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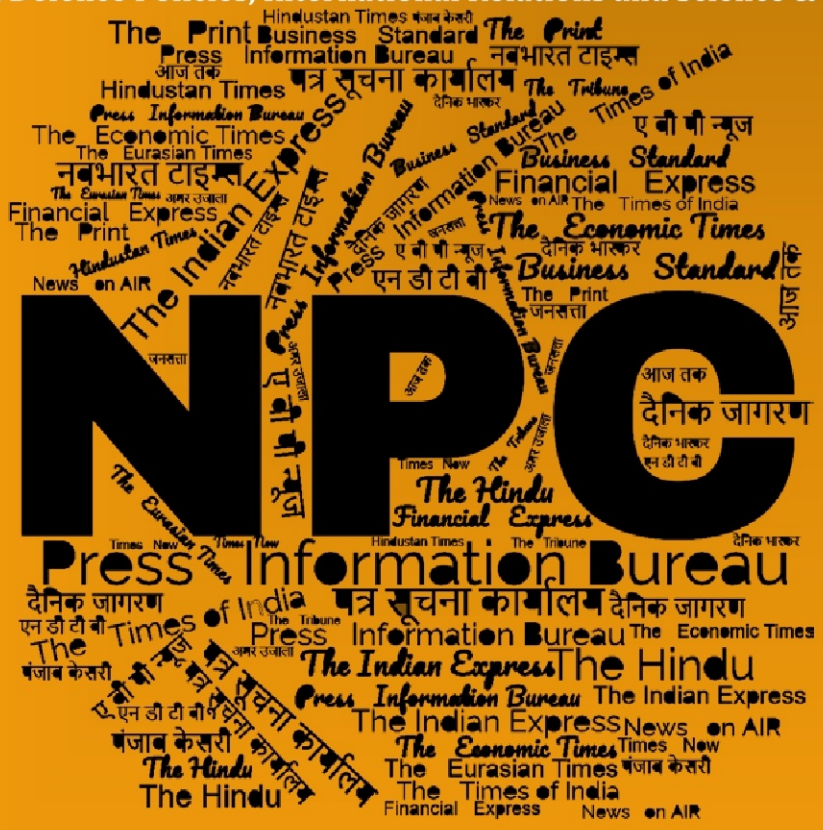
समाचार पत्रों से चयनित अंश

Newspapers Clippings

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

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



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DRDO News

Advanced technology transformed defence exports: DRDO top scientist

Source: The New Indian Express, Dt. 06 Feb 2025,
URL: https://www.newindianexpress.com/states/odisha/2025/Feb/06/advanced-technology-transformed-defence-exports-drdo-top-scientist

Distinguished scientist and DG, Electronics & Communication Systems of Defence Research & Development Organisation (DRDO) Dr Binay Kumar Das on Wednesday outlined the need for mastering latest technologies to take India to the global top.

Addressing the 11th convocation ceremony of Biju Patnaik University of Technology (BPUT) here, he said, the entire combat operation has become quite different and technology must be taken to the next level. “We need to work on disruptive technologies. 500 Xetabyte of data is expected to be crunched every year. So neuromorphic computing will come to our rescue. Mastering these technologies will carry India to the global top,” he added.

Advanced technologies have already transformed country’s defence exports eight times in last five years, he said, adding Indian defence market is soaring high for self-reliance with 500 negative import list and all set to challenge the entire world. “India Semiconductor Mission is unfolding in a big way. Mission for Green Hydrogen and PLI missions are only to name a few which are going to redefine New India,” he added.

Das said India’s test range is the only one to have maximum indigenous systems. “Today, I am spearheading the electronics cluster with only one mandate of stopping every single import and developing every system within the country,” he said.

Citing his own instance of staying back in India, he said the country is moving fast on digital front with growing business industry ecosystem and simultaneously laid thrust on growth of the farm sector..

To become third largest economy by 2030, India needs to change its thinking, augment export, design products with perfection, smart work and align the education system to overcome the challenges in traffic, pollution, energy and sustainability, he added.

Governor and Chancellor Dr Hari Babu Kambhampati presided over the function and emphasised the critical role of technical education in nation-building.

He highlighted the remarkable advancements India has made in semiconductor technology, AI, space research and IT sector.

BPUT vice-chancellor Prof Amiya Kumar Rath said the university insists the affiliated colleges to conduct ‘graduation day’ to handover certificates to students for the academic year 2023-24 within a month.

On the occasion, degrees were awarded to students in different disciplines including engineering, management, pharmacy, architecture, and applied sciences along with gold medals and other prestigious awards to outstanding performers.

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What is 155 mm/52 calibre barrel DRDO is offering to private players as transfer of technology

Source: The Print, Dt. 04 Feb 2025,
URL: https://theprint.in/defence/what-is-155-mm-52-calibre-barrel-drdo-is-offering-to-private-players-as-transfer-of-technology/2478978/

The Defence Research and Development Organisation (DRDO) has come out with an expression of interest document offering transfer of technology (ToT) for the 155 mm/52 calibre gun barrel to private players.

The barrel has been developed by the DRDO for its mounted gun system (MGS) and is now being offered to the industry as ToT.

The barrel is smaller to the one developed for the Advanced Towed Artillery Gun System (ATAGS) and hence lighter.

The ATAGS has a 155 mm/52 calibre gun barrel with a chamber volume of 25 litres as against the newer one with chamber volume of 23 litres.

“This makes the barrel lighter and can be used by an industry for developing any kind of gun system,” a source in the defence establishment said, explaining the significance.

Incidentally, the Army is looking at a lighter Towed Gun System (TGS) which will be the mainstay of the force in future. The gun is meant to be around 15 tonnes–much lighter than ATAGS but with similar firepower.

Sources said the new barrel was developed for the Mounted Gun System (MGS) that will begin Army trials this year along with other companies, including state-run Advanced Weapons and Equipment India Ltd and TATA.

The DRDO has tied up with private firm Kalyani Group for the MGS.

The DRDO, being a research and development (R&D) agency, extends the technology to private industry, which has the capacity to mass produce the weapons systems required by the armed forces. It is only after an understanding is reached between the two sides will they sign the licensing agreement for transfer of technology.

In the expression of interest, the DRDO stated that during the design and development of the weapons system (barrel, breech mechanism, muzzle brake and recoil system), the Armament Research and Development Establishment (ARDE) designed and developed a 155 mm/52 calibre barrel with 23-litres chamber capacity.

It added the gun is suitable for firing up to zone-6 charge and achieving corresponding range requirements, with an in-service 155 mm ammunition. This means the capacity of the chamber determines the firing range of the artillery gun system. The charge capacity of the gun depends on the rounds and ammunition that go into the barrel. The capacity of the chamber determines how much ammunition can go into it. The more the ammo, the longer the range to shoot. The 155mm/52 calibre, 23-litre chamber capacity barrel is well proven and exploited sufficiently to check its design ruggedness, the DRDO stated in its expression of interest letter.

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ड्रोन समेत किसी भी एरियल टारगेट को सटीक निशाना लगाने में सक्षम... क्या है VSHORADS डिफेंस सिस्टम, जिसे DRDO बना रहा है?

Source: Aaj Tak, Dt. 05 Feb 2025,
URL: https://www.aajtak.in/defence-news/story/vshorad-very-short-range-air-defence-system-dskc-2159328-2025-02-05

VShorAD यानी वेरी शॉर्ट रेंज एयर डिफेंस सिस्टम को बहुत जल्द ट्रकों पर लगाया जाएगा. ताकि इसे चीन और PAK की सीमा पर तैनात किया जा सके. अभी हाल ही में DRDO ने इसका ओडिशा के चांदीपुर में लगातार तीन बार सफल परीक्षण किया था.

VShorAD एयर डिफेंस सिस्टम रूस के S-400 जैसा है. अभी तक इसे जमीन पर रखे मैन पोर्टेबल लॉन्चर से दागा जाता था. अब इस लॉन्चर को ट्रक, बख्तरबंद वाहन, टैंक आदि पर भी तैनात किया जा सकता है. यानी इसे आसानी से चीन सीमा से सटे हिमालय या पाकिस्तान से सटी रेगिस्तानी सीमा पर तैनात कर सकते हैं.

इससे विमान, फाइटर जेट, हेलिकॉप्टर, मिसाइल या ड्रोन को मार गिराया जा सकता है. VSHORADS को बनाने में डीआरडीओ की मदद हैदराबाद स्थित रिसर्च सेंटर इमारत ने की है. इस मिसाइल में कई तरह की नई आधुनिक तकनीकें लगी हैं. जैसे- ड्यूल बैंड IIR सीकर, मिनिएचर रिएक्शन कंट्रोल सिस्टम, इंटीग्रेटेड एवियोनिक्स.

हल्का, मारक और सटीक एयर डिफेंस सिस्टम

इसका प्रोपल्शन सिस्टम ड्यूल थ्रस्ट सॉलिड मोटर है, जो इसे तेज गति प्रदान करता है. इस मिसाइल का इस्तेमाल भारतीय सेनाएं एंटी-एयरक्राफ्ट वॉरफेयर में कर सकती हैं. VSHORADS का वजन 20.5 kg है. इसकी लंबाई करीब 6.7 फीट है और व्यास 3.5 इंच. यह अपने साथ 2 kg वजन का हथियार ले जा सकता है.

1800 km/hr की गति से करता है हमला इसकी रेंज 250 मीटर से 6 km है. अधिकतम 11,500 फीट की ऊंचाई तक जा सकता है. अधिकतम गति मैक 1.5 है. यानी 1800 किमी प्रतिघंटा. इससे पहले इसकी टेस्टिंग पिछले साल मार्च और 2022 में 27 सितंबर को की गई थी.

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Defence News

Defence Strategic: National/International

Statement by Raksha Mantri on India-China Border and Patrolling Restoration

Source: Press Information Bureau, Dt. 04 Feb 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2099676

Raksha Mantri Shri Rajnath Singh on February 04, 2025 issued a tweet regarding certain remarks made in Parliament by Shri Rahul Gandhi about the statement of the Chief of the Army Staff on the situation along the India-China border.

Shri Rajnath Singh stated that the Army Chief's observations pertained to the temporary disturbance of traditional patrolling patterns by both sides along the border. He further emphasised that these patrolling practices have now been restored to their traditional pattern following the recent disengagement efforts. These details were previously shared in Parliament.

The Raksha Mantri also clarified that the words attributed to the Army Chief in the parliamentary debate were never stated by him at any time. He underscored the importance of accuracy and responsible discourse on matters concerning national security.

Shri Rajnath Singh reiterated that with respect to territorial issues, it is well documented that 38,000 sq. km of Indian territory in Aksai Chin has been under Chinese control since the 1962 conflict. Furthermore, 5,180 sq. km of territory was ceded by Pakistan to China in 1963. These historical facts remain an integral part of India's territorial discourse.

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Chief Operations Officer, Royal Bhutan Army calls on Raksha Mantri in New Delhi

Source: Press Information Bureau, Dt. 04 Feb 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2099664

Chief Operations Officer (COO), Royal Bhutan Army (RBA) Lt Gen Batoo Tshering called on Raksha Mantri Shri Rajnath Singh in New Delhi on February 04, 2025, and held discussions encompassing a variety of issues on bilateral relations. During the talks, Raksha Mantri reaffirmed India's readiness to support Bhutan in capability enhancement for defence preparedness, including provisioning of defence equipment and assets to augment capacities of Bhutan, as per its national priorities and in line with India's 'Neighbourhood First' policy.

On his part, Lt Gen Batoo Tshering appreciated Government of India's continued support and thanked India in assisting Bhutan in augmenting its modern defence capacities and training of RBA. He also reaffirmed RBA's firm commitment to work closely with India in realising the shared vision for peace and prosperity in the region.

COO, RBA is on an official visit to India from February 02-05, 2025. The visit is part of continued high-level engagements between the two sides and has provided an opportunity to further deepen the bilateral defence & security relations.

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Indian Navy To Conduct Quality Assurance Conclave

Source: Press Information Bureau, Dt. 04 Feb 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2099640

Quality Assurance (QA) Conclave, themed ‘Collaborative Quality Assurance: Bridging the Gap Between Industry and Defence’, is scheduled to be held on 07 Feb 25 at Manekshaw Convention Centre, New Delhi. Aimed to provide a strategic platform to advance India’s defence manufacturing ecosystem, the conclave will serve as a pivotal forum to foster dialogue and strengthen cooperation between the Defence and Shipbuilding sectors.

The conclave underscores the Government of India’s vision of Aatmanirbhar Bharat, built on the principles of innovation, collaboration, and operational excellence. It emphasises the importance of Quality Assurance as a critical enabler in developing a robust, self-reliant Shipbuilding industry that meets world-class standards.

As India’s Shipbuilding sector gears up to play a larger role in National Defence, the conclave will focus on harmonizing quality assurance practices to enhance efficiency, reliability, and performance. The event will bring together senior leaders from the Government, Industry, and

Quality Assurance experts to discuss advanced approaches and strategies for achieving excellence in Shipbuilding Quality Assurance, ensuring our Naval platforms are equipped to meet the highest standards of operational readiness.

The event will feature high-level discussions and expert presentations on the following topics: -

(a) Proactive Quality Control and Collaboration with Industry: Developing frameworks to enhance quality assurance through effective partnerships.

(b) Streamlining Type Tests and Risk Mitigation Strategies: Optimizing testing processes to ensure compliance and minimize risks.

(c) Balancing Quality Assurance and Timelines of Shipbuilding: Addressing the dual challenge of maintaining high-quality standards within demanding project schedules.

(d) Integrating Quality Assurance with Delay Mitigation Strategies: Exploring innovative approaches to align quality assurance with project delivery timelines.

The event seeks to promote a deeper understanding of the intersection between Quality Assurance and operational efficiency in warship building, present actionable insights and global best practices to mitigate risks and streamline processes, and foster collaboration among Defence organizations, Industry stakeholders and Policy makers to achieve shared objectives.

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General Saïd Chanegriha, Minister Delegate to the Minister of National Defence, Chief of Staff of People's National Army, Algeria to visit India

Source: Press Information Bureau, Dt. 05 Feb 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2099928

General Saïd Chanegriha, Minister Delegate to the Minister of National Defence, Chief of Staff of People's National Army, Algeria will be on an official visit to India from February 06 to 12, 2025. He will attend the inauguration of Aero India 2025 in Bengaluru and interact with Raksha Mantri Shri Rajnath Singh.

