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समाचार पत्रों से चयनित अंश
Newspapers Clippings

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

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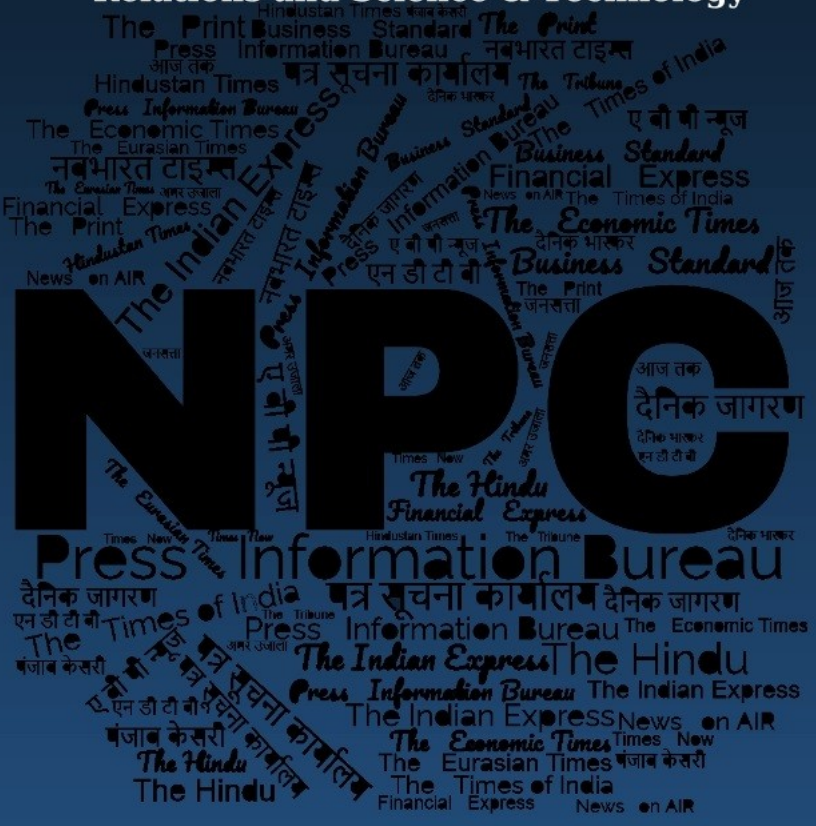

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IOS SAGAR Concludes Port Call At Port Louis, Mauritius

Source: Press Information Bureau, Dt. 29 April 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2125196

Reinforcing the enduring bond between India and Mauritius, IOS SAGAR made a significant and engaging port call at Port Louis, Mauritius, from 26 to 28 Apr 25, as part of its operational deployment in the Indian Ocean.

During her harbour visit, the ship's Commanding Officer called on the Commandant of the Mauritius Coast Guard, reaffirming the commitment to strengthen cooperation between the two maritime forces.

Select personnel of the multinational crew visited several key training facilities of the Mauritius Police Force (MPF), namely the Special Mobile Force Squadron, Maritime Air Squadron, Coast Guard Training School and the Police Helicopter Squadron and interacted with their counterparts. The visit provided a unique opportunity to exchange knowledge and experience and discuss areas of mutual interest in maritime security.

As part of social activities, an invigorating joint yoga session was organised onboard IOS SAGAR, with participation from the multinational crew and MPF personnel. The Commandant of the National Coast Guard also attended the event.

The crew of IOS SAGAR and the MPF also played a friendly volleyball match. IOS SAGAR opened its decks to visitors, welcoming members of the MPF, the Indian diaspora, and other enthusiastic groups.

Visitors were given a tour of the ship and briefed on her operational capabilities, navigation systems, and life onboard. In addition, a trek to the iconic Signal Mountain was conducted for the ship's crew, including the multinational crew.

On departure from Port Louis, IOS SAGAR is scheduled to undertake a joint Exclusive Economic Zone (EEZ) surveillance with the Mauritius Coast Guard. Upon completion, the ship will proceed towards its next port of call, Port Victoria, Seychelles, continuing its mission of enhancing maritime security, regional cooperation , and goodwill in the Indian Ocean Region (IOR).

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Army to use drone tech for border surveillance: Lt Gen A Sengupta

Source: The Times of India, Dt. 29 April 2025,
URL: https://timesofindia.indiatimes.com/city/dehradun/army-to-use-drone-tech-for-border-surveillance-lt-gen-a-sengupta/articleshow/120738645.cms

The Indian Army plans to conduct border surveillance along the Line of Actual Control (LAC) using modern technology such as unmanned aerial vehicles (UAVs) and high-tech cameras while reserving troops primarily for ground operations in the near future.

The announcement was made by Lt Gen Anindya Sengupta, General Officer Commanding-in-Chief (GoC-in-C), Central Command, on Tuesday during the inauguration of Surya Drona Tech 2025, a two-day defence technology event in Dehradun, jointly organised by the Army and the Society of Indian Defence Manufacturers (SIDM). The event concludes on Wednesday.

