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Defence News

Defence Strategic: National/International

Raksha Mantri Shri Rajnath Singh holds telecon with new US Secretary of Defense Mr Pete Hegseth

Source: Press Information Bureau, Dt. 06 Feb 2025,

URL: <https://pib.gov.in/PressReleasePage.aspx?PRID=2100413>

Raksha Mantri Shri Rajnath Singh, on February 06, 2025, congratulated Mr Pete Hegseth, in their first telephonic conversation after his confirmation as the US Secretary of Defense. The two Ministers reviewed the extensive India-US defence cooperation activities covering multiple domains in land, air, maritime and space. They appreciated the ongoing and remarkable expansion of the bilateral defence partnership, and reaffirmed their commitment to deepen the ties.

In particular, the two Ministers decided to work together on technology cooperation, integration of defence industrial supply chains, enhanced interoperability, logistics & information sharing and joint military exercises. They also agreed to provide enhanced support to the growing defence innovation collaboration between the governments, start-ups, businesses and academic institutions. India and US agreed to work together to draft a comprehensive framework on defence cooperation, aimed at structuring the bilateral collaboration for the period 2025-2035

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5th Joint Working Group meeting between MoD of India & Spain held in New Delhi

Source: Press Information Bureau, Dt. 06 Feb 2025,

URL: <https://pib.gov.in/PressReleasePage.aspx?PRID=2100344>

The 5th Joint Working Group (JWG) meeting between the Ministry of Defence of India and Spain took place in New Delhi on February 06, 2025. The meeting was co-chaired by Joint Secretary, International Cooperation Shri Amitabh Prasad and Special Advisor on Defence Diplomacy to the Secretary General of Defence Policy Brigadier General Paulino Garcia Diego.

Both sides reviewed the ongoing bilateral defence cooperation activities and discussed the plan for multiple joint activities, including in the maritime domain. They agreed to focus on a closer collaboration in defence, particularly in technology and armament production areas.

The C295 Project with Airbus Spain and Tata Advanced Systems Limited, the first Make-in-India project in the defence aircraft sector, has encouraged more Indian and Spanish companies to collaborate with each other and explore options to work together in the aerospace domain.

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Aatmanirbhar Bharat: MoD inks contracts totalling Rs 10,147 crore with EEL, MIL & BEL for rockets of PINAKA Multiple Launch Rocket System to enhance Indian Army's firepower

Source: Press Information Bureau, Dt. 07 Feb 2025,

URL: <https://pib.gov.in/PressReleasePage.aspx?PRID=2100335>

Ministry of Defence has inked contracts with Economic Explosive Limited (EEL) and Munitions India Limited (MIL) for the procurement of Area Denial Munition (ADM) Type-1 (DPICM) and High Explosive Pre Fragmented (HEPF) Mk-1 (Enhanced) rockets respectively for PINAKA Multiple Launch Rocket System (MLRS) at a total cost of Rs 10,147 crore. In addition, a contract for upgrades in SHAKTI Software has also been signed with Bharat Electronics Limited (BEL). The contracts were signed in the presence of Defence Secretary Shri Rajesh Kumar Singh in New Delhi on February 06, 2025.

ADM Type-1 of PINAKA MLRS has a specialised warhead to deliver a quantum of sub-munitions over a larger area targeting mechanised forces, vehicles and personnel, thereby denying specific areas to the enemy. HEPF Mk-1 (E) rockets are advance version of inservice HEPF rockets which have enhanced range to strike deep into enemy territory with precision and lethality.

The procurement of ADM Type-1 (DPICM) and HEPF Mk-1 (E) rockets will mark a significant milestone in the modernisation of the Artillery Rocket Regiments. These advanced ADM (DPICM) and HEPF ammunition will play a crucial role in bolstering the Indian Army's firepower by enabling precise and long-range strikes.

Beyond enhancing national defence capabilities, these projects have immense potential of direct and indirect employment generation by encouraging the Indian MSME sector through components' manufacturing. The procurement marks a pivotal step towards modernising India's defence infrastructure and empowering indigenous industries, which will be a proud flag-bearer of 'Aatmanirbhar Bharat' vision of the Government.

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LIEUTENANT GENERAL BATOO TSHERING, CHIEF OPERATIONS OFFICER OF ROYAL BHUTAN ARMY, CONCLUDES OFFICIAL VISIT TO INDIA

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>

Lieutenant General Batoo Tshering, Chief Operations Officer, Royal Bhutan Army, concluded his official visit to India, marking a key step in further strengthening the defence relations between

Bhutan and India. The visit, which took place from February 1st to 6th, 2025, enhanced bilateral military cooperation and laid the groundwork for new avenues of collaboration, particularly in training and capability enhancement.