The Minister Delegate will attend the Defence Ministers' Conclave on the theme 'BRIDGE – Building Resilience through International Defence and Global Engagement', facilitating dialogue towards strategic partnerships. He will also hold key meetings with his counterparts on the sidelines of Aero India.

In New Delhi, the General will lay a wreath at the National War Memorial and will be accorded a Guard of Honour. He is scheduled to meet Chief of Defence Staff General Anil Chauhan and Defence Secretary Shri Rajesh Kumar Singh.

General Chanegriha will also visit several military institutes, including the Defence Image Processing and Analysis Centre of the Defence Space Agency, the National Defence Academy at Khadakwasla and INS Hansa, the premier Naval Aviation training establishment.

He is also scheduled to visit Defence & Aerospace public and private establishments including BrahMos Aerospace, Goa Shipyard Limited, Bharat Electronics Limited, L&T Defence and Bharat Forge.

General Chanegriha's visit paves the way for continued collaboration between the militaries of India and Algeria. It will further deepen the strong bonds & historical relationship between the two friendly nations and enhance their cooperation on matters of mutual interest.

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Chief Of Defence Staff Inaugurates Various Infrastructure At Naval Base Karwar

Source: Press Information Bureau, Dt. 05 Feb 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2100103

General Anil Chauhan, Chief of Defence Staff & Secretary, DMA inaugurated residential accommodation for Senior Sailors of Indian Navy and Main Distribution Sub Station as part of the Trunk facilities at Naval Base, Karwar on 04 Feb 25 with VAdm Krishna Swaminathan, Vice Chief of the Naval Staff, Shri SG Dastidar, DAS, FA (DS) and other senior officers in attendance.

The residential accommodation consisting of four towers with 240 dwelling units for Master Chief Petty Officers (MCPOs) and Chief Petty Officers (CPOs) has been constructed by M/S NCC Pvt. Ltd., Hyderabad.

The Main Distribution Sub Station at the Naval Base comprises four 33/11 KV - 35 MVA transformer capable of providing 65 MVA of stabilised power supply to operational piers, accommodation and utilities through seventy-seven state-of-the-art 33 KV Gas Insulated Switchgears, frequency convertors and voltage stabilizers.

The three Captive Power Plants of 3 MVA capacity will provide power backup to the Naval Base. M/s ITD Cementation India Ltd., Mumbai has constructed the Main Distribution Sub Station.

These infrastructure developments are part of the ongoing Phase IIA of Project Seabird which will support berthing of a large number of ships and submarines at Karwar. The project also includes a dual-use Naval Air Station, a full-fledged Naval Dockyard, Covered Dry Berths and several logistics facilities for ships and aircraft. The ongoing construction of Phase IIA of Project Seabird has created 7,000 direct and 25,000 indirect jobs.

The Project conforms to the extant norms of Ministry of Environment, Forest & Climate Change (MoEF&CC) and Indian Green Building Council (IGBC). The Project aligns with the concept of Aatmanirbhar Bharat, sourcing over 90% of material and equipment from Indian vendors.

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Indian Army's Trishakti Corps demonstrates operational excellence in live fire exercise

Source: The Economic Times, Dt. 04 Feb 2025,
URL: https://economictimes.indiatimes.com/news/defence/indian-armys-trishakti-corps-demonstrates-operational-excellence-in-live-fire-exercise/articleshow/117915216.cms

Indian Army's Trishakti Corps demonstrates operational excellence in live fire exercise

The Indian Army's Trishakti Corps successfully conducted a live fire exercise validating its battle readiness, rapid deployment, and precision strike capabilities, the Army said in a press release.

The units were specifically preparing for battle in the high-altitude mountains of Sikkim, showcasing their adaptability and readiness for diverse operational environments.

Through coordinated firepower and precision engagement, the units demonstrated their preparedness for a variety of challenges, including those posed by high-altitude warfare.

This exercise underscores the Army's commitment to maintaining high standards of efficiency, agility, and mission readiness, regardless of the terrain.

The Indian Army continues to enhance its capabilities, ensuring it remains fully equipped to meet evolving security requirements across varied landscapes.

Assam Rifles, as part of its commitment to community welfare, organised an Awareness Lecture on the ill Effects of Drug Abuse at Thambal Marik Degree College, Oinam in Bishnupur District of Manipur on February 3. The initiative aimed to educate and sensitise the local youth about the dangers of drug addiction and the importance of a healthy, drug-free lifestyle in the crucial phase of teenage life, Assam Rifles said in a press release.

The session was attended by students and teachers, which highlighted the adverse effects of substance abuse on the physical and mental health of an individual. The lecture also covered legal consequences, preventive measures and the role of family and society in combating drug addiction. The session concluded with a Pledge by the students promising to stay away from substance abuse.

The Assam Rifles continues to play a proactive role in promoting social responsibility and youth empowerment. Such awareness programs reaffirm their commitment to safeguarding the future of the nation by guiding young minds toward a path of discipline and responsibility.

Assam Rifles deployed at Headquarters Veng Churachandpur organised a weapon display programme for NCC cadets attending the Annual Training Camp at Churachandpur. The event held on February 3, aimed to familiarise the cadets with the weapons held by Indian Armed Forces. 98 NCC cadets, comprising 82 girls and 16 boys attended the programme. The weapon display was followed by an interactive session, where the cadets got to learn about the evolution and significance of the displayed weapons.

This initiative is part of Assam Rifles' efforts to instil values of patriotism, leadership and social responsibility among the youth. By engaging with NCC cadets, Assam Rifles aims to inspire and motivate the future leaders of the country.

The weapon display programme was a huge success with the cadets showing keen interest in the weaponry and interacting enthusiastically with the Assam Rifles personnel.

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India inks contract with Russia for procurement of anti-ship cruise missiles

Source: The Economic Times, Dt. 04 Feb 2025,
URL: https://economictimes.indiatimes.com/news/defence/india-inks-contract-with-russia-for-procurement-of-anti-ship-cruise-missiles/articleshow/117922464.cms

India on Tuesday inked a contract with Russia for procurement of anti-ship cruise missiles, a move that will significantly augment the combat capabilities of the Indian Navy's submarine fleet. The Defence Ministry made the announcement in a post on X.

The contract was inked in the presence of Defence Secretary Rajesh Kumar Singh.

"Ministry of Defence today inked a contract with Russia for the procurement of Anti-Ship Cruise Missiles in the presence of Defence Secretary Shri Rajesh Kumar Singh in New Delhi. These missiles will significantly augment the combat capabilities of the @indiannavy's submarine fleet," it wrote on the social media platform.

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Aero India 2025: Dates, venue, registration process and what to expect

Source: The Economic Times, Dt. 05 Feb 2025,
URL: https://economictimes.indiatimes.com/news/defence/aero-india-2025-dates-venue-registration-process-and-what-to-expect/articleshow/117942169.cms

Aero India, Asia’s premier aerospace and defence exhibition, returns to Bengaluru for its 2025 edition. Set against the backdrop of the Yelahanka Air Force Station from February 10–14, this

biennial event is poised to offer an exciting blend of technological innovations, thrilling aerial displays, and global networking opportunities for industry leaders, government officials, and aviation enthusiasts.

Key Highlights of Aero India 2025

Inspiring Aerial Displays and Technology ExhibitionsAero India 2025 promises to be an unforgettable event, featuring stunning flyovers and aerobatic performances by both domestic and international teams. Attendees can expect to see cutting-edge fighter jets, helicopters, and drones in action, showcasing the latest advancements in aerospace and defence technology. Alongside these breathtaking aerial displays, the event will also highlight state-of-the-art technology exhibits from more than 15 countries, spanning both military and civil aviation sectors.

Workshops, Seminars, and Networking Opportunities

The event will host a variety of workshops and seminars, offering valuable insights into emerging trends in aerospace and defence. These sessions are expected to be led by some of the foremost experts in the field, providing a platform for discussions about the future of aviation technology and global security. Aero India also serves as an excellent networking opportunity for industry leaders, offering a space for collaboration and business development in the growing defence and aerospace sectors.

Registration and Ticket Information

For those looking to attend the event, here's a detailed breakdown of the ticket prices:

Business Pass: Rs 5,000 for Indian nationals, USD 50 for foreign nationals

ADVA Pass: USD 50 for foreign nationals, Rs 1,000 for Indian nationals

General Visitor Pass: USD 50 for foreign nationals, Rs 2,500 for Indian nationals

These passes will grant access to a variety of exhibitions, conferences, and air displays. The event is divided into two main segments, with the first three days (February 10–12) dedicated to business delegates and the remaining two days (February 13–14) open to the general public.

How to Register for Aero India 2025

Visit the official Aero India website at ataeroindia.gov.in.

Click on the "Visitor Registration" section on the homepage.

Choose the relevant pass category based on your visit.

Complete the registration form with your details (name, contact number, etc.).

Pay the registration fee and click "Submit".

You will receive a confirmation email with your pass details once your registration is complete.

Event Schedule and Public Access

Aero India 2025 will be open from 9:00 AM to 6:00 PM each day, giving attendees ample time to explore exhibitions, attend seminars, and enjoy the air displays. For the general public, the final

two days (February 13 and 14) will offer the chance to experience the thrilling aerial performances and explore the exhibits up close.

Travel Advisory and Airspace Restrictions

As Aero India is a major event attracting global attention, it is important to note that there will be temporary flight disruptions around Kempegowda International Airport due to airspace restrictions. Visitors planning to travel by air should stay updated with flight schedules and make travel arrangements accordingly.

Aero India is organised by the Ministry of Defence, in collaboration with Hindustan Aeronautics Limited (HAL), the Defence Research and Development Organisation (DRDO), the Department of Space, and the Union Ministry of Civil Aviation. The first edition of the event was inaugurated in 1996, and since then, it has become one of the most important aerospace and defence exhibitions in Asia, drawing an ever-growing international audience.

A Glimpse into the Future of Aerospace

Aero India 2025 will showcase not only India's advancements in aviation technology but also highlight the increasing collaboration between global aerospace manufacturers and the Indian defence sector. The event will bring together over 800 exhibits, setting the stage for new partnerships, technological innovations, and business opportunities.

As one of Asia's largest and most influential airshows, Aero India continues to play a key role in shaping the future of the aerospace and defence industries. Don't miss out on this remarkable opportunity to be part of the next generation of aviation and defence technology!

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India needs to be agile on self-reliance in aerospace

Source: Hindustan Times, Dt. 04 Feb 2025,
URL: https://www.hindustantimes.com/opinion/india-needs-to-be-agile-on-self-reliance-in-aerospace-101738679846847.html

The unveiling of J-36, a sixth-generation fighter aircraft by China late last year, probably came as a Sputnik moment in its contest for air dominance with the US. The race to dominate Artificial Intelligence (AI) — think Deep Seek vs OpenAI — included, the intensification of the frontier-tech contest between the two becomes clear.

The J-36, with a tailless delta platform that combines stealth design with an apparently large payload capacity for both air-to-air and air-to-ground missions, seems ready to be inducted into active service with the People's Liberation Army Air Force (PLAAF) while the Next Generation Air Dominance (NGAD) sixth generation fighter of the United States (US) is nowhere on the horizon. The launch of Sputnik, the world's first space satellite, by the erstwhile Soviet Union, took the US by surprise in 1957 leading to the space race.

While the US-China contest escalates, India should be deeply concerned with the developments across its northern borders as its depleting fighter aircraft inventory is likely to limit its aerospace power, a key element of the national security matrix. The journey towards aatmanirbharta or self-

reliance in fighter aircraft design, development and manufacturing has been arduous yet satiating, with the development of the Light Combat Aircraft (LCA) Tejas Mk1 that has entered active service with the Indian Air Force.

The question, however, is whether it is enough, and if not, then what needs to be done so that national security is not compromised. The Indian Air Force (IAF) has reposed trust in the national aerospace design and manufacturing ecosystem; however, the response has been found wanting. Production of the Tejas MK1A, which was supposed to culminate in the delivery of 12 aircraft in FY25, is yet to see even the first aircraft being delivered. The design and development of the Tejas Mk2 and the Indian fifth-generation Advanced Medium Combat Aircraft (AMCA) at the current pace are unlikely to fructify in the coming decade.

The aero engine, a critical component, needs to be imported or co-developed with a foreign Original Equipment Manufacturer (OEM) for which the details are yet to be worked out. The GE-F404 engine that powers the LCA Tejas Mk1 and Mk1A is facing production issues due to global supply chain disruption and the matter has been taken up by the Indian government with the US at the highest level. The agreement for the joint production of the GE-F414 engines with the transfer of technology is yet to be signed between Hindustan Aeronautics Limited and GE Aerospace despite the MoU that was signed between the two during Prime Minister Narendra Modi's visit to the US in June 2023.

There are only a handful of countries like the United Kingdom, the US, Russia, France, and China that possess the capability to manufacture jet engines. The Kaveri engine programme could not succeed due to a variety of reasons. India, therefore, needs to collaborate with one of these countries by getting into a strategic partnership that would entail transfer of technology and joint production of aero engines.

Airframes are normally designed and built around a proven engine and India faces the challenge of fitting an engine around the LCA Tejas airframe. The design development and production of the Tejas Mk2 and the AMCA needs to be pursued in parallel along with the production and deliveries of the Tejas Mk1A. This can only happen once the engine deal is finalised as delays are going to be counterproductive to national security. Even the Tejas Mk2 would give the IAF only 4.5 generation technology while our adversaries ramp up the production of fifth-generation fighters.

The expenditure by India on aero engines alone is likely to go up to $40 billion by 2040. The maintenance life cycle cost goes up to 35% of the cost of a fighter aircraft. If India needs to spend to develop an aero engine with a reliable strategic partner the time to act is now, and it needs to be done in mission mode with all stakeholders coming together as a single entity to ensure that it happens.

The market will be available within the country apart from export options in the future. The private industry within the country needs to be encouraged to collaborate in this venture which would take at least 8-10 years for the return on investment to be ploughed back. This unshackling of the domestic industry with a robust indigenous demand and global competition for exports would create a win-win situation for the country.

The fact that the government has formed a committee under the stewardship of the defence secretary to look into the capability gap of the IAF only vindicates the belief that we have a problem at hand. China has a system of civil-military fusion that needs to be studied to understand how China has advanced so fast.