"The use of drones in warfare is increasing, as is being witnessed in the Ukraine-Russia war," said Lt Gen Sengupta, adding, "The rise of this technology is unconventional but highly disruptive and effective for the defence forces. We, in the Army, are looking for high-altitude and rugged UAVs to protect our soldiers while proving their utility."

"All 26 passes along the LAC are currently under round-the-clock surveillance using modern technology. Efforts are on to ensure that in future, the boots on the ground would be utilised for operation while border surveillance is done only through technology," he added.

Calling the event an important milestone, Lt Gen Sengupta said, "We look forward to Uttarakhand becoming a hub for drone manufacturing in the country, and meet the requirements of the armed forces."

The event features 42 stalls by drone and defence tech manufacturers showcasing a wide array of products ranging from technology to secure meeting rooms that can detect and disable mobile phones without alerting users, systems capable of tracking foreign mobile activity in border areas to exoskeleton suits to assist troops in climbing hilly terrain.

Key highlights from the first day included live demonstrations of newly inducted robotic dogs referred to as multi-utility legged equipment (MULE) and UAVs designed for airlifting injured personnel during military operations.

Among those who attended the inaugural event were Uttarakhand governor Lt Gen Gurmit Singh (Retd), SIDM president Rajinder Singh Bhatia, Lt Gen Sandeep Jain, Commandant of Indian Military Academy (IMA), General Officer Commanding (GOC) of Uttar Bharat Area Lt Gen D G Misra, GOC Uttarakhand sub-area Maj Gen R Prem Raj, and other senior defence officers.

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Expert Explains: Why induction of 26 new Rafale M aircraft matters for the Indian Navy

Source: The Indian Express, Dt. 29 April 2025,
URL: https://indianexpress.com/article/explained/expert-explains-why-induction-of-26-new-rafale-m-aircraft-matters-for-the-indian-navy-9973586/

India and France on Monday signed a $7.4 billion (approximately Rs 63,000 crore) government-to-government contract for 26 Rafale Marine (Rafale M) fighter aircraft for the Indian Navy. Thirty-six Rafale aircraft were earlier inducted into the Indian Air Force from 2021 onward.

Why is the induction of the Rafale M important in the context of the Indian Navy?

First, what is meant by naval aviation?

Naval aviation is the use of military air power by navies, involving aircraft that operate from warships — such as aircraft carriers and other aircraft — or helicopter-carrying surface combatants, or land bases to support naval operations.

It includes specialised naval aircraft designed to meet the unique demands of carrier operations and small decks, such as short takeoffs and arrested landings, and roles such as air-to-air combat, surface and submarine attack, maritime reconnaissance, search and rescue, and logistical support.

The key roles of naval aviation include:

- FLEET AIR DEFENCE: providing air cover for naval forces beyond the reach of land-based aircraft;
- STRATEGIC POWER PROJECTION: allowing deployment of air power without needing land bases;
- ANTI-SURFACE WARFARE: attacking enemy ships with air-launched missiles;
- SUPPORTING AMPHIBIOUS WARFARE: aiding marine landings and operations inland; and
- MINE COUNTERMEASURES: using aircraft to detect and clear enemy mines.

Naval aviation is crucial for maintaining control of the seas, supporting naval and ground forces, and projecting military power along distant shores. It includes fixed-wing carrier borne squadrons, land-based Maritime Patrol Aircraft, Helicopters and Remotely Piloted Aircraft operated from warships and ashore.

And what exactly is an aircraft carrier?

An aircraft carrier is a warship that serves as a seagoing airbase, equipped with a full-length flight deck and hangar facilities for supporting, arming, deploying, and recovering shipborne aircraft.

It allows a naval force to project seaborne air power far from its homeland without having to rely on airfields ashore. Aircraft carriers as part of the Carrier Battle Groups are often the centerpiece of

modern naval warfare, with significant strategic and diplomatic influence in deterrence, command of the sea, and air supremacy.

Aircraft carriers are also adaptable and survivable airfields that are ready to control the seas, conduct strikes, and manoeuvre across the electromagnetic spectrum and cyberspace.

About 50 carriers, operated by the navies of several countries, are currently active around the world. The United States Navy leads with 11 large nuclear powered carriers followed by Brazil, China, France, India, Italy, Russia, Spain, Thailand and the United Kingdom.

What is the history of carrier aviation in India?

While Indian naval aviation will celebrate its 72nd anniversary on May 11, 2025, India's carrier aviation began with the commissioning of the INS Vikrant in 1961.

Since the 1960s, India has operated four carriers — the INS Vikrant (1961-1997), INS Viraat (1987-2017), INS Vikramaditya (since 2013), and the indigenously built INS Vikrant, which was commissioned in 2022.

Through this unbroken period of 64 years, India has operated all major types of aircraft launch and recovery systems and continues to expand its carrier fleet, with future plans for additional indigenous construction.

But why does India need aircraft carriers?

India requires aircraft carriers for several strategic, military, and geopolitical reasons.

STRATEGIC DETERRENCE AND POWER PROJECTION: Aircraft carriers enable India to assert influence and maintain favourable balance of power in the Indian Ocean, a region critical for trade, energy flow and security for India and the world.

PROTECTION OF MARITIME INTERESTS: More than 90% of India's trade by volume moves by sea. Carriers help secure Sea Lines of Communication (SLOCs), protect island territories, and deter potential threats.