Lieutenant General Tshering visited Gaya, New Delhi and Kolkata during his stay in India. While in Gaya, he visited the Officers Training Academy and several Buddhist landmarks. These visits reflected the deep-rooted military and cultural ties between Bhutan and India. Discussions at the Officers Training Academy centered around enhancing Bhutanese military training modules and expanding the scope of officer exchange programmes between the two armies.

While in New Delhi, the General laid wreath at the National War Memorial, and received a Guard of Honour at the South Block. The General also called on the Honourable Raksha Mantri Shri Rajnath Singh, Chief of Defence Staff, Chief of the Army Staff and other senior leadership, including the National Security Advisor, Defence Secretary, and Foreign Secretary. These high-level engagements resulted in reaffirming India's commitment to supporting the Royal Bhutan Army in modernisation efforts, including increased defence technology cooperation, military training, and logistical support. During his visit to the National Security Guard, Manesar, both sides explored avenues for enhanced collaboration including joint training in special operations and knowledge sharing on rapid response strategies.

Before departing for Bhutan, Lieutenant General Tshering also visited Kolkata, where he laid a wreath at Vijay Smarak and visited the Eastern Command Headquarters of the Indian Army. He called on the General Officer Commanding-in-Chief, Eastern Command, and interacted with senior officers to discuss enhanced cooperation in training and disaster relief operations - a key area of shared interest between the two countries.

Lieutenant General Tshering's visit cemented several key defence initiatives, including greater participation of Bhutanese officers in Indian defence institutions, and the possibility of focusing on peacekeeping operations. The visit served as an important milestone in solidifying the long-standing defence ties between Bhutan and India, paving the way for a more robust and future-ready partnership in military engagement.

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India, US agree to draft 10-year comprehensive framework on defence cooperation

Source: India Today, Dt. 07 Feb 2025,

URL: <https://www.indiatoday.in/india/story/india-us-defence-ties-rajnath-singh-pete-hegseth-phone-call-pm-modi-trump-2676011-2025-02-07>

Defence Minister Rajnath Singh and US Secretary of Defence Pete Hegseth agreed on Thursday to work on a 10-year framework to strengthen the India-US defence partnership. The discussions focused on intelligence, logistics, operational and industrial engagement. Singh said Hegseth reviewed various aspects of bilateral defence ties during their phone conversation. "We reviewed the ongoing defence cooperation and explored ways and means to expand and deepen the India-US bilateral defence relationship," he said. "We also agreed to chart out an ambitious agenda which includes operational, intelligence, logistics and defence-industrial cooperation," Singh added. "Looking forward to work closely with Secretary Hegseth," he added. An official readout of the

conversation said both sides agreed to draft a framework for defence cooperation covering 2025-2035. The statement noted that Singh and Hegseth reviewed defence cooperation across "multiple domains in land, air, maritime and space."

A post on 'X' by Singh described the conversation as "excellent." He noted that both sides explored ways to deepen defence ties. Singh and Hegseth also decided to work together on technology cooperation, integration of defence industrial supply chains, enhanced interoperability, logistics, information sharing and joint exercises. "They also agreed to provide enhanced support to the growing defence innovation collaboration between the governments, start-ups, businesses and academic institutions," the defence ministry said.

The call took place ahead of Prime Minister Narendra Modi's planned visit to Washington. The discussions are expected to be part of PM Modi's meeting with US President Donald Trump.

India-U.S. defence ties have expanded in recent years. In 2016, the US designated India as a "Major Defence Partner," enabling the sharing of critical military technology. Key agreements signed include LEMOA in 2016, COMCASA in 2018, and BECA in 2020, facilitating military logistics, interoperability, and geospatial intelligence sharing.

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India and Israel hold the 13th round of staff talks in New Delhi to focus on improving defence cooperation

Source: Mid Day, Dt. 07 Feb 2025,

URL: <https://www.mid-day.com/news/world-news/article/india-israel-hold-13th-round-of-staff-talks-focus-on-improving-defence-cooperation-23479670>

India and Israel successfully held the 13th round of Staff Talks from February 3 to 6 in New Delhi, which focused on improving various areas of defence cooperation such as joint training, sharing technology and regional security, ANI reported. The Additional Directorate General of Public Information of the Indian Army shared details of the dialogue on X, stating, "The 13th India-Israel Staff Talks were successfully conducted from 03 to 06 February at New Delhi, India. The discussions focused on enhancing defence cooperation, joint training, technology sharing and regional security."