The way ahead probably would be to appoint a team with responsibility and accountability that would ensure that its recommendations are pursued in earnest within realistic time frames. This team needs to be led by a dynamic individual not necessarily from the ministry of defence. The government would need to act post haste with a deliberately crafted strategy to ensure aatmanirbharta in the aerospace domain.

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Aero India to put spotlight on IAF's plans for new transport planes

Source: Hindustan Times, Dt. 05 Feb 2025,
URL: https://www.hindustantimes.com/india-news/aero-india-to-put-spotlight-on-iaf-s-plans-for-new-transport-planes-101738745166824.html

Brazilian plane maker Embraer on Wednesday announced that it will showcase its KC-390 Millennium transport aircraft at Aero India, Asia's biggest airshow, in Bengaluru from February 10 to 14, with the development bringing into focus the Indian Air Force's plans to buy up to 80 medium transport aircraft (MTA).

The two other players vying for the MTA order are US aerospace firm Lockheed Martin with its C-130J Super Hercules aircraft and European Airbus Defence and Space with its A-400M. While the C-130J is already in service with the IAF, the A-400M will also be on display at the airshow.

The three-cornered contest to equip IAF with 40 to 80 aircraft is in line with the government's Make in India initiative to boost self-reliance in the defence manufacturing sector. The IAF is looking for a new transport aircraft in the 18 to 30-tonne cargo carrying capacity to meet its growing airlift needs.

"Embraer is excited to be back at Aero India as we showcase the KC-390 Millennium and our broad portfolio of defence and security solutions to the industry," a company statement said, quoting Embraer Defense and Security CEO Bosco da Costa Junior. Embraer will showcase the versatility and performance of the KC-390, which is configured to support air-to-air refuelling, it added.

The focus of the 15th edition of Aero India will be on forging new partnerships and exploring ways to fast-track indigenisation in the aerospace sector.

The KC-390 can carry a load of 26 tonnes, compared to C-130J's 20 tonnes and A-400M's 37 tonnes.

India will float a tender for the MTA procurement after the defence acquisition council grants its acceptance of necessity (AoN) for the project. The DAC is India's apex military procurement body

and headed by defence minister Rajnath Singh. Under India's defence procurement rules, the AoN by the council is the first step towards buying military equipment.

The IAF had requested information on MTA from original equipment manufacturers (OEMs) two years ago. The information sought included scope of technology transfer; methods to enhance indigenisation and to setup a dedicated manufacturing line, including design, integration and manufacturing processes in India; capability to undertake indigenous production of systems, subsystems, components and spares; and making India a regional or global hub for manufacturing and maintenance, repair and overhaul (MRO) of the equipment.

Embraer and Mahindra have signed a memorandum of understanding to bid for the MTA order, while Lockheed Martin has tied up with Tata Advanced Systems Limited (TASL). Airbus has not yet announced who it will partner with to compete for the project, but state-run plane maker Hindustan Aeronautics Limited could be an option, HT has learnt.

The IAF currently operates 12 C-130J aircraft, while Airbus is jointly executing a ₹21,935-crore project with TASL to equip the air force with 56 C-295 aircraft to modernise its transport fleet. In the defence sector, Embraer has so far supplied eight jets to India for VVIP travel and use as airborne early warning and control aircraft.

"#AeroIndia2025 will showcase the future of airpower with advanced technology, spectacular aerial displays and global aerospace innovations," the defence minister's office wrote on X on Wednesday.

The biennial airshow's last edition in 2023 attracted over seven lakh visitors, dignitaries from 98 countries and 809 exhibitors, including businesses, investors, start-ups and MSMEs. More than 250 partnerships and technology transfers worth ₹75,000 crore were witnessed at the time, the defence ministry earlier said.

The United States looks forward to deepening the US-India defence partnership and showcasing the best in aerospace innovation at Aero India, the US embassy in India wrote on X.

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Stryker infantry vehicle deal with U.S. progresses; Javelin missile to be demonstrated again

Source: The Hindu, Dt. 05 Feb 2025,
URL: https://www.thehindu.com/news/national/stryker-infantry-vehicle-deal-with-us-progresses-javelin-missile-to-be-demonstrated-again/article69184833.ece

In the backdrop of U.S. President Donald Trump's remarks to Prime Minister Narendra Modi that India buy more military equipment from them and amid the upcoming visit of Mr. Modi to Washington DC next week, several defence deals in the pipeline are in focus, among them the deal for co-production of Stryker infantry combat vehicles.

The performance of Stryker in high-altitude was demonstrated for the Indian Army and negotiations are making progress, according to sources in the know.

A note for New Delhi on dealing with 'Trumperica'Stryker, manufactured by General Dynamics, has been evaluated in high altitude conditions of Ladakh last September-October and the report has subsequently been shared with the Army Headquarters for further action, according to the sources.

The performance of the vehicles was demonstrated in high altitude conditions between 13,000 and 18,000 feet which also saw the testing of the Javelin Anti-Tank Guided Missile (ATGM), two sources said. And given some shortcomings, last month a communication was sent and re-trials are now awaited anytime, the sources stated.

The Stryker with its double-V hull performed optimally, one of the sources said, adding that the Javelin's performance was not at the optimum level, which was due to the vintage of the system that was sent and repeat trials are expected to validate that. India has already sent a communication to the U.S. side asking for repeat demonstration of the Javelin, another source said, and the schedule is being worked out.

India, U.S. in talks for Stryker infantry vehicles and Javelin missiles

The Indian Army has identified a key requirement for ATGMs mounted on infantry combat vehicles, several defence officials stated. However, the Stryker variant with the Javelin ATGM is under development and is expected to be demonstrated to India in the near future, it has been learnt.

Assembling in India

The envisaged plan, according to sources, is the procurement of few hundred vehicles in two stages. Direct import of small number of Strykers in the first stage and license manufacture of a bulk of them, with some customisations, in India likely by defence public sector undertaking Bharat Earth Movers Limited (BEML).

Military equipment co-developed by India, U.S. can be used to dissuade countries from going to 'mutual adversaries'A U.S. readout on the telephonic conversation between Mr. Modi and Mr. Trump, after he assumed office for the second time, said, "The President emphasised the importance of India increasing its procurement of American-made security equipment and moving toward a fair bilateral trading relationship."

Taking forward the ongoing conversations forward, Sandy Long, senior adviser for defence exports in the office of the U.S. Deputy Assistant Secretary for defence exports and cooperation, is expected at Aero India in Bengaluru next week. The office leads and directs the U.S. Army's global security assistance programmes.

The Stryker deal is expected to figure in the conversations during Mr. Modi's U.S. visit along with the deal for license manufacture of General Electric F-414 jet engines in India and the long delays in deliveries of the F-404 engines for the Light Combat Aircraft (LCA)-Mk1A which has delayed the delivery and induction schedule.

In June 2024, then U.S. Deputy Secretary of State Kurt M. Campbell had stated that India had expressed interest in co-production of the Stryker infantry vehicles and the two countries were in relatively early stages of talks on the Stryker and the Javelin ATGM. However, some defence

officials have expressed reservations on going for the Stryker given that several such vehicles have been developed and demonstrated by Indian companies in recent years.

The U.S. has in the past demonstrated both the Stryker as well as the Javelin ATGM to the Indian Army during bilateral exercises. Javelin was extensively evaluated by the Indian Army though the deal did not go through.

In November 2023, then Defence Secretary Giridhar Aramane said discussions surrounding the Stryker were being held under the defence industry cooperation road map which aims to co-develop and co-produce machinery, weapons and equipment required by the two countries. Stating that the initial offer on several infantry combat systems had come from the U.S., he had stated that any cooperation in this would happen if Indian militaries' needs were finalised.

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India issues RFI to procure active protection systems for T-90 tanks

Source: Janes Dt. 05 Feb 2025,
URL: https://www.janes.com/osint-insights/defence-news/land/india-issues-rfi-to-procure-active-protection-systems-for-t-90-tanks

The Indian Army has issued a request for information (RFI) in support of its planned procurement of a new active protection system (APS) for its T-90S/SK 'Bhishma' main battle tanks (MBTs).

Released on 3 February, the RFI is intended to identify foreign companies to manufacture the APS through collaboration with Indian industry, indicating probable local production of the system. The RFI asks foreign companies to respond by the beginning of April.

The procured APS should possess "soft kill, hard kill, and counter-unmanned aircraft system (C-UAS)" capabilities to enhance the T-90S/SK's survivability, the RFI said. The APS should also be capable of "being integrated with [the] T-90 without denuding [its] existing capabilities", it added.

According to the RFI, the soft-kill systems will be intended to neutralise anti-tank guided missiles (ATGMs) and UASs. The hard-kill system is required to be capable of neutralising chemical energy (CE) and kinetic energy (KE) projectiles.

The APS should be modular and capable of integrating additional sensors and combat systems, the RFI added.The RFI does not specify the number of APSs to be manufactured. However, it is likely that all operational T-90S/SK MBTs will receive the upgrade. According to Janes World Armies, the Indian Army operates about 1,000 T-90 MBTs of several variations. The type has been in service with the army since 2001.

Indian Army T-90 MBTs are produced under licence from Russia's UralVagonZavod (UVZ) by India's state-owned Heavy Vehicles Factory (HVF) in Chennai.

The T-90S MBT is the export configuration of the MBT.

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India's fifth-generation fighter jets to feature 'Beast Mode'? What is it? How will it change course of war?

Source: The Week, Dt. 04 Feb 2025,
URL: https://www.theweek.in/news/defence/2025/02/04/indias-fight-generation-fighter-jets-to-feature-beast-mode-what-is-it-how-will-it-change-course-of-war.html

The Advanced Medium Combat Aircraft, the fifth-generation fighter jet of India, which is under development, is set to have the 'Beast Mode' feature. This essentially means the fighter jets will have vastly enhanced firepower and offensive capabilities.

Not an entirely new feature in fighter jets, 'Beast Mode' refers to the ability to carry maximum firepower—mostly at the expense of stealth feature—to be used during the deep-strike missions where the fighter jets need to penetrate into heavily defended enemy areas. This increased firepower, involving missiles and bombs, will be part of the external heads of the aircrafts.

This mode is specifically designed for the later phases of a conflict, when air superiority is already established and the air defences of the enemy are neutralised or significantly reduced, eliminating the need for stealth features in fighter jets.

According to media reports, while the standard configuration of India's fifth-generation fighter jets will focus on stealth, with weapons carried internally, it would be able to transition into the 'Beast Mode', offering tactical advantage to the force.

This ability to switch between stealth and 'Beast Mode' will make the AMCA highly versatile, and is expected to be a game-changer in the country's areal combat abilities.

A report in Defence.in claimed that while the feature takes inspiration from fifth-generation fighters like the F-35 of the US, India's fight-generation fighters are expected to have various indigenous technologies.

In the case of f-35, in stealth mode, it can carry about 5,700 pounds of internal weapons, but when converted into 'Beast Mode' it can carry up to 22,000 pounds of internal and external weapons.

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Bamboo-based composites for Indian Army bunkers in high-altitude areas: IIT Guwahati, Army sign MoU

Source: The Week, Dt. 04 Feb 2025,
URL: https://www.theweek.in/news/defence/2025/02/04/bamboo-based-composites-for-indian-army-bunkers-in-high-altitude-areas-iit-guwahati-army-sign-mou.html

The Indian Army and Indian Institute of Technology, Guwahati (IITG) signed a memorandum of understanding (MoU) for research, design and fabrication of Epoxy bamboo-based composites as a replacement for traditional building materials used in the construction of bunkers in high-altitude Areas.

The project will lead to the building of multiple defence works in high-altitude terrain for field trials, according to a release from the army.

The fabricated panels will provide the same level of protection, but with reduced weight, decreasing the time and effort required for ferrying of supplies, and ultimately enhancing force preservation.

The MoU was signed on Monday in the presence of the GOC Red Horns Division Maj Gen Rohin Bawa and IITG director Prof Devendra Jallihal.

The signing of this MoU is a step towards innovation and collaboration, setting new standards for cooperation between government research, development institutions and military educational bodies to drive technological progress, Bawa said.

The partnership represents a shared commitment to exploring new technological frontiers and addressing modern battlefield challenges, he said.

Bawa further highlighted the collaborative role of academia, industry, researchers, and startups in fostering a whole-of-nation approach and expressed confidence that this partnership will contribute to groundbreaking achievements and support the nation's self-reliance initiative.

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Defence Secretary spells out big procurement push, overhaul of system

Source: The Print Dt. 05 Feb 2025,
URL: https://theprint.in/defence/defence-secretary-spells-out-big-procurement-push-overhaul-of-system/2480816/

Defence Secretary Rajesh Kumar Singh is looking to double the value of the total number of contracts signed by the ministry this fiscal as compared to the last. Singh also underlined that the year 2025 would see large reforms being initiated to cut down on the long procurement timelines, an issue which has been red-flagged by the domestic as well as the foreign industry.

What matters in defence is not annual allocation, but the “number of contracts one is ready to sign up which determines your pace of expenditure,” the defence secretary asserted.

“Let me assure you (that) we are on pace right now to sign the largest number of contracts ever in our history. Last year was another high of Rs 1.8 lakh crore. This year, we have already hit Rs 1.15 lakh crore, and my intent is to double last year’s number before the end of this financial year,” he said at a budget discussion hosted by CNBC. “I intend to cross Rs 2 lakh crore and may be even more.”

His comments came even as the defence ministry had to return unspent funds worth Rs 13,000 crore from its 2024-25 budget due to failure of the Services to utilise them. The Modi government has allocated Rs 6.81 lakh crore for the Ministry of Defence (MoD) for the financial year 2025-26. Of this total budget, Rs 1.80 lakh crore was set aside for capital outlay on defence services.

Singh underlined that from the day he took office in November last year, his focus has been on procurement. “That is an area which has been bedeviled by delays. We have identified where the delays are. It is in three specific areas,” he said, adding that the first is at the Services front in finalizing the Request for Proposal (RFP).

Incidentally, the longest pending RFP is the one for 114 fighter jets that the Indian Air Force (IAF) is supposed to issue but is awaiting clearance from the government.

The next delay, according to the defence secretary, is “in what they call the field evaluation trials and thereafter delays in what they call cost negotiations”. “All of them take years at a time,” he added.