BLUE WATER NAVY CAPABILITY: Carriers allow the Indian Navy to operate far from home shores, reinforcing its status as a blue water force capable of extended operations and rapid responses to crises.

CONTINUOUS OPERATIONAL READINESS: Having multiple carriers ensures that at least one is always operational on each coast, even as others are in maintenance or refit.

NON-MILITARY ROLES: Carriers also play a vital role in Humanitarian & Disaster Relief (HADR) operations that project India's soft power and the ability to respond to regional emergencies and calamities, which are not uncommon in the Indian Ocean Region.

How will the Rafale Ms help the Navy?

Over the years, India has operated a wide variety of carrier-based fighters — from Sea Hawks, Alizes, Sea Harriers and, at present, the very capable fourth generation MiG29Ks.The country is now developing the fifth generation Twin Engine Deck Based Fighter (TEDBF), that is likely to be operationalised in the middle of the next decade.

The 26 Rafale M jets, a four-and-a-half-generation battle-proven combat aircraft, will augment the existing MiG29K fleet.

A great advantage that accrues with the induction of the 26 Rafale Ms for the Indian Navy is the commonality with the IAF Rafales. This provides the desirable scope for interoperability and joint training, as well as for maintenance and safe practices of these assets and their aircrew between the two services.

The induction of this very capable aircraft in the coming years is a shot in the arm for the Indian armed forces, and shall ensure continued and enhanced combat capabilities across the full spectrum of India's military might.

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India, Russia hold talks over attack; Defence supplies assured

Source: The Economic Times, Dt. 30 April 2025,
URL: https://economictimes.indiatimes.com/news/defence/india-russia-hold-talks-over-attack-defence-supplies-assured/articleshow/120740661.cms

Russia has offered to expand its counterterrorism partnership with India, following discussions between the two sides over the Pahalgam terrorist attack, according to people familiar with the matter.

India's ambassador to Russia Vinay Kumar met deputy foreign minister Andrey Rudenko on Monday in the wake of the terrorist attack in which 26 civilians were killed. The two sides are in touch over defence supplies from Russia to India, said the people.

"On April 28, deputy foreign minister Andrey Rudenko...(and) India's ambassador to Russia Vinay Kumar...discussed current bilateral issues...as well as the general situation in the South Asian region, including the escalation of tensions between New Delhi and Islamabad...," said a Russian government statement.

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Here's What Makes India's Kamikaze Drones Extremely Lethal Against Pakistan

Source: Republic World, Dt. 29 April 2025,
URL: https://www.republicworld.com/defence/defence-technology/heres-what-makes-indias-kamikaze-drones-extremely-lethal-against-pakistan

India's recent advancements in drone warfare have reached a pivotal moment with the successful testing of kamikaze First Person View (FPV) drones by the Indian Army's Fleur-De-Lis Brigade. This development, conducted in collaboration with the Defence Research and Development Organisation's (DRDO) Terminal Ballistics Research Laboratory (TBRL), marks a significant leap in India's military capabilities, particularly in the context of its tense relationship with Pakistan following the Pahalgam terror attack on April 22, 2025. The attack, which claimed 26 lives and

injured over 20, has heightened tensions, prompting India to showcase its drone technology as a potential response.

The trial site, located in the Pathankot sector, was not chosen at random. Given its proximity to the Line of Control, it served as a rehearsal theatre for operations India might consider if it escalates post-Pahalgam. Tactically, these FPV drones are designed to act as cheap, lethal strike vectors against hardened targets like Pakistani armoured formations, radar positions, and forward bunkers. Each unit, built indigenously, combines aerial agility with terminal explosive precision.

From Battle School To Battlefield: India's DIY Drone Arsenal Gets Frontline-ready

The FPV drone initiative began in August 2024 as a classified in-house weapons programme within the Fleur-De-Lis Brigade. This elite Army formation, trained in next-gen asymmetric warfare, collaborated with TBRL for payload science while overseeing assembly at its own Rising Star Drone Battle School. Over 100 such kamikaze drones were fabricated by March 2025 using modular, low-cost, high-impact designs specifically for precision engagement roles.

Trials were executed in three tightly monitored phases: explosive lethality calibration, manoeuvrability tests, and trigger-system integrity validation. DRDO scientists supervised each sortie, ensuring the explosive payload was activated only under secure command. These drones carry tailored warheads with enough blast force to destroy an armoured vehicle, making them ideal for LoC missions. Their single-use nature, paired with low production cost—Rs 1.4 lakh per unit—permits swarm doctrine deployment.

Loiter, Lock, Strike: How India's FPV Drones Are Engineered For Surgical Strikes

Technically, each drone runs on a compact FPV system linked to a radio-controlled detonation protocol. Operators receive real-time telemetry and payload updates through headset-mounted goggles, giving them direct control over when and where the drone hits. Safety protocols include a dual-stage arming mechanism to prevent unintentional detonation during transport or fallback.

Lightweight materials and radar-evasive profiles grant these drones a near-stealth footprint. They are reported to reach speeds of 40 metres per second with a warhead capacity of 700 grams—enough to rupture APC hulls and degrade enemy bunkers. The real innovation lies in their flexibility. These drones can turn mid-flight, evade countermeasures, and dive into soft or semi-armoured targets based on operator commands.