Highlighting the importance of the dialogue, the Indian Army added, "This strategic dialogue reaffirms the commitment to mutual growth in defence capabilities, fostering deeper bilateral ties between the two nations united by shared interests and trust."



Both the countries cooperate across several fronts. Last year, the two countries held the 17th India-Israel Foreign Office Consultations, showcasing the strength of the Strategic Partnership. The discussions included an exchange of views on the prevailing situations in West Asia and the Indo-Pacific, ANI reported.

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LCA Tejas Mark-1A fighter jets to be added to Indian Air Force after April?

Source: The Week, Dt. 06 Feb 2025,

URL: <https://www.theweek.in/news/defence/2025/02/06/lca-tejas-mark-1a-fighter-jets-to-be-added-to-indian-air-force-after-april.html>

Even as the Indian Air Force's long wait for the single-engine, multi-role combat aircraft Tejas Mark-1A continues, there are indications that the fast-depleting fighter fleet of the IAF will be rejuvenated with the induction of five Tejas fighter jets after April.

As the US-based aerospace and defense company General Electric assured that the supply of F-404 jet engines will happen in March, Tejas maker Hindustan Aeronautics Limited (HAL) will fit them onto the three Tejas Mark-1A jets that are "ready in the flight line."

According to a Times of India report, HAL will have five Tejas Mark-1A jets and four trainers ready by March-April.

"If the GE engines begin coming, fitments can be done in a few days," TOI quoted a top defence source as saying. The report suggested that if the supply of engines happens on time, HAL can scale up production of the fighter jets to 20 per year.

"The first Tejas Mark-1A should roll out of the Nashik line a month or two. HAL is also subcontracting private companies to build wings, fuselages and the like. If they deliver, Tejas production can even go up to 30 per year," TOI quoted the source as saying.

The Tejas aircraft is a potent platform for air combat and offensive air support missions while reconnaissance and anti-ship operations are its secondary roles.

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The allure of Aero India 2025: India eyes bigger military market amid global power shifts

Source: The Week, Dt. 07 Feb 2025,

URL: <https://www.theweek.in/news/defence/2025/02/06/the-allure-of-aero-india-2025-india-eyes-bigger-military-market-amid-global-power-shifts.html>

These are interesting times we live in. One, major conflicts are ensuing across the world, including the ones in Ukraine and the Israeli-Palestinian conflagration, that have in them the potential to escalate into another one of Great Wars.

Second, with traditional power balances shifting and a strategic 'rebalancing' taking place after the end of the Cold War, a process of realignment has set in, giving impetus to the buttressing of military strength by most major nations of the world.

In this backdrop, Aero India 2025 may have a defined narrative—India wants a larger pie of the military market to sell its products, seeks greater collaboration with foreign Original Equipment Manufacturers with more favourable transfer-of-technology terms, and yet build up its indigenous capability to make military products.

Being held in the IT city of Bengaluru, for five days from Monday, all roads will lead to the Yelahanka Air Force Station where the 15th edition of the biannual show is being hosted. A government flagship air show, touted to be Asia's biggest, it is being organised by the Defence Exhibition Organisation, under the aegis of the Ministry of Defence's Department of Defence Production.

Besides providing a platform for the display of military and technology prowess in the aerospace sector by the powers that be, it aims to productively engage governments and the military-industrial complex in Business-to-Government (B2G) and Business-to-Business (B2B) interactions. Just to give an idea, in the show's 14th edition in 2023, more than 250 B2B partnerships were finalised with a total value of more than Rs 75,000 crore.

But it is also an event where strategic and military alliances firm up and get showcased. While Russian weaponry comprises the dominant chunk of the Indian Air Force (IAF) arsenal including the Sukhoi series fighters and MiGS, the Americans have been trying to wean off India from the Russian sourcing and replace it with their own or with Western assets. Meanwhile, the Indian military effort has been more focused on 'Atmanirbharta'—indigenisation of its weapons and platforms. In the regional context, the strategic and military developments in the South Asian geography have added another dimension to India's security preparedness.

With China fielding fifth-generation stealth fighter aircraft like the J-20 aka 'Mighty Dragon' in significant numbers and deployed in air bases very close to the Indian border, the security balance in the region is shifting very fast. The speedy development of the sixth-generation J-36 is being acknowledged as an effort by China to claim global leadership in cutting-edge aerospace

weaponry. What would also worry the Indian leadership is the Chinese proactive help to Pakistan to ramp up the latter's air force by providing and collaborating on fighter aircraft development and manufacturing.

This is happening at a time when the IAF is desperately in need of new fighter squadrons to ramp up its air combat capability. The IAF fields only about 31 fighter squadrons as against the mandated 42 squadrons that would be needed in case of a two-war front scenario.