Multiple industry sources said that the evaluation trials are very long and take years to be completed because of the way it is designed. However, the Services argue that many times it is those participating in trials who keep seeking extensions and changes which are allowed under the framed rules.

“We are going to ensure accountability in terms of much shorter timelines and that I said I intend to ensure that our contracts this year are double if not triple of last year,” the defence secretary said, regarding the identified areas of delay. Singh further said he was trying to ensure that order books are full across the defence industry so that everyone has visibility, everybody on the same page – from original equipment manufacturer to component manufacturers.

When it comes to foreign players, he said, the format of the C-295 deal or similar templates will be followed. While 16 C-295 aircraft are to be manufactured in Seville, Spain, and delivered to the IAF in ‘fly-away’ condition, 40 more would be manufactured and assembled by Tata Advanced Systems (TASL) in India as part of an industrial partnership with Airbus. “If you want a slice of (Indian) defence pie, you have to be making it in India. In fact, make it for the world,” Singh said.

Efforts were being made to ensure easier transfer of technology of systems developed by the Defence Research and Development Organisation (DRDO) to the private industry, the defence secretary said, adding that the DRDO would also gain efficiency from the private sector’s manufacturing capability.

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When will Rafale M fly from Indian Navy carriers? We may now know the date

Source: Business Standard Dt. 05 Feb 2025,
URL: https://www.business-standard.com/external-affairs-defence-security/news/when-will-rafale-m-fly-from-indian-navy-carriers-we-may-now-know-the-date-125020500746_1.html

The Indian Navy could receive the first of the 26 Rafale Marine (Rafale M) aircraft carrier-based naval combat aircraft by May 2028 at the latest, with ThePrint reporting on Tuesday that India and France are likely to sign the €7 billion ($7.6 billion or Rs 63,000 crore) deal in April 2025, under a government-to-government contract, during French Defence Minister Sébastien Lecornu's visit to

India. The report added that both sides have completed negotiations for the deal. Sources within the defence and security establishment informed the news portal that Prime Minister Narendra Modi is scheduled to visit France from February 10-12 to co-chair an Artificial Intelligence (AI) Summit. During the visit, he is also expected to hold bilateral discussions with French President Emmanuel Macron, where both nations may formally announce the deal.

However, sources informed the news portal that the deal is expected to be signed only after the Parliament Budget session concludes. While the initial plan was to finalise the agreement within the current financial year, the timeline may be extended due to the ongoing Parliament session.

Why is India buying the Rafale M?

The Rafale M acquisition will enable the Indian Navy to operate these aircraft from its two aircraft carriers, INS Vikrant and INS Vikramaditya. Currently, both carriers are equipped with the Russian-made Mikoyan MiG-29K fighter aircraft.

India selected the Rafale M over the American Boeing F/A-18 Super Hornet for its naval fleet. A key advantage of this choice is the commonality with the Indian Air Force's (IAF's) Rafale jets, which is expected to reduce costs related to spares and maintenance. France completed the delivery of all 36 Rafale jets to the IAF in December 2022. India had ordered the combat aircraft in a Rs 59,000-crore government-to-government deal in September 2016.

When will the Indian Navy get its first Rafale M?

As per ThePrint report, France would be contractually required to deliver the first Rafale M aircraft within 37 months from the deal's signing. With the agreement likely to be finalised in April 2025, this means the Indian Navy can expect the first Rafale M to be delivered by May 2028.

The contract is also expected to include a provision requiring Dassault Aviation to demonstrate a modified Rafale M with the Indian Navy’s requested changes within 18 months. While sources did not specify the exact modifications, they indicated that the changes are aimed at ensuring optimal performance from Indian aircraft carriers.

The Rafale M development follows a report from the same portal indicating that the Indian Navy has dropped plans to operate three aircraft carriers simultaneously and is instead prioritising the construction of a second indigenous aircraft carrier to eventually replace INS Vikramaditya.

According to that report, the government does not support the Navy's position on maintaining a three-carrier fleet, which would have ensured that at least two carriers remained operational at all times, even if one was undergoing refits. Instead, the government is reportedly pushing for a greater focus on submarines, including nuclear-powered attack vessels, rather than expanding the aircraft carrier fleet.

What are the capabilities of the Indian Navy's Rafale M jets?

The IAF variant and the Navy’s Rafale M have approximately 80 per cent common components. "The Air Force single-seat Rafale C, the Air Force two-seat Rafale B, and the Navy single-seat Rafale M feature maximum airframe and equipment commonality, and very similar mission capabilities," says Dassault Aviation, the aircraft's manufacturer.

All Rafale variants belong to the 4+ generation of fighter aircraft, incorporating advanced avionics and select capabilities typically found in fifth-generation jets. However, the Rafale M aircraft being acquired for the Indian Navy under the latest deal features key distinctions from the IAF variant.

The Rafale M is a single-seat, multi-role fighter capable of executing deep strikes, air defence, and reconnaissance missions. Similar to the IAF variant, Dassault Aviation describes the Rafale M as an "omnirole aircraft", meaning it can engage in air-to-air and air-to-ground combat simultaneously.

Designed for aircraft carrier operations, the Rafale M includes several modifications that differentiate it from the IAF variant:

- Reinforced undercarriage and landing gear to withstand the impact of carrier landings.
- Tail hook system for arrested landings on a carrier deck.
- Jump strut nosewheel that extends during short takeoffs, including catapult launches.
- Built-in ladder for cockpit access from the carrier deck.
- Carrier-based landing system for precision landings.
- Foldable wings to accommodate storage constraints on aircraft carriers.
- These structural reinforcements make the Rafale M slightly heavier than the IAF variant.

Both the IAF Rafale and the latest standard of the Rafale M feature:

- Thales RBE2 active electronically scanned array (AESA) radar, with the Rafale M's version optimised for maritime operations.
- Thales SPECTRA internal electronic warfare system, also fine-tuned for naval operations.

Both variants share a common weapons package, including:

- Meteor long-range air-to-air missile (A2A)
- MICA A2A missile
- HAMMER air-to-surface stand-off weapon
- SCALP long-range stand-off missile
- AM39 EXOCET anti-ship missile

Laser-guided bombs

These features make the Rafale M a formidable naval fighter, ensuring seamless integration with India's carrier-based operations while maintaining compatibility with IAF Rafales for streamlined logistics and maintenance.

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बॉर्डर पर दुश्मनों के छक्के छुड़ाएगी AK-203! इस साल सेना को मिलेंगी रूसी तकनीक से बनीं 70 हजार असॉल्ट राइफल

Source: Aaj Tak, Dt. 06 Feb 2025,
URL: https://www.aajtak.in/defence-news/story/indian-army-to-receive-70-thousand-ak-203-rifles-made-with-russian-technology-in-2025-ntc-rptc-2159992-2025-02-06

भारतीय सेना को सशक्त करने के लिए इस साल 70 हजार AK–203 असॉल्ट राइफलें मिलेंगी. रक्षा सूत्रों के अनुसार, इसके बाद 2026 में अतिरिक्त 1 लाख यूनिट भी सौंपी जाएंगी. यह डिलीवरी रूस के साथ एक बड़े समझौते का हिस्सा है, जिसका उद्देश्य भारतीय सैनिकों को दुनिया की सबसे एडवांस और विश्वसनीय असॉल्ट राइफलों में से एक से लैस करना है. भारतीय सेना को 2024 में इनमें से 35 हजार राइफलें पहले ही मिल चुकी हैं.

दरअसल, उत्तर प्रदेश के अमेठी में एक संयुक्त भारत–रूस वेंचर के तहत निर्मित AK–203 ने वर्तमान में सेवा में मौजूद पुरानी INSAS राइफलों की जगह लेना शुरू कर दिया है. इस साल इन AK–203 राइफलों में स्वदेशी सामग्री को 30 प्रतिशत तक बढ़ाया जाएगा, जबकि बाद की आपूर्ति में स्वदेशी सामग्री को और बढ़ाया जाएगा. बेहतर एर्गोनॉमिक्स, स्थायित्व और अनुकूलनशीलता के साथ AK–203 बढ़ी हुई मारक क्षमता प्रदान करता है, जो इसे आतंकवाद विरोधी अभियानों और उच्च ऊंचाई वाले युद्ध सहित विभिन्न युद्ध परिदृश्यों के लिए आदर्श बनाता है.

AK–203 प्रसिद्ध कलाश्निकोव सिरीज का आधुनिक वर्जन है, जो बेहतर सटीकता, लाइट वेट कंस्ट्रक्शन और एडवांस ऑप्टिक्स व सहायक उपकरण के साथ संगतता प्रदान करता है. राइफल में 7.62×39 मिमी गोला–बारूद के लिए चैम्बर है, जो 5.56 मिमी इंसास राइफलों की तुलना में अधिक रोकने की शक्ति प्रदान करता है.

मेक इन इंडिया के तहत बनाई जा रही राइफलें

यह खरीद 'मेक इन इंडिया' पहल के तहत भारत के व्यापक रक्षा स्वदेशीकरण लक्ष्यों के अनुरूप है. जो यह सुनिश्चित करता है कि अधिकांश राइफलें भारत–रूस संयुक्त वेंचर इंडो–रूसी राइफल्स प्राइवेट लिमिटेड (आईआरआरपीएल) द्वारा घरेलू स्तर पर निर्मित की जाती हैं. यह न केवल हथियारों के उत्पादन में भारत की आत्मनिर्भरता को बढ़ाता है बल्कि रूस के साथ द्विपक्षीय रक्षा सहयोग को भी मजबूत करता है.

बता दें कि चीन के साथ वास्तविक नियंत्रण रेखा (LAC) पर तनाव और पाकिस्तान से लगातार सीमा पार खतरों के साथ थल सेना के हथियारों को आधुनिक करना भारतीय सेना के लिए प्राथमिकता रही है. AK–203 सैनिकों को अधिक मजबूत, रखरखाव में आसान और युद्ध–सिद्ध बन्दूक प्रदान कर रही है, जिससे उनकी परिचालन तत्परता में उल्लेखनीय सुधार हुआ है.

भारत की 2021 में रूस के साथ हुई थी डील AK–203 कॉन्ट्रैक्ट भारत और रूस के बीच भारत में AK–203 असॉल्ट राइफलों के निर्माण के लिए एक डील है. जुलाई 2021 में इस कॉन्ट्रैक्ट पर हस्ताक्षर किए गए थे, जिसकी कीमत ₹5,000 करोड़ से अधिक है. इस कॉन्ट्रैक्ट में इंडो–रूसी राइफल्स प्राइवेट लिमिटेड (IRRPL) और रोसोबोरोनएक्सपोर्ट (RoE) के बीच एक संयुक्त वेंचर शामिल है. इस कॉन्ट्रैक्ट में 6.1 लाख से अधिक AK–203 राइफलों का उत्पादन शामिल है. इसमें रूस से प्रौद्योगिकी हस्तांतरण शामिल है.

एके-203 राइफल की ये है खासियतए

के–203 राइफल इंसास से छोटी और हल्की है. इंसास बिना मैगजीन और बेयोनेट के भी 4.15 KG की है. AK–203 का वजन 3.8 KG है. इंसास की लंबाई 960 मिमी है. एके–203 सिर्फ 705 मिमी लंबी है. वजन और लंबाई कम होने पर राइफल को लंबे समय तक उठाया जा सकता है. इससे जवान थकते कम हैं.

AK–203 में 7.62x39mm की बुलेट्स लगती हैं, जो ज्यादा घातक होती हैं. इंसास में 5.56x45mm की गोलियां लगती हैं. इंसास की रेंज 400 मीटर है, जबकि AK–203 की रेंज 800 मीटर है. यानी काफी दूर से दुश्मन को ढेर कर सकते हैं.

INSAS सिंगल शॉट और तीन–राउंड का बर्स्ट फायर करती है. AK–203 सेमी–ऑटोमैटिक या ऑटोमैटिक मोड में चलती है. सिर्फ एक ही मामले में इंसास बेहतर है. इंसास एक मिनट में 650 गोलियां दाग सकती है, जबकि AK–203 सिर्फ 600 गोलियां ही दागती है.

INSAS में 20 से 30 राउंड की मैगजीन लगती है. AK–203 में 30 राउंड की बॉक्स मैगजीन लगती है. इंसास की मजल वेलोसिटी 915 मीटर प्रति सेकेंड है. AK–203 की मजल वेलोसिटी 715 मीटर प्रति सेकेंड है. यानी इंसास की गोलियां ज्यादा तेज गति से जाती है. दोनों ही राइफलें गैस ऑपरेटेड, रोटेटिंग बोल्ट तकनीक पर काम करती हैं.

इंसास राइफल पर इन–बिल्ट आयरन साइट, माउंट प्वाइंट लगाया जा सकता है, ताकि दूरबीन से दुश्मन को देखा जा सके. इस मामले में AK–203 ज्यादा बेहतर है क्योंकि इसपर एडजस्टबल आयरन साइट तो है ही, इसके अलावा पिकैटिनी रेल लगी है, यानी आप दुनिया के किसी भी तरह के दूरबीन को इस बंदूक पर लगा सकते हैं. यानी जितनी ताकतवर दूरबीन उतना घातक हमला.

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साल के अंत तक मिलेगा S-400 एयर डिफेंस सिस्टम का चौथा स्क्वॉड्रन, सिलिगुड़ी में होगा तैनात

Source: Aaj Tak, Dt. 05 Feb 2025,
URL: https://www.aajtak.in/defence-news/story/india-to-receive-fourth-squadron-of-s-400-air-defence-system-from-russia-by-year-end-rptc-2159558-2025-02-05

भारत इस साल के अंत तक रूसी निर्मित एस–400 वायु रक्षा प्रणाली के चौथे स्क्वॉड्रन को प्राप्त करने वाला है. सूत्रों ने पुष्टि की है कि पांचवां स्क्वॉड्रन 2026 में आने की उम्मीद है. भारत ने पहले ही एस–400 प्रणाली के तीन स्क्वॉड्रन प्राप्त कर लिए हैं. उन्हें विभिन्न स्थानों पर तैनात किया है. भारत ने 2018 में रूस के साथ एस–400 प्रणाली के पांच स्क्वॉड्रन के लिए लगभग ₹35,000 करोड़ के सौदे पर हस्ताक्षर किए थे. यह उन्नत वायु रक्षा प्रणाली भारत के रणनीतिक स्थानों की सुरक्षा में महत्वपूर्ण भूमिका निभाती है.