Drone War Doctrine: India's Asymmetric Play Against Pakistan's Heavy Armour Doctrine

India's drone initiative comes at a time when the tactical calculus with Pakistan is evolving. The FPV platform directly challenges Pakistan's reliance on tank-heavy offensive doctrines along the LoC. Unlike Pakistan's Burraq drone—which carries heavier payloads but lacks FPV precision—India's kamikaze drones offer real-time strike decision-making, lower costs, and finer manoeuvrability.

Pakistan's indigenous drones like Shahpar II or Chinese imports like Wing Loong II favour surveillance roles. In contrast, India's FPV drones are built for terminal effects. They're more comparable to Ukraine's battlefield kamikaze drones than to traditional military UAVs. This not

only enhances India's deterrence posture but also gives policymakers a tool for escalation management—short of sending in jets or artillery.

The New Normal: Drone Warfare Reshapes Retaliatory Doctrine In Post-pahalgam India

The Pahalgam massacre, attributed to The Resistance Front—a proxy backed by Pakistan's ISI—has shifted the conversation. India has already suspended the Indus Waters Treaty and shut the Attari border crossing. But as calls for kinetic response mount, drones offer a surgical, deniable option with minimal collateral damage. In future skirmishes, a swarm of 20–30 drones could be launched from concealed bases to neutralise Pakistani tanks, radar units, or logistic nodes in seconds. Unlike artillery, drones don't leave launch signatures. Unlike manned missions, they carry no pilots. And unlike strategic airstrikes, they operate below radar thresholds—perfect for controlled retaliation in a post-Pahalgam theatre.

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कितने भी रडार लगा ले PAK, दो भारतीय मिसाइल काफी हैं उन्हें बर्बाद करने के लिए ... Rudram-1 और Kh-31P

Source: Aaj Tak, Dt. 29 April 2025,
URL: https://www.aajtak.in/defence-news/story/indian-anti-radiation-missiles-can-destroy-pakistan-radar-dskc-2228286-2025-04-29

पहलगाम आंतकी हमले के बाद पाकिस्तान ने भारतीय सीमा के पास अपनी वायु रक्षा प्रणालियों को मजबूत करने के लिए कई उन्नत रडार और सतह से हवा में मार करने वाली मिसाइल प्रणालियां तैनात की हैं. इनमें चीनी मूल की HQ-9/P लंबी दूरी की वायु रक्षा प्रणाली और इसके HT-233 रडार शामिल हैं.

दूसरी ओर, भारत ने अपनी सप्रेशन ऑफ एनिमी एयर डिफेंस (SEAD) क्षमताओं को बढ़ाने के लिए सु-30MKI फाइटर जेट, रूसी Kh-31P एंटी-रेडिएशन मिसाइल और स्वदेशी रुद्रम-1 मिसाइल को तैनात किया है. यह रिपोर्ट पाकिस्तान की रडार तैनाती, भारत की SEAD रणनीति और इन मिसाइलों की तकनीकी विशेषताओं पर केंद्रित है.

पाकिस्तान की भारतीय सीमा के पास रडार तैनाती

पाकिस्तान ने अपनी वायु रक्षा को मजबूत करने के लिए भारतीय सीमा के निकट कई रडार और मिसाइल प्रणालियां तैनात की हैं.

HQ-9/P वायु रक्षा प्रणाली

प्रकार: लंबी दूरी की सतह से हवा में मार करने वाली मिसाइल (SAM) प्रणाली.

रेंज: लगभग 125 किमी (कुछ स्रोतों के अनुसार 200 किमी तक).

रडार: HT-233 फेज्ड-ऐरे फायर कंट्रोल राडार, जो सक्रिय रडार होमिंग (ARH) और इनर्शियल नेविगेशन सिस्टम (INS) के साथ काम करता है. यह रडार 150 किमी तक की दूरी पर लक्ष्यों का पता लगा सकता है.

विशेषताएं: HQ-9/P को चीनी S-300PMU का उन्नत संस्करण माना जाता है, जो जटिल हवाई खतरों जैसे फाइटर जेट, क्रूज मिसाइल और ड्रोन को नष्ट करने में सक्षम है.

तैनाती: पाकिस्तान ने इन प्रणालियों को पंजाब और सिंध प्रांतों में विशेष रूप से लाहौर, कराची और रावलपिंडी के आसपास तैनात किया है. ये सभी भारत के साथ सीमा के निकट हैं.

LY-80 और LY-80EV

प्रकार: मध्यम दूरी की वायु रक्षा प्रणाली (LOMADS).

रेंज: 40–70 किमी

रडार: IBS–150 S–बैंड पैसिव इलेक्ट्रॉनिकली स्कैन ऐरे (PESA) रडार और L–बैंड फायर कंट्रोल रडार.

विशेषताएं: सेमी–एक्टिव रडार होमिंग (SARH) और INS का उपयोग. ये प्रणालियां कम ऊंचाई पर उड़ने वाले लक्ष्यों को निशाना बनाने में सक्षम हैं. ये प्रणालियां मुख्य रूप से सीमा के पास सैन्य ठिकानों और महत्वपूर्ण बुनियादी ढांचे की सुरक्षा के लिए तैनात हैं.