Moreover, against the 'Mighty Dragon', the IAF's most modern and frontline platform is the 4.5 generation Rafale fighter from the French Dassault stable. A fifth-generation fighter aircraft in the IAF fleet would definitely somewhat erode Chinese supremacy in the skies.

In that context, it is pertinent to raise the question if the US would offer the cutting-edge F-35 fighter to India under favourable financial considerations. It would be definitely in their interest to do so as the US looks at India as being on the frontline to counter the growing Chinese military and economic might. It was during Aero India 2023 that the F-35 first landed on Indian soil. Later, two F-35 aircraft stood by on the tarmac for a static display even as two B-1 bombers flew past underlining their long-range operational capability. Another platform put on display were the two B-1 strategic bombers that flew about 15,000 km from the United States Air Force (USAF) base at South Dakota and then to Guam before flying over Bengaluru.

In August 2020, the US deployed B-1 bombers along with about 200 airmen amid escalating tensions between India and China over the border dispute along the Line of Actual Control in eastern Ladakh.

With the US likely to fly in its F-35s to Aero India, Russia is not very far behind with a likely Aero India debut by the fifth-generation stealth multirole fighter Sukhoi-57. The Russians claim the superiority of the Su-57 over the F-35 in terms of its supersonic cruising speed, on-board arsenal, and stealth prowess. But what would be a main factor for India while deciding whether to go in for foreign fighter aircraft or not is the reported progress in India's Advanced Medium Combat Aircraft (AMCA) programme. The main stumbling block for the AMCA programme is the lack of an aero engine. While there have been ongoing talks with the General Electric F414 engines, it is an issue that is yet to be resolved. There is a possibility that Bengaluru's Aero India may yield answers to that among many more.

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Science & Technology News

Amalgamated hybrid materials enable brain-mimicking artificial synapses for computing breakthroughs

Source: Press Information Bureau, Dt. 6 Feb 2025,

URL: <https://pib.gov.in/PressReleasePage.aspx?PRID=2100327>

Taking inspiration from nature, a group of scientists have amalgamated hybrid materials to form a robust biomimetic system that closely mimics the behavior of biological synapses. This can pave the path towards a new wave of innovation in computing with breakthroughs in robotics, machine learning, and real-time data processing.

The human brain, known for its remarkable energy efficiency, is serving as a model for developing advanced technologies. At the forefront of these efforts are solution-processed memristor (a non-volatile electrical component that regulates the flow of current in a circuit) devices, which are designed to replicate the brain's synaptic functions. These devices are not only efficient but also scalable and cost-effective, making them ideal for creating neuromorphic systems-computers that function like the human brain. By mimicking how neurons communicate and process information, memristors have immense potential to revolutionize artificial intelligence, enabling smarter, faster, and more energy-efficient AI systems.

In a recent finding, a group of scientists from S. N. Bose National Centre for Basic Sciences (SNBNCBS), in collaboration with the National Institute of Technical Teachers' Training and Research (NITTTR), developed a hybrid material incorporating nanoscale conductive clusters to facilitate the formation of metallic pathways within a memristive layer. The foundation of the technology is the development of mesoporous graphitic carbon nitride ($g\text{-C}_3\text{N}_4$, abbreviated as CN) nanosheets embedded with silver nanoparticles (Ag NPs) to enable incremental resistance modulation via electric field-induced electrochemical metallization. The amalgamation of these hybrid materials by SNBNCBS, an autonomous institute of Department of Science and Technology, forms a robust biomimetic system known as AgCN that closely mimics the behavior of biological synapses. The research was published in the journal *Advanced Functional Materials*,