एस-400 की तैनाती के प्रमुख क्षेत्रों में होगी

सिलीगुड़ी कॉरिडोर की सुरक्षा के लिए एक स्क्वॉड्रन को तैनात किया गया है. पठानकोट क्षेत्र में एक अन्य स्क्वॉड्रन को तैनात किया गया है ताकि जम्मू–कश्मीर और पंजाब की रक्षा को मजबूत किया जा सके. भारत की पश्चिमी सीमा पर एक स्क्वॉड्रन को तैनात किया गया है ताकि राजस्थान और गुजरात में महत्वपूर्ण स्थानों की सुरक्षा सुनिश्चित की जा सके. भारत के पास S–400 एयर डिफेंस मिसाइल सिस्टम मौजूद होने की वजह से चीन या पाकिस्तान सीमा पार से नापाक हरकत नहीं कर पाएंगे. इस एयर डिफेंस मिसाइल सिस्टम के बचे हुए यूनिट्स आने के बाद देश की सुरक्षा अभेद्य हो जाएगी. एस–400 मिसाइल सिस्टम के ऑपरेटर्स की ट्रेनिंग पूरी हो चुकी है.

हथियार नहीं महाबली है यह अभेद्य रक्षा कवच

एस–400 एयर डिफेंस मिसाइल सिस्टम हथियार नहीं महाबली है. इसके सामने किसी की भी साजिश नहीं चलती. यह आसमान से घात लगाकर आते हमलावर को पलभर में राख में बदल देता है. एस–400 मिसाइल सिस्टम को

दुनिया की सबसे सक्षम मिसाइल प्रणाली माना जाता है. पाकिस्तान और चीन भारत के लिए हमेशा से चुनौती रहे हैं. भारत का इन देशों से युद्ध भी हो चुका है. शक्ति का संतुलन बनाए रखने के लिए ऐसी मिसाइल प्रणाली की देश को जरूरत थी. भारत को एस–400 सिस्टम मिलने से भारतीय वायुसेना की ताकत में इजाफा होगा.

35 हजार करोड़ रुपए में हुई थी पांच यूनिट की डील

भारत ने अक्टूबर 2018 में रूस के साथ ऐसे पांच सिस्टम खरीदने का करार किया था जिसकी लागत 5 अरब डॉलर यानी 35,000 करोड़ रुपये है. चीन हो या पाकिस्तान S–400 मिसाइल एयर डिफेंस सिस्टम के बल पर भारत न्यूक्लियर मिसाइलों को अपनी जमीन तक पहुंचने से पहले ही हवा में ही ध्वस्त कर देगा. S–400 से भारत चीन–पाकिस्तान की सीमा के अंदर भी नजर रख सकेगा. जंग में भारत S–400 सिस्टम से दुश्मन के लड़ाकू विमानों को उड़ने से पहले निशाना बना लेगा. चाहे चीन के जे–20 फाइटर प्लेन हो या फिर पाकिस्तान के अमेरिकी F–16 लड़ाकू विमान. यह मिसाइल सिस्टम इन सभी विमानों को नष्ट करने की ताकत रखता है. रूस ने साल 2020–2024 तक भारत को एक–एक कर ये मिसाइल सिस्टम देने की बात कही थी.

एक बार में 72 मिसाइल दाग सकता है ये सिस्टम

S–400 एक बार में एक साथ 72 मिसाइल छोड़ सकती है. इसके सबसे खास बात ये है कि इस एयर डिफेंस सिस्टम को कहीं मूव करना बहुत आसान है क्योंकि इसे 8X8 के ट्रक पर माउंट किया जा सकता है. S–400 को नाटो द्वारा SA–21 Growler लॉन्ग रेंज डिफेंस मिसाइल सिस्टम भी कहा जाता है. माइनस 50 डिग्री से लेकर माइनस 70 डिग्री तक तापमान में काम करने में सक्षम इस मिसाइल को नष्ट कर पाना दुश्मन के लिए बहुत मुश्किल है. क्योंकि इसकी कोई फिक्स पोजिशन नहीं होती. इसलिए इसे आसानी से डिटेक्ट नहीं कर सकते.

S–400 मिसाइल सिस्टम में चार तरह की मिसाइलें होती हैं जिनकी रेंज 40, 100, 200, और 400 किलोमीटर तक होती है. यह सिस्टम 100 से लेकर 40 हजार फीट तक उड़ने वाले हर टारगेट को पहचान कर नष्ट कर सकता है. एस–400 मिसाइल सिस्टम (S–400 Air Defence Missile System) का रडार बहुत अत्याधुनिक और ताकतवर है. 600 km की रेंज में 300 टारगेट ट्रैक करने की ताकतइसका रडार 600 किलोमीटर तक की रेंज में करीब 300 टारगेट ट्रैक कर सकता है. यह सिस्टम मिसाइल, एयरक्राफ्ट या फिर ड्रोन से हुए किसी भी तरह के हवाई हमले से निपटने में सक्षम है. शीतयुद्ध के दौरान रूस और अमेरिका में हथियार बनाने की होड़ मची हुई थी. जब रूस अमेरिका जैसी मिसाइल नहीं बना सका तो उसने ऐसे सिस्टम पर काम करना शुरू किया जो इन मिसाइलों को टारगेट पर पहुंचने पर पहले ही खत्म कर दे.

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US B-1 bombers, Philippine FA-50 fighter jets hold joint patrols over Scarborough Shoal. A warning to China?

Source: The Week, Dt. 04 Feb 2025,
URL: https://www.theweek.in/news/defence/2025/02/04/us-b-1-bombers-philippine-fa-50-fighter-jets-hold-joint-patrols-over-scarborough-shoal-a-warning-to-china.html

The US and Philippine fighter aircraft conducted a joint patrol and training over the disputed Scarborough Shoal in the South China Sea. Chinese fighter jets had fired flares over this disputed area last year to drive away a Philippine aircraft.

Scarborough Shoal, also known as Bajo de Masinloc or Huangyan Island, is a contentious atoll located within the Exclusive Economic Zone of the Philippines. However, China claims it to be part of its historical territory.

The largest atoll in the South China Sea, Scarborough Shoal has been witnessing large-scale naval drills by China amid the ongoing territorial disputes with the Philippines.

Two US Air Force B-1 bomber aircraft and three Philippine Air Force FA-50 fighter jets joined the patrol and training, which involved practising how to intercept a hostile aircraft, Philippine Air Force spokesperson Maria Consuelo Castillo said.

It was not known if the patrol faced any challenge from Chinese side guarding the shoal.

"The exercises focused on enhancing operational coordination, improving air domain awareness and reinforcing agile combat employment capabilities between the two air forces," the Philippine Air Force said.

In August, two Chinese Air Force aircraft flew close then fired flares in the path of a Philippine Air Force plane on routine patrol over the shoal. All those aboard the Philippine Air Force NC-212i turbo-prop transport plane were unharmed.

The Southern Theater Command of the Chinese People's Liberation Army had then said a Philippine Air Force aircraft illegally entered the airspace above the shoal and disrupted training activities by Chinese forces.

Apart from China and the Philippines, Brunei, Malaysia, Vietnam and Taiwan have overlapping territorial claims in the busy sea passage, but hostilities have particularly flared in the past two years between Chinese and Philippine coast guard and navy forces in the Scarborough Shoal and another fiercely contested atoll, the Second Thomas Shoal.

It remains to be seen how China will react to this latest military drill—the first since US President Donald Trump took office again—by the allies.

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USS Preble Fires HELIOS Laser, Proving High-Energy Weapons Are Closer to Naval Combat Reality

Source: Republic World, Dt. 05 Feb 2025,
URL: https://www.republicworld.com/defence/defence-technology/uss-preble-fires-helios-laser-proving-high-energy-weapons-are-closer-to-naval-combat-reality

The U.S. Navy has taken a major leap in futuristic warfare by successfully testing its High-Energy Laser with Integrated Optical Dazzler and Surveillance (HELIOS) system on a warship. In a recently disclosed report, the Arleigh Burke-class destroyer USS Preble fired the directed-energy weapon at an aerial drone during a weapons testing exercise in fiscal year 2024—showing that laser warfare isn't just sci-fi anymore.

The report, released by the Office of the Director, Operational Test and Evaluation, didn't specify when or where the test took place but did include a black-and-white photo of a streak of white light beaming from the warship into the sky. The test was designed to prove that HELIOS is combat-ready and can effectively take out airborne threats.

A Big Win for Laser Weapons—But a Long Road Ahead

The HELIOS system, a 60-plus-kilowatt laser built by Lockheed Martin, was installed on the USS Preble in August 2022, making it the first tactical laser weapon to be integrated into an operational U.S. warship. The system is meant to zap drones, disable enemy sensors, and eventually counter missiles—all without wasting a single missile or bullet.

The timing of the test couldn’t be more relevant. Since late 2023, U.S. Navy warships have been busy intercepting drone and missile attacks from Iran-backed Houthi rebels in the Red Sea and Gulf of Aden. These conflicts have highlighted the need for cost-effective, unlimited munition sources, and HELIOS could be a game-changer.

But despite the successful test, laser weapons still have hurdles to clear before becoming standard in naval combat. Some of the biggest challenges include:

- Power Supply: Lasers require a lot of energy, and not all ships have the infrastructure to handle them.
- Weather Conditions: Fog, rain, and dust can weaken laser beams, limiting their range and effectiveness.
- Tactical Integration: The Navy is still figuring out exactly how and when to use lasers in real combat.

Lasers Could Change the Game—If the Navy Can Figure Them Out

Right now, the U.S. military spends $1 billion a year on developing high-energy lasers and high-power microwaves, but progress has been slow. The Navy has installed eight Optical Dazzling Interdictor, Navy (ODIN) systems on destroyers—designed to blind enemy sensors rather than destroy targets. There's also a 150-kilowatt Laser Weapon System Demonstrator (LWSD) mounted on a San Antonio-class amphibious transport dock for further testing.

So, what's next? The Navy will likely ramp up testing, pushing the limits of HELIOS in more challenging scenarios. If all goes well, directed-energy weapons could become a regular part of naval warfare, offering low-cost, unlimited firepower against drones, missiles, and even enemy aircraft.

For now, the USS Preble's laser shot is a big step forward, proving that warships of the future may not need to rely solely on missiles and guns—sometimes, all they'll need is a well-aimed beam of light.

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US Marine Corps Aviation Overhaul to See More Carrier-Based F-35Cs, AI-Integration, and Drone Wingmen

Source: Republic World, Dt. 05 Feb 2025,
URL: https://www.republicworld.com/defence/global-defence-news/us-marine-corps-aviation-overhaul-to-see-more-carrier-based-f-35cs-ai-integration-and-drone-wingmen

The U.S. Marine Corps has rolled out an ambitious new aviation strategy that embraces artificial intelligence, autonomous systems, and next-generation drones to maintain air superiority in high-intensity conflict zones. The 2025 Marine Corps Aviation Plan, released Monday, marks the first update to the service's aerial warfare doctrine in three years and signals a shift toward a more technologically advanced, agile, and resilient force.

A key pillar of the new strategy is Project Eagle, a modernization effort aimed at integrating AI-driven software with advanced aviation concepts to ensure the Corps' fleet can survive and operate effectively in contested environments. The plan also formalizes a strategic shift in the Marine Corps' procurement of the F-35 Joint Strike Fighter, with a notable increase in the number of carrier-based F-35C variants at the expense of the F-35B, which features short takeoff and vertical landing capabilities.

Project Eagle: A High-Tech Overhaul

Marine aviation leaders describe Project Eagle as a fundamental transformation of how the Corps will fight in the air, leveraging AI, automation, and advanced networking capabilities to accelerate decision-making in combat.

"We are committed to shaping a future aviation force that is ready, resilient, and capable of rapidly responding to emerging threats, wherever they may arise," Col. Derek Brannon, of Headquarters Marine Corps Aviation, said in a statement.

Project Eagle will focus on two core concepts:

- Distributed Aviation Operations (DAO) – A new approach that disperses aviation squadrons, logistics hubs, and command-and-control units across the battlefield, making them harder to detect and neutralize. This could involve shifting decision-making authority to lower levels and adopting a more fluid operational style to outmanoeuvre adversaries.
- Decision-Centric Aviation Operations (DCAO) – A doctrine that seeks to harness AI and advanced computing to significantly reduce the time required to make tactical decisions. By leveraging big data analytics, automated threat recognition, and networked sensor fusion, the Corps aims to enhance situational awareness and speed up engagement times.

The strategy underscores the need for a “data-centric and data-enabled organization,” highlighting investments in infrastructure, personnel training, and digital modernization as essential steps. The plan explicitly states that “linear incremental change will not be sufficient”, calling for “transformative” leaps in how Marine Aviation integrates cutting-edge technology.

Drones, AI, and Manned-Unmanned Teaming

The Marine Corps Aviation Plan also prioritizes the development of unmanned systems and AI-powered aircraft, with a specific emphasis on “manned-unmanned teaming.” This concept envisions piloted fighter jets, such as the F-35, flying alongside autonomous drone wingmen that can carry weapons, provide surveillance, or conduct electronic warfare missions.

Additional investments will be made in future drones for logistics and aircraft survivability enhancements, ensuring the Corps can sustain prolonged operations in conflict zones with limited resupply options.

Reshaping the Marine Corps' F-35 Fleet

One of the most notable shifts in the plan is the adjustment of the Marine Corps' F-35 procurement strategy. While the overall number of F-35s remains at 420, the balance between the two variants has changed significantly:

- The Corps will now buy 280 F-35Bs and 140 F-35Cs, nearly doubling the number of carrier-capable F-35Cs compared to previous plans.
- This is a major revision from the 2022 plan, which aimed for 353 F-35Bs and just 67 F-35Cs.

The shift reflects an evolving strategy that emphasizes the F-35C's longer range, higher payload capacity, and ability to operate from U.S. Navy aircraft carriers, giving the Marine Corps more flexibility in high-end naval warfare scenarios.

Under the new plan, four Marine Fighter Attack Squadrons (VMFA-232, VMFA-323, VMFA-112, and VMFA-134) will transition to F-35C squadrons, bringing the Corps’ future fleet composition to 12 squadrons flying F-35Bs and 8 squadrons flying F-35Cs.

By the end of 2025, the Marines expect to have 183 F-35Bs and 52 F-35Cs delivered, according to the strategy document.