FM-90 (HQ-7 का निर्यात संस्करण)

प्रकार: छोटी दूरी की वायु रक्षा प्रणाली (E–SHORADS).

रेंज: 15 किमी

कमांड–गाइडेड मिसाइल जो ड्रोन, हेलीकॉप्टर और कम ऊंचाई पर उड़ने वाले विमानों को निशाना बना सकती है. ये प्रणालियां सीमा के निकट सैन्य अड्डों और हवाई अड्डों की सुरक्षा के लिए उपयोग की जाती हैं.

रणनीतिक महत्व

पाकिस्तान की ये तैनातियां भारत के हवाई हमलों, विशेष रूप से 2019 के बालाकोट हवाई हमले के बाद को रोकने के लिए हैं. HQ–9/P और इसके HT–233 रडार की तैनाती से पाकिस्तान का लक्ष्य भारतीय वायुसेना (IAF) के लिए खतरा बढ़ाना. अपनी रक्षा प्रणालियों को मजबूत करना है. हालांकि, इन रडारों की प्रभावशीलता भारत की उन्नत SEAD रणनीतियों के सामने सीमित हो सकती है.

भारत की SEAD रणनीति: सु-30MKI और Kh-31P

भारत की वायुसेना ने SEAD मिशनों को करने के लिए सु–30MKI फाइटर जेट और Kh–31P एंटी–रेडिएशन मिसाइल का उपयोग किया है. बहु–भूमिका वाला फाइटर जेट, जो लंबी दूरी की उड़ान और भारी हथियार ले जाने में सक्षम है. यह SEAD मिशनों के लिए आदर्श है क्योंकि यह उच्च ऊंचाई (15 किमी तक) से मिसाइल लॉन्च कर सकता है.

हथियार: Kh–31P, रुद्रम–1, ब्रह्मोस–ए और अस्त्र मिसाइलों के साथ. सु–30MKI का लंबा ऑपरेशनल रेंज और उन्नत एवियोनिक्स इसे पाकिस्तानी रडारों को निशाना बनाने के लिए प्रभावी बनाते हैं.

Kh-31P एंटी-रेडिएशन मिसाइल

सुपरसोनिक एंटी–रेडिएशन मिसाइल.

रेंज: 110–250 किमी (लॉन्च की ऊंचाई पर निर्भर)

गति: मैक 3.5+ (लगभग 4300 किमी/घंटा)

नेविगेशन: पैसिव होमिंग हेड (PHH) जो K–बैंड राडार सिग्नल का पता लगाता है. यह लॉक–ऑन–बिफोर/आफ्टर–लॉन्च मोड में काम करता है.

विशेषताएं

लो RCS (रडार क्रॉस–सेक्शन): इसका कम रडार सिग्नेचर इसे रडार द्वारा पकड़े जाने से बचाता है.

हाई–डाइवर टर्मिनल अटैक: मिसाइल ऊंचाई से तेजी से नीचे आती है, जिससे रडार को प्रतिक्रिया देने का समय नहीं मिलता.

लॉफ्टेड लॉन्च: मिसाइल को 100 किमी से अधिक दूरी से लॉन्च किया जा सकता है, जो सु–30MKI को सुरक्षित दूरी पर रखता है.

प्रभाव: Kh–31P HQ–9/P के HT–233 रडार को नष्ट कर सकता है, क्योंकि इसकी तेज गति और K–बैंड होमिंग राडार के OODA (Observe, Orient, Decide, Act) लूप को बाधित करती है. यह रडार के जानने से पहले ही उसे नष्ट कर देता है.

SEAD ऑपरेशन

सु–30MKI 15 किमी की ऊंचाई से Kh–31P को लॉन्च करता है, जो 100–125 किमी दूर HT–233 रडार को निशाना बनाता है. मिसाइल का पैसिव होमिंग हेड रडार के सिग्नल का पता लगाता है और तेजी से उसकी ओर बढ़ता है. इसका कम RCS और हाई–डाइवर अटैक रडार को प्रतिक्रिया देने का समय नहीं देता, जिससे रडार नष्ट हो जाता है.

परिणाम: HQ–9/P प्रणाली अंधी हो जाती है, जिससे भारतीय विमानों के लिए हवाई हमले आसान हो जाते हैं.

रुद्रम-1: भारत की स्वदेशी एंटी-रेडिएशन मिसाइल

रुद्रम–1 भारत की पहली स्वदेशी एंटी–रेडिएशन मिसाइल है, जिसे डीआरडीओ ने विकसित किया है. यह Kh–31P का उन्नत विकल्प है. SEAD मिशनों में क्रांतिकारी बदलाव लाने की क्षमता रखता है. सुपरसोनिक एयर–टू–सरफेस एंटी–रेडिएशन मिसाइल.

रेंज: 100–250 किमी (लॉन्च की ऊंचाई पर निर्भर, 500 मीटर से 15 किमी तक).