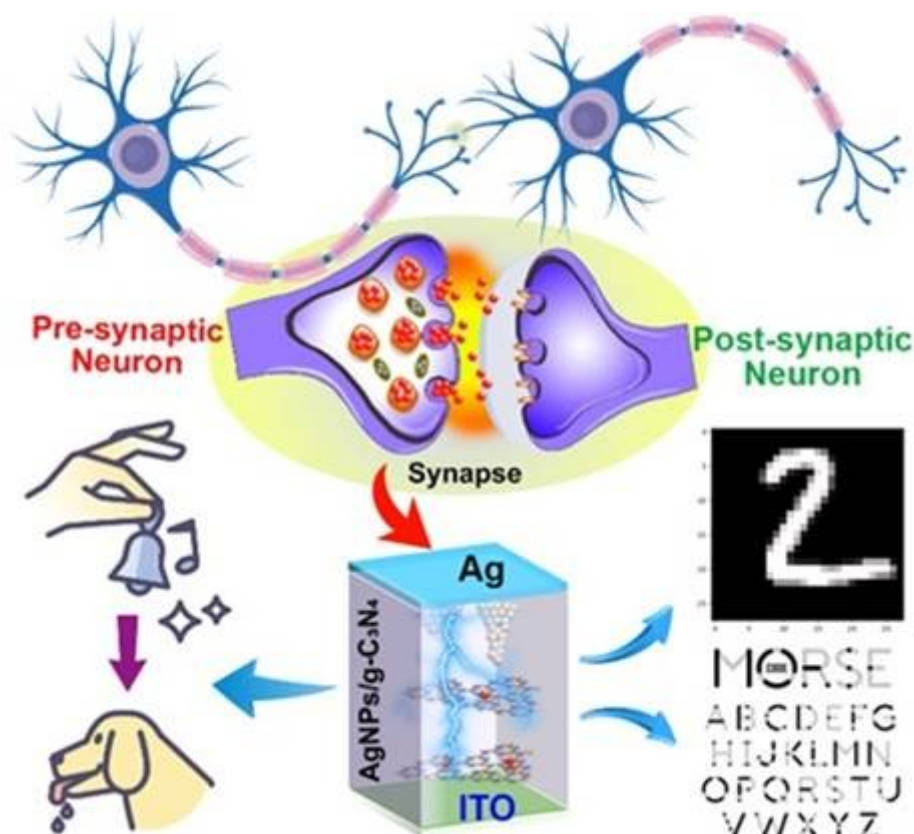
The AgCN system exhibits gradual and continuous changes in resistance, a property that is critical for energy-efficient and adaptive computing systems. The utilization of biomimicry principles in neuromorphic computing devices has yielded unparalleled capabilities. Contrary to conventional computing systems that employ rigid algorithms, neuromorphic systems emulate the brain's capacity for learning and adaptation. AgCN-based memristors exhibit remarkable versatility and adaptability in this domain.

These devices effectively replicated Morse Code by modulating their current to produce precise dot-and-line signals, underscoring their potential for real-time code detection applications. The core innovation of this technology lies in the electric field-induced strengthening or weakening of metallic pathways through the conductive clusters, which play a crucial role in modulating synaptic plasticity.

The devices can learn, adapt, and detect patterns with remarkable accuracy by varying voltage pulse numbers, amplitudes, and widths. A particularly noteworthy demonstration involved the

devices' capacity to emulate Pavlov's dog experiment, thereby highlighting their aptitude for associative learning, a process analogous to biological learning. The impact of these devices extends beyond mere imitation of synaptic behavior, as they empower machines to learn and adapt with greater efficiency by processing and transmitting information in a manner analogous to biological synapses.

This capacity is of paramount importance for next-generation AI systems, which necessitate high-speed, low-power solutions for image recognition and real-time decision-making tasks. The development of conductive-island-assisted synaptic devices represents a significant leap forward in the field of artificial intelligence, as biomimicry drives innovation.



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Union Minister for Science and Technology Dr. Jitendra Singh highlights steps taken by Government to Boost Women's Participation in STEM

Source: Press Information Bureau, Dt. 6 Feb 2025,

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

Union Minister of State (Independent Charge) for Science and Technology; Earth Sciences and Minister of State for PMO, Department of Atomic Energy, Department of Space, Personnel, Public Grievances and Pensions, Dr. Jitendra Singh stated that Department of Science and Technology

(DST) is implementing the ‘**Women in Science and Engineering-KIRAN (WISE-KIRAN)**’ scheme to promote women's participation in STEM fields while replying to an unstarred question in Rajya Sabha Today. According to the written reply, the Minister enlisted various steps taken by government in detail-**Fellowship Programmes to Support Women in Research**

- **WISE-PhD Fellowship:** Supports women in pursuing research in basic and applied sciences.
- **WISE-Post Doctoral Fellowship (WISE-PDF) & WISE-SCOPE:** Encourages women to pursue postdoctoral research.
- **WIDUSHI Programme:** Helps senior women scientists, including retired and unemployed professionals, continue their research careers.

WISE-IPR: Training Women in Intellectual Property Rights

The **WISE Internship in IPR (WISE-IPR)** offers a one-year on-the-job training in Intellectual Property Rights for women.

Vigyan Jyoti: Inspiring Young Girls to Join STEM

The **Vigyan Jyoti** programme mentors’ meritorious girls in Class IX-XII, encouraging them to pursue higher education and careers in STEM fields where female participation is low.

