it under every rock and leaf. Their knowledge of quite a few animals is just incomplete or at odds with what they studied in school. There's a lot of work left if the zoo is to be a fully understood place without any surprises.

To do this physicists have one advantage: a common theory that collects all these animals under a single, unified description, called the Standard Model (SM) of particle physics. Physicists can explore 'new physics' in terms of whether it agrees or disagrees with the SM. Right now it's like a big jigsaw puzzle with a few important pieces missing. If physicists find a new piece in their calculations or their particle collider experiments, they can check if it fits into the puzzle. If it doesn't, maybe the puzzle itself needs to be changed.

In a sense, grouping fermions into fine categories is an exercise in meticulously cataloguing the exact shapes of the puzzle's pieces. This way, if physicists find a piece whose shape is new even in a very small way, they stand to make a big update.

Something strange comes this way A particle as it exists in the wilderness of space is slightly different from a particle that exists inside solids and liquids. "In condensed-matter physics, every material can behave like a new universe," IIT Kanpur assistant professor Adhip Agarwala said. "Here strange particles can arise and be experimentally detectable, which are otherwise not usually seen in three dimensions."

For example, two-dimensional materials can host particles called anyons whose properties lie somewhere between those of fermions and bosons. Recently, physicists at Columbia University and Pennsylvania State University reported finding another strange particle called a semi-Dirac fermion.

Dirac fermions have mass and aren't their own anti-particles. A semi-Dirac fermion has mass when it's moving in one particular direction but not in a perpendicular direction. This unusual characteristic, which makes semi-Dirac fermions very exotic, is the result of the fermion's interaction with the electric and magnetic forces acting on it in certain materials.

The semi-Dirac fermion reported in the experiment is technically a quasiparticle. A quasiparticle is a clump of particles or energy-packets that, in some given conditions, behaves like a single particle. Protons are quasiparticles, for example: each proton is made of three quarks and the gluons holding them together. In most settings, what separates particles from quasiparticles is a

distinction without a difference. If a quasiparticle is a fermion, it's a fermion in the same way an electron is a fermion.

Location, location, location When trying to find puzzle pieces with new shapes, physicists need to know exactly which material to look in or they could be searching forever. This is much like in life sciences research. By studying the 1-mm-long roundworm *Caenorhabditis elegans*, for example, scientists have discovered many fundamental principles of biology and have won four Nobel Prizes so far. The locale of choice in the new study was a layered crystalline material called zirconium silicon sulphide (ZrSiS).

A twisting mystery of electrons, vibrations and heat When a magnetic field is applied to a metal, the electrons inside are accelerated along a curved path. (The protons are confined to the atomic nuclei.) The energy of these electrons is called cyclotron energy.

In the metal, the cyclotron energy increases linearly with the strength of the magnetic field. This relationship can be denoted as  $B^1$ , where  $B$  is the strength of the magnetic field and 1 is the exponent to which it is raised. In graphene, which is a single-layer sheet of carbon atoms linked together, the cyclotron energy increases in step with the square-root of the magnetic field strength. The relationship is thus  $B^{1/2}$ .

In ZrSiS, the researchers found the cyclotron energy to increase as  $B^{2/3}$ . Previous theoretical research has found that this scaling factor is a unique signature of semi-Dirac fermions.

Comparison of the power law of transitions for different fermions in a log-log scale plot. Power-law fitting associated with the semi-Dirac fermions in ZrSiS shown as purple dashed line. Orange and black lines show the power-law scaling for other fermions. Comparison of the power law of transitions for different fermions in a log-log scale plot. Power-law fitting associated with the semi-Dirac fermions in ZrSiS shown as purple dashed line.

### **The same laws of nature**

The researchers didn't land up at ZrSiS by accident; the locale is crucial, after all. Physicists in general knew for some time that there could be semi-Dirac fermions in graphene. But to reveal the quasiparticles' presence, they had to first stretch graphene to such a degree that they often ended up tearing it apart. (Curiously, non-stretched graphene is a material that hosts a Dirac fermion, so its power law is denoted by the orange line in the graph above.) An older study also revealed some unusual electronic properties in zirconium silicon selenide (ZrSiSe), which has a similar structure, in the presence of a magnetic field.

The authors of the present study put these and other indications together and decided to look for semi-Dirac fermions in ZrSiS — and voila.

“This shows the magic of condensed matter physics, where every material, be it graphene or ZrSiS, can host exotic particles that one can discover in table-top experiments — whereas to discover subatomic particles we often need huge colliders,” Agarwala said. “It is the same laws of nature that guide them all.”

New moiré superconductor opens the door to new quantum materials The zoo expands Physicists regularly subject subatomic particles to extreme conditions to elucidate the laws of nature at the

edge of reality. The Large Hadron Collider in CERN in Europe smashes billions of protons head on with as much energy as there was just 0.000000000000004 seconds after the Big Bang. Even in the present study, the researchers subjected ZrSiS crystals to a magnetic field of up to 17.5 tesla — about 270,000-times stronger than the earth’s magnetic field.

The researchers have said they plan to continue their studies calculations to understand more about ZrSiS and try to explain some other unusual electronic behaviour they observed in their study. The finding is a new animal in the particle zoo. As one more enclosure awaits its occupant and zoo authorities fill out the paperwork, the question arises: how will it change the zoo?

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