गति: मैक 2 (लगभग 2470 किमी/घंटा)

वजन: 140 किग्रा

नेविगेशन

प्रारंभिक चरण: INS, GPS और भारतीय NAVIC सैटेलाइट नेविगेशन.

अंतिम चरण: पैसिव होमिंग हेड (PHH) जो 100 किमी की दूरी से रडार सिग्नल का पता लगा सकता है.

मिलीमीटर वेव (MMW) सीकर: विभिन्न मौसमों में काम करने की क्षमता.

लॉक–ऑन–बिफोर/आफ्टर–लॉन्च: लचीला लक्ष्यीकरण.

विशेषता: रुद्रम–1 रडार बंद होने पर भी लक्ष्य को ट्रैक कर सकता है, क्योंकि यह इनर्शियल नेविगेशन और मेमोरी ट्रैकिंग का उपयोग करता है.

लक्ष्य: रडार, संचार केंद्र और अन्य रेडियो फ्रीक्वेंसी स्रोत.

पाकिस्तानी रडारों पर प्रभाव

HQ-9/P और HT-233 रडार: रुद्रम-1 की 250 किमी की रेंज और MMW सीकर इसे HT-233 रडार को नष्ट करने में सक्षम बनाते हैं, भले ही रडार बंद हो जाए. इसका PHH 100 किमी से सिग्नल पकड़ सकता है. मेमोरी ट्रैकिंग रडार के अंतिम स्थान को लक्षित करता है.

LY-80 और FM-90 रडार: रुद्रम-1 की सटीकता (10 मीटर CEP) और लंबी रेंज इसे इन रडारों को भी नष्ट करने में प्रभावी बनाती है.

रुद्रम-1 की स्वदेशी तकनीक भारत को रूसी मिसाइलों पर निर्भरता से मुक्त करती है. SEAD मिशनों में अधिक लचीलापन प्रदान करती है. रुद्रम-1 को सु-30MKI में लगाया गया है. इसे मिराज 2000, राफेल, जगुआर, और तेजस में भी लगा सकते है.

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Pakistan Employs "Chinese-Russian" AD System To Thwart IAF Fighters; How Does It Compete Against S-400 Triumf?

Source: The EurAsian Times, Dt. 29 April 2025,
URL: https://www.eurasiantimes.com/s-400-vs-hq-9-to-decide-the-fate-of-india-pakistan-battle/

As India and Pakistan assess their offensive and defensive capabilities in light of the escalating hostilities, advanced air defense systems have become prized assets that can significantly influence the outcome of an air superiority battle between New Delhi and Islamabad.

While both India and Pakistan have advanced fourth-generation fighters, drones, and ballistic & cruise missiles in their arsenals, New Delhi's Russian-built S-400 and Islamabad's Chinese-supplied HQ-9 air defense systems are critical to their respective security.

The S-400 Triumf and HQ-9 are the most advanced air defense systems in the arsenals of these countries. Notably, both India and Pakistan acquired these crucial AD systems following their brief air duel in 2019.

Pakistan inducted the China-supplied HQ-9 AD system in October 2021, whereas India received its first S-400 unit in December 2021. Thus, the presence of these state-of-the-art AD systems will be a new surprise element this time around if India and Pakistan clash. Therefore, a head-to-head comparison of the capabilities of these systems becomes imperative.

Pakistan's China-Supplied HQ-9

The HQ-9 is a long-range surface-to-air missile (SAM) system developed and manufactured by China Precision Machinery Import-Export Corporation (CPMIEC), a Beijing-based Chinese defense company.

The system is designed to intercept various aerial threats, including aircraft, cruise missiles, air-to-surface missiles, and tactical ballistic missiles. The system was developed based on technology derived from Almaz-Antey, the Russian company that makes the S-300, S-400, and S-500 air defense systems.

Notably, while China has flagrantly violated the intellectual property rights of the Russian Sukhoi company to develop its fighter aircraft, in the case of air defense systems, Moscow itself allowed Beijing to acquire air defense technologies, mainly for the production of fourth-generation anti-aircraft missile systems.

The HQ-9 was developed using Almaz-Antey technology, incorporating elements from the Russian S-300 missile system. The system entered service in the early 2000s. The HQ-9A variant entered service in 2001. Later, more advanced versions, like the HQ-9B, were inducted.

In 2021, Pakistan acquired its HQ-9P variant. The system is equipped with a Track-via-missile (TVM) system that combines inertial guidance, mid-course uplink, and terminal active radar or semi-active radar homing (SARH). It uses HT-233 3D phased-array radar, capable of tracking up to 100 targets.

Pakistani HQ-9

In the Chinese Armed Forces, an HQ-9 battery comprises a command vehicle, six control vehicles, six targeting radar vehicles, six search radar vehicles, 48 missile-launch vehicles, and 192 missiles, along with a positioning vehicle, a communications vehicle, a power supply vehicle, and a support vehicle.

While the HQ-9B has an engagement range of 250-300 km, the Pakistan Army's HQ-9P has a claimed engagement range of 125 km only. Engagement ranges against cruise missiles and similar targets are thought to be much shorter, around 25 km. However, some media reports claim that the Pakistan Air Force has also inducted the HQ-9B variant, which can engage combat aircraft at a range of 250 km and an altitude of 27 km.