BioCARE Fellowship: Empowering Women in Biotechnology

The **BioCARE Fellowship** by the Department of Biotechnology (DBT) supports women scientists in biotechnology and allied fields, helping them establish a strong research career.

NIDHI: Supporting Women-Led Startups in Technology

The **National Initiative for Developing and Harnessing Innovations (NIDHI)** provides women entrepreneurs with:

- **Capacity building, incubation facilities, mentorship, and early-stage funding.**
- **NIDHI-Seed Support Program (NIDHI-SSP):** Early-stage seed funding for startups, including women-led ventures.

Technology Business Incubators in Women’s Universities

DST has established **Technology Business Incubators (TBIs)** in:

- **Indira Gandhi Delhi Technical University for Women (IGDTUW), Delhi**
 - **Sri Padmavati Mahila Visvavidyalayam (SPMVV), Tirupati**
- Additionally, an **Inclusive Technology Business Incubator (iTBI)** has been set up at Delhi Technological University (DTU), Delhi, focusing on gender, caste, and geographical inclusivity in entrepreneurship.

GATI: Driving Gender Equality in Research Institutions

The **Gender Advancement for Transforming Institutions (GATI)** programme under WISE-KIRAN promotes gender-sensitive policies in research institutions to increase women's representation in STEM (Science, Technology, Engineering, Mathematics, and Medicine).

Women Scientist Scheme (WOS): Reviving Careers and Driving Research

- **WOS-A:** Supports women returning to research in basic and applied sciences.
- **WOS-B:** Enables women scientists to provide S&T solutions to societal challenges.

- **WOS-C:** Trains women in Intellectual Property Rights (IPR), with **523 women supported in the last 10 years**, of whom **40% are now registered Patent Agents**.

Dr. Jitendra Singh highlighted that **2076 women scientists have benefited under WOS-A**, with **40% completing PhDs and publishing 5000+ research papers**.

“These initiatives collectively empower women to excel in STEM fields, research, and entrepreneurship, creating a more inclusive scientific ecosystem in India”, says Dr. Singh

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“The GenomeIndia project, under Department of Biotechnology, ensures equitable representation in sample collection” says Science and Technology Minister Dr. Jitendra Singh

Approximately, 36.7% of the samples were collected from rural, 32.2 % were from urban and 31.1 % were from the tribal populations informs, Dr. Singh

Source: Press Information Bureau, Dt. 6 Feb 2025,

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

Union Minister of State (Independent Charge) for Science and Technology; Earth Sciences and Minister of State for PMO, Department of Atomic Energy, Department of Space, Personnel, Public Grievances and Pensions, Dr. Jitendra Singh stated that approximately 36.7% of the samples were collected from rural, 32.2 % were from urban and 31.1 % were from the tribal populations while answering the unstarred question in Rajya Sabha, today.

Dr. Jitendra Singh affirmed that In the Genome India project, equitable representation from rural, urban and tribal population was ensured.

The S&T minister also highlighted that in order to achieve this goal, the researchers involved in GenomeIndia project faced some challenges, as outlined below.

- **Geographic Accessibility:** Reaching tribal remote regions to collect samples and gather data from these populations was difficult task.
- **Cultural and Socioeconomic Barriers:** Overcoming socioeconomic and cultural barriers and convincing such populations for their participation in the project was challenging.
- **Lack of Awareness and Education:** Rural and tribal populations are not having sufficient awareness of the benefits of genetic research, that led to misunderstandings about its purpose and value. Educating and convincing such populations was hard.
- **Data Representation and Bias:** Rural and tribal populations were not easily accessible and on the contrary, urban populations were often more accessible and had greater awareness. Hence, removal of bias by ensuring participation of appropriate proportions of all types of populations was important.
- **Logistical Constraints:** Insufficient accessibility to state-of-art healthcare infrastructure, laboratories, and skilled professionals in isolated regions made it challenging to collect samples and conduct blood parameter assessments.

Dr. Jitendra Singh further informed that the **GenomeIndia Team** followed pre-planned strategies to overcome various challenges. He stated, “**Nearby logistics hubs were established for sample transportation, and laboratories were approached in advance to prepare resources for handling a higher number of samples.**”

Additionally, partnerships with local healthcare institutions were formed to streamline data collection and improve accessibility. The involvement of local leaders and community representatives in interactions with rural and tribal populations helped mitigate cultural and socioeconomic barriers, build trust, and promote greater participation from these communities.

Outreach programs and community engagement initiatives were conducted to raise awareness about the importance of genetic studies and assure participants of data confidentiality, dispelling myths and clarifying the goals of the **GenomeIndia Project**. Moderated campaigns were organized to ensure balanced inclusion of diverse groups. Logistic constraints in isolated regions were effectively handled through systematic planning, he added.