Improving Aircraft Sustainment and Readiness

The plan also takes aim at modernizing aircraft maintenance and sustainment, recognizing that traditional methods are insufficient for the demands of future conflicts. Proposed changes include:

- Redesigning support equipment to enhance efficiency and safety.
- Modernizing training systems to integrate AI-powered simulations and predictive maintenance tools.
- Expanding the use of additive manufacturing and digital modelling to streamline logistics and reduce dependence on long supply chains.
- Encouraging innovation among aviation sustainment personnel to develop new ways to keep aircraft mission-ready in austere conditions.

The Bigger Picture: Preparing for the Next War

The 2025 Marine Corps Aviation Plan is the latest in a series of efforts aimed at preparing the U.S. military for potential large-scale conflicts against near-peer adversaries like China and Russia. As part of this shift, Marine aviation is leaning heavily into automation, AI, and survivability-focused designs to remain effective in a high-threat environment.

With Project Eagle leading the way, the Marine Corps is betting big on technology, networking, and new operational concepts to keep its aviation forces ahead of future adversaries. The plan is clear: slow, incremental improvements will not be enough. To win the wars of tomorrow, Marine Aviation is embracing disruptive innovation—and betting that a smarter, more connected, and more autonomous force will be the key to battlefield dominance.

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China readying for war? PLA burrows underground and hardens air bases

Source: The Economic Times, Dt. 04 Feb 2025,
URL: https://economictimes.indiatimes.com/news/defence/readying-for-war-the-pla-burrows-underground-and-hardens-air-bases/articleshow/117902447.cms

Chairman Xi Jinping is very serious in his admonitions that the People's Liberation Army (PLA) should get ready for war. Such preparations are literally and very visibly seen in the hardening of military air bases and the construction of a brand new command complex to protect personnel against bombardment.

Satellite imagery reveals numerous projects to fortify PLA facilities, but the most startling of all is a brand new command complex currently under construction some 25-30km west-southwest of the center of capital city Beijing.

In late January the Financial Times broke the news of this massive facility presumably designed to act as a wartime command-and-control center for the PLA. The site covers approximately 1,500 acres, and is ten times larger than the Pentagon.

Satellite imagery shows deep holes burrowed into the ground, which will eventually house hardened bunkers, likely strong enough to resist nuclear attack. Once completed, it will be the world's largest military command center. Already, some observers have dubbed it Beijing Military City, and more than 100 cranes are at work there daily.

The building site measures some 4km across, and dispersing the facility over a wider area, as well as burrowing deep into the ground, helps ensure greater survivability when under attack. Although it is impossible to verify all details about the new complex at present, it appears there are several underground nodes connected by subterranean passageways, with perhaps even its own subway network.

Could analysts be mistaken, however, and the whole area be nothing more than a residential site? The location certainly stands out given the dearth of large, new residential real estate construction sites, as China wilts under a sharp economic slump.

Notably, there is no commercial advertising or marketing associated with any new development in this particular area near Beijing. Furthermore, the Chinese internet is silent on what is happening at this worksite, and all this is evidence that a top-secret project is being built on behalf of the military.

Although there are no military guards at the huge construction site, public access is prohibited all around, with checkpoints ensuring no interlopers can gain access. Neither photographs nor drones are allowed, and nearby hiking and tourist sites are now off limits.

Houses in the adjacent Qinglonghu area were being bulldozed to make way for this new development too. Construction at the sprawling site began in mid-2024, with the coordinates 39°49'7.65"N 116° 3'58.22"E marking its approximate midpoint.

Such a large-scale effort should not come as a surprise, as the Chinese Communist Party goes all out to mark the PLA's 100th anniversary in 2027. By that date, Xi wants to have the capability of attacking Taiwan. Literally, Xi has ordered the PLA to "accelerate the integrated development of mechanization, informatization and intelligentization, while boosting the speed of modernization in military theories, organizations, personnel and weapons and equipment".

At the time of writing, China's Foreign Ministry had failed to make any comment on the existence or purpose of the new construction. The Chinese Embassy in Washington had told the Financial Times it was "not aware of the details", and also stressed that China was "committed to the path of peaceful development and a defense policy that is defensive in nature."

Currently, the major secure headquarters for the PLA, and for the top body led by Xi, the Central Military Commission (CMC), is located in the Western Hills of Beijing at the approximate coordinates of 40°0'39.27"N 116°14'10.70"E. Also known as the Joint Combat Command Center, this large but dated underground fortress was constructed decades ago during the Cold War.

At this stage, it appears the new complex will supplant the role of Western Hills, as it will surely be better protected against American weapons such as so-called "bunker buster" bombs and even nuclear weapons.

Another important upgrade at the new site will be modern digital and communication systems integrated into the facility from the beginning. This complex thus looks to be a kind of "doomsday bunker" for China. A lack of jointness has always been a major weakness of the PLA, but such a command center would oversee every aspect of the PLA's activities, especially control of combat forces in wartime.

In its expose of the new underground facility near Beijing, the Financial Times quoted Dennis Wilder, former head of China analysis for the CIA, as saying, "If confirmed, this new advanced underground command bunker for the military leadership, including President Xi as the Chairman of the CMC, signals Beijing's intent to build not only a world-class conventional force but also an advanced nuclear warfighting capability."

In fact, Xi is expanding the capability of the PLA Rocket Force (PLARF) at an unprecedented clip. China now has more than 600 operational nuclear warheads, but by 2030 the PLARF will have a predicted 1,000 nuclear warheads, and with even more to come after that. The PLA also has the world's leading arsenal of hypersonic missiles, and it possesses approximately 400 intercontinental ballistic missiles (ICBM) that can reach the US mainland.

The Pentagon's report, "Military and Security Developments Involving the People's Republic of China 2024", was published last December. It confirmed three new missile silo fields deep inside China that contain 320 silos for ICBMs, plus China is likely doubling DF-5 liquid-propellant ICBM numbers to 50 silos. The US expects the DF-41 ICBM to be deployed in silos and on railways, in addition to known road- mobile launchers.

Furthermore, China is nowadays keeping some nuclear forces on heightened alert for an early-warning counterstrike posture, what Washington calls "launch on warning". As part of China's bold and unexplained expansion of nuclear weapons, it appears the nation is also developing a large laser-ignited fusion research center in Mianyang, a town in Sichuan Province.

This elaborate research facility will assist design work on nuclear weapons, as well as exploration of clean power generation. Satellite images show the existence four newly built and outlying arms that house laser bays, as well as a central experimental bay likely containing a target chamber with hydrogen isotopes. With such a facility, high-powered lasers compress and heat fuel in order to achieve nuclear fusion, without resorting to actual nuclear detonations.

The facility is located at the coordinates 31°32'41.60"N 104°44'27.48"E. It resembles the USA's National Ignition Facility, but is approximately 50% bigger. Such laser- induced fusion and subcritical experiments are crucial to maintain safe and reliable nuclear arsenals.

Decker Eveleth, a researcher at the US-based research organization CNA Corp, commented, "A couple of thoughts: first, you could argue that this construction effort is good as it indicates that China is not planning on relying on future nuclear weapons tests. Such a facility strengthens the Comprehensive Nuclear Test Ban Treaty."

Nonetheless, Eveleth added, "On the other hand, such a facility will potentially allow China to develop and field new and more sophisticated nuclear weapon designs, including more miniaturized warheads. That has some implications for the future of China's posture, if they choose to go down that road."

Moving on to other military structures in China, the PLA has been busily constructing hardened shelters to protect aircraft and equipment across numerous air bases. Studying this issue, the Hudson Institute published a report entitled "Concrete Sky: Air Base Hardening in the Western Pacific" last month.

The authors, Thomas H. Shugart and Timothy A. Walton, noted that US "airfields face a threat of severe Chinese military attack. PLA strike forces of aircraft, ground-based missile launchers, surface and subsurface vessels, and special forces can attack US aircraft and their supporting systems at airfields globally, including in the continental United States.

"They posited that in the event of a conflict with China in the Indo-Pacific, "the overwhelming majority of US aircraft losses would likely occur on the ground at airfields (and that the losses could be ruinous)".

Furthermore, they lamented that "the US military has devoted relatively little attention, and few resources, to countering these threats compared to developing modern aircraft". Shugart and Walton continued, "The People's Republic of China (PRC) expects airfields to come under heavy attack in a potential conflict, and has made major investments to defend, expand and fortify them.In the past decade, China has pursued a nationwide and systematic effort to improve the resiliency of its air bases. The PLA has more than doubled its hardened aircraft shelters (HAS) and unhardened individual aircraft shelters (IAS) at military airfields, giving China more than 3,000 total aircraft shelters - not including civil or commercial airfields."

In around 2010, the PLA had approximately 370 HASs, but that number now exceeds 800. Non-hardened shelters have also more than doubled, from 1,100 to 2,300+.

Most of these improvements have been at bases near China's borders, particularly in the east, south and west. Such a proliferation of hardened shelters is enough to house and hide the vast majority of Chinese combat aircraft. Not only that, but, "China has also added 20 runways and more than 40 runway-length taxiways, and increased its ramp area nationwide by almost 75%." China now has 134 air bases within 1,000nm of the Taiwan Strait that contain more than 650 HASs and almost 2,000 non-hardened IASs.

By comparison, the USA has added just two HASs, 41 IASs, one runway, one taxiway and 17% more ramp area in an area within 1,000nm of Taiwan, excluding facilities in South Korea. At present, the American military has access to just a third of the level of China's military airfield capacity within a radius of 1,000nm of Taiwan.

The Hudson Institute report therefore concluded: "Overall, this creates an imbalance in which PLA forces would need to fire far fewer 'shots' to suppress or destroy US, allied and partner airfields than the converse. This imbalance ranges from approximately 25% if the US employed military airfields in Japan, the Philippines, South Korea and Taiwan, to as great as 88% if it employed only military airfields in Japan. Operationally, this could make air operations in a conflict significantly easier to sustain for the PRC than for the United States; strategically, this destabilizing asymmetry risks incentivizing the PRC to exercise a first-mover advantage. China could initiate a conflict if it sees an opportunity to nullify adversary airpower on the ramp."

The authors clearly warned of two things. "First, the PRC clearly expects its airfields to come under heavy attack in a potential conflict and has made major investments to defend, expand and fortify them. Second, the United States' investments have been much smaller in scale and scope and are misaligned with the severe threat environment facing US forces."

If Xi decides to attack Taiwan, he will require, and seek, air dominance by using a surprise attack to paralyze enemy air forces whilst they are still on the ground. The PLA has been developing the ability to do this, with major investment in long-range strike aircraft like the H-6K that can carry cruise missiles, as well as building up a vast stock of ballistic missiles able to target airfields in places like Japan and the Philippines. The PLARF possesses an estimated 1,300 medium-range ballistic missiles plus 500 intermediate-range ballistic missiles that could reach Guam.There is no doubt that China can hold the USA under serious threat of bombardment.

The Hudson Institute report stated, "These activities are consistent with PLA expectations that US or other forces will attack the PRC from multiple azimuths in a Taiwan-related conflict or other scenarios. Accordingly, more effective airfields near China's borders would help improve its ability to generate aircraft to guard its airspace, as well as to sustain offensive strike operations under attack. It has also hardened and expanded some airfields deep inside its borders, where the expectedenemy attack density will be lower and, in turn, where it can conduct heavier maintenance on aircraft more securely."

The PLA has also improved airfield reconstitution capabilities for repairing damage after an attack, including hiring private contractors.The signs are worrying. The PLA is burrowing underground, and hardening facilities above ground, in readiness for conflict with an adversary like the USA. It certainly does not look like China is "committed to the path of peaceful development."

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Iran displays Russian-made defence systems in military exercise

Source: The Economic Times, Dt. 05 Feb 2025,
URL: https://economictimes.indiatimes.com/news/defence/iran-displays-russian-made-defence-systems-in-military-exercise/articleshow/117950314.cms

Iran used Russian-made long-range air defence systems in a military exercise on Wednesday, following Israeli strikes last October which Israel said had seriously weakened Tehran's defensive capabilities.

The exercise took place one day after Israel's Prime Minister Benjamin Netanyahu met U.S. President Donald Trump to discuss regional topics including Iran's nuclear programme.Both leaders said Iran could not be allowed to develop nuclear weapons, with Trump announcing earlier the resumption of his "maximum pressure" campaign on Iran to drive its oil exports down to zero in order to stop it from obtaining a nuclear weapon.

On Oct. 26, Israeli war planes hit missile factories and other sites near Tehran and in western Iran, the Israeli military had said. This followed an Iranian attack on Israel on Oct. 1 involving about

200 ballistic missiles.Iranian state TV reported on Wednesday that in a simultaneous operation, Iran's long-range air defence system Bavar-373 and Russian-made S-300 shot down a hypothetical hostile target by firing missiles.

"Some enemy officials and media outlets, after the malicious attack in October, had claimed that they had rendered Iran's long-range air defence systems non-operational," it said.Israel's then defence minister Yoav Gallant said in October that the Israeli strikes had weakened Iran's attack and defensive capabilities, leaving it at a huge disadvantage in the event of future action.

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Science & Technology News

Story of NavIC: crucial indigenous SatNav system, a few hurdles in development path

Source: The Indian Express, Dt. 05 Feb 2025,
URL: https://indianexpress.com/article/explained/explained-sci-tech/navic-indigenous-satnav-story-9818700/

India’s space agency on Sunday (February 2) reported the partial failure of its NVS-02 navigation satellite due to the non-firing of its engines in space. This was the latest in a series of setbacks suffered by the Indian Regional Navigation Satellite System (IRNSS), operationally referred to as the Navigation with India Constellation (NavIC) system.

The IRNSS was conceived in 1999 following the war in Kargil, during which India’s military could not use the American Global Positioning System (GPS) in the conflict zone. (India and the US now cooperate in many fields, and Washington has approved the system.)

An indigenous seven-satellite constellation serving both defence and civilian needs was proposed to be put in place by 2016, and the first satellite, IRNSS 1A, was launched on July 1, 2013.

Eleven years later, however, only five of the 11 satellites launched in the Rs 2,250 crore NavIC program – including replacements for failed satellites – are fully operational, the Indian Space Research Organisation (ISRO) has said.