India's Russian-Built S-400 Triumf

The S-400 Triumf, developed by Russia's Almaz-Antey corporation, is a mobile surface-to-air missile system designed to detect, track, and destroy various aerial targets, including fighter jets, cruise missiles, ballistic missiles, and drones. India signed a US$5.43 billion deal with Russia for five S-400 Triumf air defense system regiments in October 2018, during a bilateral summit between Prime Minister Narendra Modi and President Vladimir Putin.

India received its first S-400 squadron in December 2021 and has since received deliveries of three S-400 squadrons. In July 2024, India conducted its first military exercise with S-400, now renamed Sudarshan. According to a press release, the system achieved a remarkable success rate, effectively 'shooting down' 80% of the simulated enemy fighter aircraft and compelling the remaining aircraft to retreat and abort their missions.

The exercise showcased that the S-400 system is now fully integrated with the Indian armed forces. While there is no official confirmation about their deployments, some reports suggest that New Delhi has deployed 1.5 squadrons each at the borders with China and Pakistan. The system has a detection range of 600 km and an engagement range of 40-400 km, providing layered air defense. It can track nearly 100 targets simultaneously. Therefore, if deployed near the Line of Control (LoC) or the India-Pakistan international border, the S-400 can provide India with a deep-strike interception capability.

It uses four different missiles: the 40N6, which has a 400 km range for high-altitude targets like aircraft, the 48N6E3, which has a 250 km range for targets like aircraft and cruise missiles, the 9M96E2, which has a 120 km engagement range for high maneuverability targets, and the 9M96E, which has a 40 km engagement range. In July of last year, reports emerged of hacked emails from high-ranking Russian officials, which revealed that India had purchased all four types of missiles included in the S-400 system. The S-400 traces its roots back to the S-75 missile system, which gained fame for shooting down an American U-2 spy plane over Soviet territory in 1960. Russian experts claim that the S-400 is capable of countering stealth fighters, even posing a threat to advanced American aircraft, such as the F-35.

S-400 Vs HQ-9

Feature	S-400 (India)	HQ-9/P (Pakistan)
Max Targets Tracked	100	100
Max Targets Engaged	36	8-10
Radar Detection Range	600 km	150-200 km
Engagement Range	40-400 km	25-125 km
Missile Guidance	Active/semi–active radar, TVM	Semi-active radar, TVM
Battle-Tested	Yes	No

S-400 Vs HQ-9/P comparison

A head-to-head comparison between the two will reveal that the S-400 offers significantly superior air defense capabilities compared to the HQ-9. S-400 can detect targets as far as 600 km and engage targets up to 400 km, whereas HQ-9B can engage targets only up to 250 km. The HQ-9P

variant can engage targets within a 125 km range only. This means that S-400 can detect and engage targets much further away than the HQ-9.

While both can track up to 100 targets simultaneously, S-400 can engage 36 targets simultaneously, whereas HQ-9 can only engage 8-10 targets at once. Therefore, S-400 is much better suited for countering dense or multi-axis attacks. Additionally, while the S-400 has proven its effectiveness in the Russia-Ukraine war, with numerous kills to its credit, the HQ-9 has yet to be tested in real-world combat scenarios.

India's S-400 Holds Edge, But Can China/Turkey Play Spoilsport?

It is clear that the S-400 AD system outclasses the HQ-9. However, China and Turkey, two of India's adversaries and Pakistan's close allies, also operate the S-400 system. As such, these countries are aware of the S-400 system's operational limits and weaknesses, including its loopholes in detecting, tracking, or engaging targets, and can share this sensitive information with Pakistan.

While S-400 is one of the most advanced AD systems in the world, it is far from perfect, and its operational limits were also highlighted in the ongoing Ukraine war, where, despite the presence of these systems, many Ukrainian missiles and drones were able to penetrate well-defended Russian areas. Ukraine has also claimed that it has successfully eliminated as many as five units of Russian S-400 systems.

However, despite these vulnerabilities, the S-400 system offers significantly improved air defense capabilities compared to the Chinese-built HQ-9. India's S-400 and Pakistan's HQ-9 are the most advanced air defense systems in the arsenals of these two countries. However, they are by no means the only AD systems available to New Delhi and Islamabad, as they both operate a host of other short- and medium-range AD systems.

Apart from the S-400, India also operates the Akash (30-70 km range), Barak-8 (70-100 km range), SPYDER (15-35 km range), and QRSAM (25-30 km range) air defense systems. Similarly, apart from HQ-9P, Pakistan has in its arsenal the LY-80 (40-70 km range), FM-90 (15 km range), and Spada-2000 (20 km range).

Revenge For MiG-21 Bison

In the aftermath of the Balakot airstrikes in 2019, India lost an MiG-21 Bison in the following air combat with the Pakistan Air Force. The lack of long-range air-to-air missiles was the main reason India was not able to counter the Pakistani Air Force's adventurism effectively.