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Chandrayaan-4 set to launch in 2027: Centre

Source: Hindustan Times Dt. 6 Feb 2025,

URL: <https://www.hindustantimes.com/india-news/chandrayaan4-set-to-launch-in-2027centre-101738867104696.html>

The Chandrayaan-4 mission, whose objective is to bring back lunar samples that are not damaged and contaminated, will be launched in 2027, Union science & technology minister Jitendra Singh said on Thursday.

India has sent three space missions to Moon in 2008, 2019 and 2023 in the Chandrayaan series. In the first two iterations, the Moon’s surface, sub-surface and exosphere were studied in a global scale from orbiter platforms. Chandrayaan-3 was the first-ever successful lunar soft-landing and robotic exploration in the southern polar region of the Moon, and has conducted in-situ studies of the lunar surface, near-surface plasma. It also recorded, for the first time, lunar ground vibrations in the southern polar regions. Chandrayaan-4 will involve at least two separate launches of the heavy-lift LVM-3 rocket that will carry five different components of the mission which will be assembled in orbit. “The Chandrayaan-4 mission aims to collect samples from the moon’s surface and bring them back to the Earth,” Singh told PTI Videos in an interview. During a speech at Akashvani in October last year, former Isro chairman S Somanath had said that Chandrayaan-4 would likely be launched in 2028.

In September last year, the Union Cabinet approved two space science missions — Chandrayaan-4, and the Venus Orbiter Mission (VOM) to study different facets of the planet including its surface and atmosphere. The Indian Space Research Organisation (Isro) website states that VOM is scheduled to launch in March 2028.

According to information on the Indian Space Research Organisation (Isro) website, these two missions are stepping stones to the Prime Minister Narendra Modi’s Space Vision 2047, which includes placing the Bharatiya Antariksha Station in orbit by year 2035. The government has also envisaged an Indian landing on the Moon by 2040.

The country is also set to launch two missions — Gaganyaan and Samudrayaan — in 2026, said Singh. The Gaganyaan mission involves sending Indian astronauts in a specially designed spacecraft to low-earth orbit and bringing them back safely. Samudrayaan will carry three scientists in a submersible up to a depth of 6,000 metres in the deep ocean, to explore the seabed and unlock vast resources, including critical minerals, rare metals, and undiscovered marine biodiversity. For this, the National Institute of Ocean Technology, Chennai, an autonomous institute under MoES, has developed 6,000m depth rated Remotely Operated Vehicle (ROV) and various other underwater instruments. “This achievement will align with the timelines of India’s other landmark missions, including the Gaganyaan space mission, marking a pleasant coincidence in the nation’s journey toward scientific excellence,” Singh said.

Prior to Chandrayaan-4 and Gaganyaan mission, the first uncrewed mission of the Gaganyaan project carrying a woman robot astronaut, or Vyommitra, will take place this year.

Last year, Singh said that Vyommitra astronaut is designed to simulate human functions in the space environment and interact with the life support system.

Speaking of Isro’s progress and plans, Singh said while the first launch pad was set up in 1993 and the second one after a 10-year gap in 2004, India’s space sector has undergone unprecedented expansion, both in terms of infrastructure and investment, in the last decade.

“We are now building a third launch pad and for the first time for heavier rockets, and expanding also beyond Sriharikota with a new launch site in Tamil Nadu’s Tuticorin district to launch small satellites,” Singh said.

The minister said that India’s space economy, currently valued at \$8 billion, is projected to reach \$44 billion in the next decade, further cementing India’s role as a global space powerhouse.

The reforms initiated in the past decade, including the unlocking of the space sector for private players, have led to greater innovation, investment, and international collaborations, Singh said.

“With new infrastructure, increased private participation and record-breaking investments, India is poised for even greater achievements in the years to come,” he said.

“In the last few years, Isro has been notching success after success, and therefore the leadership feels more confident to take up more ambitious projects in even shorter timelines. Advancing timelines reflects their confidence,” said Aniket Sule, associate professor (astronomy), Homi Bhabha Centre for Science Education, an affiliate of the Tata Institute of Fundamental Research. “Previous Chandrayaan mission successes also play a vital role. Therefore, if Isro is saying they will launch Chandrayaan-4, they will do it.”

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Asteroid collision carved 2 massive ‘grand canyons’ on moon in 10 minutes

Source: Hindustan Times Dt. 6 Feb 2025,

URL: <https://www.hindustantimes.com/world-news/asteroid-collision-carved-2-massive-grand-canyons-on-moon-in-10-minutes-101738751861698.html>

A new study by US and British scientists has revealed that an ancient asteroid collision near the moon's south pole created two massive canyons, each the size of the Grand Canyon in Arizona, in just 10 minutes, according to findings published in the journal *Nature Communications* on Tuesday.