After IRNSS-1A in 2013, the IRNSS-1B, 1C, 1D, 1E, 1F, 1G, 1H, 1I, 1J, and 1K were launched between April 4, 2014 and January 29, 2025. Following the launch of IRNSS-1G, the seventh in the series on April 28, 2016, ISRO had said that “the successful launch… [of the satellite] signifies the completion of the IRNSS constellation”.

What went wrong with the satellites?

Mid-2016 onward, there were reports of failures of the rubidium atomic clocks used in several navigation satellites, including ISRO’s IRNSS and the European Space Agency’s (ESA’s) Galileo

Global Navigation Satellite System (GNSS). There are three atomic clocks on each IRNSS satellite.

Then ISRO chairman A S Kiran Kumar announced in July 2016 that all the atomic clocks on IRNSS 1A had “stopped working”, even though the “overall performance of our navigation system” had not been affected, and the “rest of the satellite components [were] functioning perfectly”. A replacement satellite, IRNSS 1H, with modified clocks, would be launched in 2017, the space agency said.

An ISRO satellite navigation program official had said at the time that “six of the seven IRNSS satellites that were launched [until April 2016] are still working”, but there were “inherent hardware related problems on the rubidium atomic clocks in some of these satellites”. The clocks used in the Galileo system had developed similar problems, the official had said.

The atomic clocks on four other IRNSS satellites – 1C, 1D, 1E, and 1G – also developed problems subsequently. The engine failure on the IRNSS-1K (or NVS-02) launched last month, which has left it in a sub-optimal orbit around Earth, means that six of the 11 IRNSS satellites launched so far have been partial failures.

Also, the IRNSS-1H, launched on August 31, 2017 to replace the IRNSS-1A, did not reach the desired orbit after a heat shield protecting the satellite on board the PSLV-C39 rocket did not detach during the launch.

So how many satellites in the NavIC system are operational currently?

It is estimated that only four IRNSS satellites are fully operational currently – 1B, 1F, 1I (the replacement for 1A after the launch of 1H, the original replacement, failed), and 1J (the replacement for the partially failed 1G).

ISRO’s 2023-24 annual report says that following the launch of NVS-01 on May 28, 2023, five NavIC satellites are operational – IRNSS-1B, 1C, 1F, and 1I, and NVS-01 (IRNSS-1J). However, according to some estimates, 1C is only partially operational due to the presence of the old series of atomic clocks that were reported to be malfunctioning.

First-generation IRNSS satellites launched after July 2016 – that is, 1H and 1I – carried modified versions of the original clocks provided by a European supplier under a Euro 4 million deal for an estimated 45 clocks.

1J, which is operational, and 1K, which reported an engine failure last month, belong to the next generation of IRNSS satellites, and are, on that account, called NVS-01 and NVS-02 respectively. These satellites are equipped with a mix of indigenous and foreign clocks instead of the defective clocks used in the first generation satellites.

Why is the IRNSS/ NavIC system important for India?

The NavIC satellites provide two types of services – Standard Positioning Service which is for general and commercial use, and Restricted Service which is meant for the defence forces – over the Indian landmass and neighbouring regions.

According to A S Ganeshan, a former director of ISRO's Satellite Navigation Program, the indigenous system provides positioning data "at all times with position accuracy better than 20 metres during all weather conditions, anywhere within India and a region extending about 1,500 km around India on dual frequencies in L5 and S band". ('Benefits of an Indian Navigation System', Science and Culture, 2017)

A primary reason to develop an indigenous satellite navigation system like the IRNSS despite the existence of global systems such as the GPS (US), GLONASS (Russia), Galileo (Europe), Beidou (China), and QZSS (Japan), is the reliability that it offers in defence use.

"Since the first Global NSS systems (GPS and GLONASS) were primarily developed for military purposes, the military applications are one of the drivers for these systems. …GPS offers encrypted Precise Positioning Service which is available only to the US military and its allies. GNSS is used for different types of military applications such as military navigation and target acquisition," Ganeshan wrote.

For NavIC to become ubiquitous in the Indian subcontinent, ISRO will have to sell its capabilities to general positioning service providers such as mobile phone and vehicle manufacturers, etc.

In December 2023, a few months after the successful launch and deployment of the NVS-01 (IRNSS-1J) satellite on May 29, 2023, the American mobile communications chipmaker Qualcomm reported an agreement to incorporate NavIC support in some of its chipsets.

The partial failure of NVS-02 (1K) notwithstanding, ISRO plans to launch three more second-generation NavIC satellites – NVS-03, 04, and 05 – "to augment NavIC base layer constellation with enhanced features for ensuring continuity of services".

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China's Chang'e-7 mission sends flying robot to moon's south pole in groundbreaking search for water

Source: The Times of India, Dt. 04 Feb 2025,
URL: https://timesofindia.indiatimes.com/science/chinas-change-7-mission-sends-flying-robot-to-moons-south-pole-in-groundbreaking-search-for-water/articleshow/117910459.cms

China is taking lunar exploration to the next level with its ambitious Chang'e-7 mission, sending a flying robot to the moon's south pole in a groundbreaking search for water as per reports by South China Morning Post.

This daring mission marks a huge leap in space exploration, as scientists aim to uncover the moon's hidden resources, potentially unlocking the secrets of the lunar surface. It's not just any robot, though; this flying marvel is designed to navigate the harsh terrain of the south pole, where water ice may lie buried for billions of years. With this innovative technology, China is setting its sights on a new frontier in space exploration, and the world can't wait to see what's next.

China’s Chang’e-7 introduces flying detector to explore moon’s south pole and uncover water secretsThe Chinese Chang'e-7 mission promises to change lunar exploration forever. It is the first smart flying robot sent by China to look for water in the south pole of the moon. The smart flying detector, which crawls, jumps, and flies by rocket propulsion, will explore regions that no rovers can. Unlike the conventional rovers, which can only travel a few kilometers from their landing site, the flying detector can leap dozens of kilometers in one go, which will allow it to explore further.

With its six-legged design and advanced navigation capabilities, the robot can traverse the moon's rugged, uneven terrain, including dark craters where water ice might be found. The robot will be powered by a combination of fuel and solar energy, equipped with cameras and scientific tools to analyze the lunar environment. This mission marks a significant step towards China’s goal of building a permanent research station on the moon and opening new possibilities in space exploration.

Is there water on the moon?

China’s Chang’e-7 mission aims to find outChina's Chang'e-7 mission is ready to revolutionize space exploration as it plans to send a flying robot to the south pole of the moon, which will be looking for frozen water. For years, scientists have considered the south pole of the moon a potential location where ice deposits exist in permanently shadowed craters that have never been exposed to sunlight for billions of years.

This resource may be one of the necessities for long-lasting human habitation on the Moon: drinking water, oxygen, and even rocket fuel, therefore eliminating the use of expensive fuel brought from Earth.

The new flying robot equipped with advanced technologies will be used to traverse over the rugged moon surface, as it will literally take leaps and bounds across that lunar surface area. This mission is a significant step towards China's vision of building a permanent lunar research station and sending crewed lunar missions by 2030. The Chang'e-7 mission will open a new chapter in humanity's exploration of the moon.

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A question for the AI age: do machines and humans learn the same way?

Source: The Hindu, Dt. 06 Feb 2025,
URL: https://www.thehindu.com/sci-tech/science/human-learning-machine-learning-cognitive-neuroscience-animal-brains/article69183502.ece

The dramatic surge of artificial intelligence (AI) has also made visible the machines humming underneath to make its applications possible.From their origins in being able to separate data into different groups, AI today excels at too many tasks to count. Just in 2024, smartphones have started to be sold with AI models built into them while five of the seven men who won the 2024 science Nobel Prizes did so for work in AI.

As it happens, the age of AI also promises to be a time in which scientists will learn a lot about the human brain as well. Existing AI models are inspired mostly by the brains of animals. Since these brains haven't been easy to study, scientists have been looking to AI models as a proxy.

How do humans learn?

Machines excel at things that are nearly impossible for most humans, including rapidly analysing large datasets, predicting complex patterns, and learning to play chess like a grandmaster within a day. Yet neuroscientists say they also struggle with tasks that human children find easy, like understanding motives.

"The paradox of today's AI stems from the fact that the human brain has an evolutionary, biological origin and AI does not," Celeste Kidd, associate professor of psychology at the University of California, Berkeley, said. "It is likely that [for] the type of intelligence that we have evolved for taking care of helpless offspring, we need to be able to read the intentions of a child that is running towards a cliff [or one] that's not yet able to feed themselves and say that they are hungry."

According to Arjun Ramakrishnan, assistant professor in the department of biological sciences and bioengineering at IIT-Kanpur, "at the heart of what drives learning in humans and animals" is a "dual focus on both meeting immediate biological needs and adapting to a constantly shifting environment."

"The need to secure resources and maintain balance in the face of an ever-changing environment," he added, "likely spurred the evolution of sophisticated neural mechanisms, driving not just simple responses to immediate needs but also complex learning and strategic decision-making abilities."

Learning is thus not just a process of acquiring static information but an ongoing, dynamic interaction between an organism and its environment.

"The brain, shaped by evolutionary pressures, must adapt not only to predictable stimuli but also to the unpredictability of environmental fluctuations," he added. "This complexity is reflected in the ability of humans and animals to sense and respond to rapid changes in the environment and social interactions, a key advantage for survival."

Learning is thus long-duration, interactive, and includes feedback loops between the organism's internal state and external challenges.

Humans' upper hand

According to biologists at the Heidelberg Laureate Forum, a meeting held in September 2024 in Germany, machines are not curious. "Unlike AI systems, children are naturally curious, exploring the world on their own while simultaneously learning within a social and cultural context," Kidd said at the forum. "Our curiosity is driven by knowing what we don't know."

According to Kidd, the information children discover when they seek it is of a different type than the data fed into AI systems.

"The single experience of a child with an apple is very different from Google Photos labeling an apple in an image. A child's experience with an apple is sensory. They're feeling the apple, they're

seeing the apple, it's multi-dimensional. The data people are getting is much, much richer. And there are tons of correlations you can pick up on in order to leverage things like learning and generalisation."

The human brain and the body have been 'trained' on such data over millennia.Thus, human learning requires much less data to solve a problem with the same level of proficiency, according to Ashesh Dhawale, the DBT Wellcome Trust India Alliance Intermediate Fellow at the Centre for Neuroscience, Indian Institute of Science, Bengaluru, said.

For example, although the AlphaZero model developed by Google subsidiary DeepMind is better at chess than any human player, it reached this level of proficiency only after playing around 40 million games during its training, Dhawale said. "In contrast, it is estimated that humans need some tens of thousands of training games to reach grandmaster proficiency."

"One of the key advantages humans have over machines lies in the speed and efficiency of learning," Ramakrishnan said. "We can absorb new information rapidly, building on past experiences and knowledge in a flexible, adaptive way."

This ability to continuously improve on prior lessons without extensive reprogramming gives humans a significant edge in dynamic environments where new information and challenges emerge constantly.

Humans are also remarkably good at "transfer learning". "We can apply knowledge and skills from one context to entirely different, unfamiliar scenarios with relative ease," Ramakrishnan said. This ability to generalise is still a significant challenge for machines and artificial networks, which are typically confined to narrow domains and struggle to adapt to new or unforeseen contexts without retraining.

The communication between neurons in the human brain takes the form of biochemical processes that operate more slowly than the channels between neurons in artificial neural networks, according to Brigitte Röder, professor of biological psychology and neuropsychology at the University of Hamburg. Yet the human brain makes decisions stunningly fast using abstractions and generalisation whereas machines still struggle to do this.

Dhawale used the example of chess. "If you are proficient at chess, this ability will likely extend to other board games like checkers. This means humans can learn the structure underlying a task and generalise it to quickly solve new tasks — that is, they can learn to learn," he said.

Researchers are now attempting to bring this paradigm to machine learning, an approach called meta learning. It's not unlikely that machines will catch up here as well.

Humans also excel at motor-skill learning. "Somehow humans and animals are very efficient at learning how to move," according to Dhawale, "but we don't know exactly why this is the case."

Neural networks are great at navigating tasks involving discrete choices but they stumble with movement. One reason is because being able to make a simple motion, such as reaching for a fruit on a table, requires a learning agent to optimise for many independent parameters varying continuously across many degrees of freedom.

Then there's energy efficiency. According to Ramakrishnan, the human brain's low power consumption becomes readily apparent when recognising patterns, making decisions, and conducting social interactions. Machines can operate very fast but their energy consumption is also much higher, especially when they process large datasets.

Where machines excel

However, machines are more reliable.

Unlike machines, which are built for repeatability and can perform the same task again with consistent precision, humans contend with fatigue, emotional decision-making, and distractions.

"While we are designed to operate in volatile, ever-changing environments and our ability to explore and adapt is one of our greatest strengths, this flexibility often comes at the cost of consistency," Ramakrishnan said.

In contrast to the brain, neural network models are often trained to search exhaustively for solutions to complex tasks, Dhawale explained. This means they are more likely to discover new, better solutions to problems than humans can. At games like chess and go, AI models have been known to develop moves that surprise even expert players.

"One could argue that the strategies used by humans to learn may be more efficient but can't discover the most optimal solutions because they are not designed to search exhaustively."

From artificial to human

The differences between human and machine learning could elucidate where the neural network of each brain — artificial or biological — falls short.

"Neurons are often treated simplistically as point processes that communicate via electrical impulses, essentially operating in an on/off mode," Ramakrishnan said. "This reductionist approach has nonetheless allowed us to uncover fundamental principles that underlie complex cognitive behaviours."

At its core is the idea that feedback loops drive learning. Researchers used it to develop reinforcement learning, a training algorithm that has also been remarkably successful at explaining how organisms update their knowledge and adapt based on their experiences, according to Ramakrishnan.

The development of artificial neural networks has also expanded our understanding of how memories could be stored and accessed in the brain: as dynamic processes that can be activated and adjusted over time rather than remain preserved in particular areas.Artificial neural networks with this ability can perform better. "The development of algorithms that handle short-term and long-term memory processes in artificial networks has provided us with a deeper understanding of how the brain may operate in these domains," Ramakrishnan said.

More broadly, AI models' successes in the real world have prompted neuroscientists and cognitive scientists to revisit ideas of how the human brain learns.

For some time since the mid-20th century, scientists assumed the brain represented information about the world in a symbolic manner and that its many abilities — perception, planning,

reasoning, etc. — were achieved through symbolic operations. Many early attempts at building AI models thus used approaches. One well-known application was expert systems, models capable of complex reasoning as a series of if-then problems.