This discovery is seen as positive news for scientists and NASA, who are planning to land astronauts at the untouched, Earth-facing side of the moon's south pole, which is believed to contain older rocks in their original condition.

The researchers mapped the area using data and images from NASA's Lunar Reconnaissance Orbiter and tracked the debris path that formed the canyons. The study suggests that the canyons, located in the "Schrödinger impact basin" on the moon's far side, were carved in less than 10 minutes by debris launched into the air when an asteroid or comet impacted the lunar surface around 3.8 billion years ago.

This collision released around "130 times the energy of the current global stockpile of nuclear weapons," according to geologist David Kring of the Lunar and Planetary Institute, University Space Research Association in Houston, and lead author of the study.

How the canyons were discovered: All about the study

- Scientists used data from NASA's Lunar Reconnaissance Orbiter and computer modelling to track the speed and direction of debris from the asteroid impact. They found that the debris travelled at speeds up to 2,200 miles (3,600 km) per hour.
- "Vallis Planck", one of the canyons, is about 174 miles (280 km) long and 2.2 miles (3.5 km) deep. "Vallis Schrödinger", the other canyon, is roughly 168 miles (270 km) long and 1.7 miles (2.7 km) deep.
- The space rock that struck the moon passed over the south pole, creating a large basin and sending boulders speeding at nearly 1 mile per second (1 km per second). The debris carved out two canyons in under 10 minutes, which is much faster than the millions of years it took for the Grand Canyon to form.
- This impact occurred during a period of heavy bombardment in the inner solar system, during which space rocks were likely dislodged due to changes in the orbits of the solar system's giant planets.
- The object that struck the moon is estimated to have been 15 miles (25 km) in diameter, more significant than the asteroid that caused the extinction of the dinosaurs 66 million years ago.
- Geologist David Kring explained in the journal that because debris from the Schrödinger impact was thrown from the lunar south pole, ancient rocks in that area will be close to the surface, making it easier for Artemis astronauts to collect them. These samples will offer insights into the moon's early history.
- These rocks will help test the theory that the moon formed after a large impactor collided with Earth, sending molten material into space. They will also shed light on the hypothesis that the moon's early surface was once a vast ocean of magma, Kring added.
- Kring also said that it is unclear whether these two canyons are permanently shadowed, similar to some of the craters at the moon's south pole. "That is something that we're clearly going to be reexamining," he said.
- Permanently shadowed areas on the moon's surface are thought to contain significant ice, which could potentially be used to create rocket fuel and drinking water for future moon explorers.

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ISRO releases global map of phytoplankton distribution

Source: News Nine Dt. 7 Feb 2025,

URL: <https://www.news9live.com/science/isro-releases-global-map-of-phytoplankton-distribution-2815455>

ISRO has released a global map of chlorophyll concentration, that indicates phytoplankton blooms, captured from its EOS-06 satellite. The satellite is capable of capturing a global snapshot of phytoplankton distribution at a sub kilometre resolution, once every two days. The instrument on board that captured the data is called the Ocean Colour Monitor 3 (OCM-3), that observes the Earth in 13 spectral bands.

The phytoplankton distribution serves as an indicator for biological productivity. The same instrument monitors global vegetation, and gathers data on the Normalized Difference Vegetation Index (NDVI). Scientists can use the data from EOS-06 to assess the health of the planet. The middle latitudes, the equator, as well as the upwelling zones on the west coasts of South America, Africa and the Indian Subcontinent are the regions in the oceans with high productivity.

The phytoplankton blooms are enhanced by circulation driven by the wind. ISRO also operates a visible/infrared instrument in conjunction with the OCM-3 to identify potential fishing zones. Apart from the payloads with the sensitive instruments, and the satellite itself, ISRO has also developed the entire pipeline necessary to convert the observations into data that has a practical utility, and offers this intelligence as a 'product'.

The EOS-06 satellite

EOS-06 is a third generation Earth Observation Satellite dedicated to monitoring the ocean, with the sensitive payloads on board capable of monitoring the surface temperature, direction of winds and the colour of the waters. ISRO had previously released animations of the dynamic biosphere, capturing the changes in the direction of ocean winds as well as the distribution of chlorophyll, which indicates the phytoplankton growth.

It was this satellite that provided us with an advance warning of Cyclones Fengal and Dana well before the storms had even formed. The satellite was deployed in November 2022 with the PLSV.

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