On the other hand, contemporary neural networks operate connectionist models, named for the weighted connections between the nodes in a network. These models begin with a blank slate and use pattern recognition techniques to achieve their primary goals: say, to accurately predict the next word in an unfinished sentence.

“The question, therefore, is what type of AI — symbolic or connectionist — is the better model for human learning,” Dhawale said. “Despite the success of neural network AI models, I still think they learn in a very different way from how humans learn.”

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Bogus scientific papers slowing lifesaving medical research

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URL: https://www.thehindu.com/sci-tech/science/bogus-scientific-papers-slowing-lifesaving-medical-research/article69179476.ece

Over the past decade, furtive commercial entities around the world have industrialised the production, sale and dissemination of bogus scholarly research. These paper mills are profiting by undermining the literature that everyone from doctors to engineers rely on to make decisions about human lives.

It is exceedingly difficult to get a handle on exactly how big the problem is. About 55,000 scholarly papers have been retracted to date, for a variety of reasons, but scientists and companies who screen the scientific literature for tell-tale signs of fraud estimate that there are many more fake papers circulating – possibly as many as several hundred thousand. This fake research can confound legitimate researchers who must wade through dense equations, evidence, images and methodologies, only to find that they were made up.

Even when bogus papers are spotted – usually by amateur sleuths on their own time – academic journals are often slow to retract the papers, allowing the articles to taint what many consider sacrosanct: the vast global library of scholarly work that introduces new ideas, reviews and other research and discusses findings.

Scientific fraud is rising, and automated systems won’t stop it.

We need research detectives

These fake papers are slowing research that has helped millions of people with lifesaving medicine and therapies, from cancer to COVID-19. Analysts’ data shows that fields related to cancer and medicine are particularly hard-hit, while areas such as philosophy and art are less affected.

To better understand the scope, ramifications and potential solutions of this metastasising assault on science, we – a contributing editor at Retraction Watch, a website that reports on retractions of scientific papers and related topics, and two computer scientists at France’s Université Toulouse

III–Paul Sabatier and Université Grenoble Alpes who specialise in detecting bogus publications – spent six months investigating paper mills.

Co-author Guillaume Cabanac also developed the Problematic Paper Screener, which filters 130 million new and old scholarly papers every week looking for nine types of clues that a paper might be fake or contain errors.An obscure moleculeFrank Cackowski at Detroit's Wayne State University was confused.

The oncologist was studying a sequence of chemical reactions in cells to see whether they could be a target for drugs against prostate cancer. A paper from 2018 in the American Journal of Cancer Research piqued his interest when he read that a little-known molecule called SNHG1 might interact with the chemical reactions he was exploring. He and fellow Wayne State researcher Steven Zielske began experiments but found no link.

Meanwhile, Zielske had grown suspicious of the paper. Two graphs showing results for different cell lines were identical, he noticed, which "would be like pouring water into two glasses with your eyes closed and the levels coming out exactly the same." Another graph and a table in the article also inexplicably contained identical data.

Zielske described his misgivings in an anonymous post in 2020 at PubPeer, an online forum where many scientists report potential research misconduct, and also contacted the journal's editor. The journal pulled the paper, citing "falsified materials and/or data."

"Science is hard enough as it is if people are actually being genuine and trying to do real work," said Cackowski, who also works at the Karmanos Cancer Institute in Michigan.

Legitimate academic journals evaluate papers before publication by having other researchers in the field carefully read them over. But this peer review process is far from perfect. Reviewers volunteer their time, typically assume research is real and so don't look for fraud.

Some publishers may try to pick reviewers they deem more likely to accept papers, because rejecting a manuscript can mean losing out on thousands of dollars in publication fees.

Worse, some corrupt scientists form peer review rings. Paper mills may create fake peer reviewers. Others may bribe editors or plant agents on journal editorial boards.

An 'absolutely huge' problem

It's unclear when paper mills began to operate at scale. The earliest suspected paper mill article retracted was published in 2004, according to the Retraction Watch database, which details retractions and is operated by The Center for Scientific Integrity, the parent nonprofit of Retraction Watch.

An analysis of 53,000 papers submitted to six publishers – but not necessarily published – found 2% to 46% suspect submissions across journals. The American publisher Wiley, which has retracted more than 11,300 articles and closed 19 heavily affected journals in its erstwhile Hindawi division, said its new paper mill detection tool flags up to 1 in 7 submissions.

As many as 2% of the several million scientific works published in 2022 were milled, according to Adam Day, who directs Clear Skies, a company in London that develops tools to spot fake papers.

Some fields are worse than others: biology and medicine are closer to 3%, and some subfields, such as cancer, may be much larger, Day said.

The paper mill problem is “absolutely huge,” said Sabina Alam, director of Publishing Ethics and Integrity at Taylor & Francis, a major academic publisher. In 2019, none of the 175 ethics cases escalated to her team was about paper mills, Alam said. Ethics cases include submissions and already published papers. “We had almost 4,000 cases” in 2023, she said. “And half of those were paper mills.”

Jennifer Byrne, an Australian scientist who now heads up a research group to improve the reliability of medical research, testified at a July 2022 U.S. House of Representatives hearing that nearly 6% of 12,000 cancer research papers screened had errors that could signal paper mill involvement. Byrne shuttered her cancer research lab in 2017 because genes she had spent two decades researching and writing about became the target of fake papers.

In 2022, Byrne and colleagues, including two of us, found that suspect genetics research, despite not immediately affecting patient care, informs scientists’ work, including clinical trials. But publishers are often slow to retract tainted papers, even when alerted to obvious fraud. We found that 97% of the 712 problematic genetics research articles we identified remained uncorrected.

Potential solutions

The Cochrane Collaboration has a policy excluding suspect studies from its analyses of medical evidence and is developing a tool to spot problematic medical trials. And publishers have begun to share data and technologies among themselves to combat fraud, including image fraud.

Technology startups are also offering help. The website Argos, launched in September 2024 by Scitility, an alert service based in Sparks, Nevada, allows authors to check collaborators for retractions or misconduct. Morressier, a scientific conference and communications company in Berlin, offers research integrity tools. Paper-checking tools include Signals, by London-based Research Signals, and Clear Skies’ Papermill Alarm.

But Alam acknowledges that the fight against paper mills won’t be won as long as the booming demand for papers remains. Today’s commercial publishing is part of the problem, Byrne said. Cleaning up the literature is a vast and expensive undertaking. “Either we have to monetise corrections such that publishers are paid for their work, or forget the publishers and do it ourselves,” she said.

Do we need a radical alternative to scientific publishing?

There’s a fundamental bias in for-profit publishing: “We pay them for accepting papers,” said Bodo Stern, a former editor of the journal Cell and chief of Strategic Initiatives at Howard Hughes Medical Institute, a nonprofit research organisation and funder in Chevy Chase, Maryland. With more than 50,000 journals on the market, bad papers shopped around long enough eventually find a home, Stern said.

To prevent this, we could stop paying journals for accepting papers and look at them as public utilities that serve a greater good. “We should pay for transparent and rigorous quality-control mechanisms,” he said.

Peer review, meanwhile, “should be recognised as a true scholarly product, just like the original article,” Stern said. And journals should make all peer-review reports publicly available, even for manuscripts they turn down.

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India's climb to top: Paving the way for space industrialisation

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While India has achieved many successes in the past in its various space missions, the recent launch of Chandrayaan-3 has skyrocketed India’s scientific capabilities in the space sector on a global platform. The praise for this mission was primarily driven by the fact that India is the fourth country to achieve a soft landing on the moon through a very cost-effective mission. That said, this technological progress is yet to be leveraged with increased investments in this sector - a factor that is indispensable for achieving growth.

The current reality is that the space industry is still in a relatively early stage in terms of investment from non-government entities, unlike in other developed countries like the United States which have witnessed major private sector investments.

As per India’s Space Vision 2047, amongst other landmark projects, the Government of India targets establishing Bharatiya Antariksh Station (BAS) by 2035 and landing of an Indian on Moon by 2040. These ambitious targets are expected to be achieved through technological advancements, international partnerships, and increased participation of private players.

Currently, the estimated size of the Indian space economy is around US$ 8.4 billion (approx. Rs 726 million) which aggregates to 2% of the global space economy and is expected to grow to US$ 44 billion (approx. Rs 3 trillion) by the year 2033. As per reports, the number of start-ups in the space sector in India has gone up manifold from 1 in 2014 to over 200 in 2024 with an investment size of Rs 1000 crore (approx. US$ 115 million) in 2023. Therefore, the funding opportunities are aplenty for investors looking to diversify their portfolios.

To aid this growth, the government has recently liberalised foreign investment caps for this sector and FDI up to 100% is now permitted under the automatic route for manufacturing of components and systems/ sub-systems for satellites, ground segment and user segment. FDI is permitted under the automatic route for up to 74% for satellite manufacturing and operation, satellite data products and ground segment and user segment, and up to 49% for launch vehicles and associated systems or subsystems, creation of spaceports for launching and receiving spacecraft.

Additionally, there are opportunities for collaboration with ISRO and other space-related entities which has the potential to open doors for strategic partnerships, both within India and internationally through collaborative joint ventures, research opportunities, and access to global markets. This growth creates many opportunities for private companies to provide innovative solutions and services, from satellite manufacturing to ground equipment and data analytics.

Therefore, being an early investor in a successful space startup could lead to substantial returns as the market matures. To augment such growth, there has been a slew of reforms at the policy level to enable enhanced participation of private players in the space sector.

Policy Level Changes

The paradigm shift has been primarily brought about by the introduction of the Indian Space Policy 2023 (ISP 2023) and the establishment of the Indian National Space Promotion and Authorization Center (IN-SPACe) to act as a single window for space launches, infrastructural support for launch pad establishment, satellite purchases and sales, and data dissemination.

ISP 2023 has laid down four implementation agencies (ISRO, IN-SPACe, New Space India Limited and Department of Space), each having a clear set of demarcated roles and responsibilities. These policy-level changes are expected to act as a positive catalyst and increase investor confidence as is evident from the Economic Survey Report of 2023-24, which states that 440 applications have been received from 300 Indian entities with respect to authorization, technology transfer, etc.

Agnikul Cosmos Private Limited established the first private launchpad and mission control centre whereas several private sector entities such as PixxelSpace, Digantara, Dhruva Space, Azista BST Aerospace, and Tata Advanced Systems Limited, have developed satellites and functional payloads for operations in outer space. Among foreign players, Alphabet Inc's Google became one of the first major investors in the Indian space economy when it took part in the funding round of Pixxel, a satellite-image startup. Hence, with increasing commercial activity, government backing, and global demand for space services, private investors investing in companies that are innovating in this space in India will allow investors to capitalize on first-mover advantages.

In May 2024, IN-SPACe brought out the ‘Norms, Guidelines and Procedures for implementation of the Indian Space Policy 2023 in respect of Authorization of Space Activities’ (NGP) to implement portions of the ISP 2023. The NGP inter alia listed out space activities that need authorization from IN-SPACe, criteria for granting such authorization, form for seeking authorization and necessary conditions/ guidelines to be adhered to by an applicant. For example, the establishment and/ or operation of space objects, operations of space transportation system, establishment and/ or operation of ground systems, and dissemination of space-based earth observation are a few of the activities which would need authorisation from IN-SPACe.

Further, it details an online mechanism for filing of these applications and provides a timeline of 75-120 days for processing of such applications. Currently, only Indian entities are allowed to make applications for authorisation to IN-SPACe, however, foreign entities can apply to IN-SPACe through an Indian entity which can be its subsidiary, joint venture or any arrangement recognised by the Government of India. Investors looking to invest in entities which have already obtained

authorisation from IN-SPACe should make adequate provision in their transaction documentation in terms of conditions precedent for the company having to obtain fresh authorisation/ intimation, as the case may be, from IN-SPACe if there is any change in management/ control/ shareholding pattern of the authorization holder pursuant to the funding round.

These clear and standardized rules will assist investors in planning long-term strategies with the assurance that their legal rights, including property rights, will be respected. For cross-border investments, a single, consolidated legal framework with simplified compliances instead of navigating through multiple, conflicting laws or regulations is generally a crucial determining factor for foreign investors for investment in any country. Hence, the ISP 2023 and NGP are a welcome step in the right direction for improving the ease of doing business and paving the way for increased investment in this sector by non-government entities.

From a tax perspective, the government has granted GST exemption on satellite launch services as well as on the transfer of communication assets which is a great impetus for businesses to participate in this sector. Apart from these, there are multiple other initiatives and policies aimed to assist and increase participation of the private actors in this sector such as the Seed Fund Scheme, a Government of India initiative, to encourage start-ups in the areas of urban development/ disaster management to use space technology to transform a concept into a prototype, skill development programs to equip individuals to significantly contribute to the development of skill technology, the establishment of a state-of-the-art Space Systems Design Lab in Ahmedabad with high-end facilities to enable entities to effectively participate and contribute in research and development in this sector, etc.

The ball does not stop at bringing in regulatory reforms only. From a financial angle, as of October 2024, the Union Cabinet approved the establishment of an Rs 1,000 crore Venture Capital Fund which will be deployed over the next 5 years to aid India’s space sector. This strategic initiative is not only aimed at boosting innovation but is also aimed to position India as a global leader in the space sector.

Suggested Way Forward

In light of the above discussion, while it is commendable that NGP addresses procedural aspects of operating businesses relating to space activities, a national law governing various substantive matters such as data ownership, intellectual property rights ownership for inventions made in space, environmental safety, detailed space liability insurance provisions, etc in line with the established legal framework of various countries like USA and France is the need of the hour.

For example, while NGP mandates companies to obtain third-party insurance with prescribed conditions to address inter alia the State’s liability under the Convention on International Liability for Damage Caused by Space Objects which makes the launching state absolutely liable for damages occurring on earth or in air, other states have more detailed ways of covering liability related aspects.

From an international perspective, under French laws, a liability ceiling is provided for space operators beyond which the State takes over the liability under prescribed conditions. Protections like this ensure businesses thrive.

As per recent reports, the government is also working towards introducing consolidated legislation to regulate the commercialisation of space activities. Hence, the time is ripe for foreign investors to shift their focus towards this upcoming untapped sector before it gets saturated.

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