However, India has drawn lessons from the 2019 fiasco. Since then, India has inducted 4.5-generation Rafale fighter jets, which are more lethal than anything Pakistan has seen before. Indian Rafales are also equipped with Meteor missiles, having a range of 100-200 km. India also ordered a significant quantity of R-77 BVR (Beyond Visual Range) missiles integrated with Su-30 MKI fighter jets. Overall, it appears Russian-origin technology is pitted against each other, i.e., S-400 against an analog of S-300 aka HQ-9.

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Science & Technology News

Scientists Chart the Sun's Subsurface Weather Tied to Its 11-Year Activity Cycle

Source: Press Information Bureau, Dt. 29 April 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2125195

An international team of solar physicists have traced giant tides of plasma beneath the Sun's surface at a region called near-surface shear layer (NSSL). The plasma currents shift with the Sun's magnetic heartbeat and could have far-reaching influence on space weather and Earth.

The near-surface shear layer (NSSL) extending to about 35,000 km in depth is a critical region beneath the Sun's surface. It is marked by distinct rotational behaviours that vary with depth and by changes, over space and time, that relate to active region magnetic fields and the solar cycle.

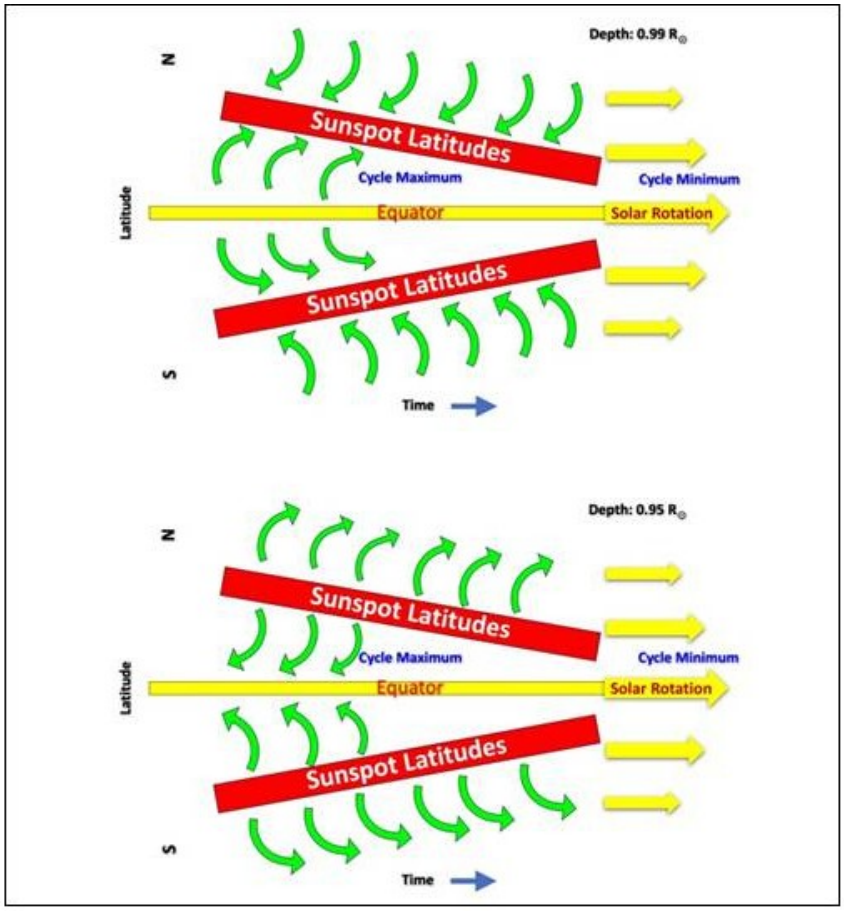

***Fig 1**: Depictions of how flow structures near the surface (0.99 solar radii) and at a deeper layer near (0.95 solar radii) develop as sunspots appear and evolve over time (over the 11-year solar cycle). The directions of swirly motions in the northern and southern hemispheres of the Sun are determined by the Coriolis force, just the same way it shapes the storm systems on the Earth.*

A study led by astronomers from the Indian Institute of Astrophysics (IIA), an autonomous institute of the Department of Science and Technology (DST) have probed the dynamic "inner weather" of the Sun - plasma currents just beneath its surface at the NSSL, that pulse in step with its 11-year sunspot cycle.

In the research published last week, in 'The Astrophysical Journal Letters', researchers from the IIA, Stanford University (USA), and the National Solar Observatory (NSO, USA) have traced how these hidden flows shift over time, potentially reshaping our understanding of solar dynamics in general and how the Sun's interior connects to its outer magnetic behaviour in particular.

Employing helioseismology—an advanced technique that tracks sound waves as they travel through the Sun—the team observed changes in the movement of solar material using more than a decade of data from NASA's Solar Dynamics Observatory/ Helioseismic and Magnetic Imager (SDO/HMI) and the ground-based Global Oscillations Network Group (GONG) of National Solar Observatory (NSO), USA.

Peering Beneath the Surface

The analysis led by Professor S.P. Rajaguru and PhD student Anisha Sen from IIA revealed fascinating patterns -- surface plasma flows converge toward active sunspot latitudes, but reverse direction midway through the NSSL, flowing outward to form circulation cells. These flows are strongly influenced by the Sun's rotation and the Coriolis force—the same force responsible for the spin of hurricanes on Earth.

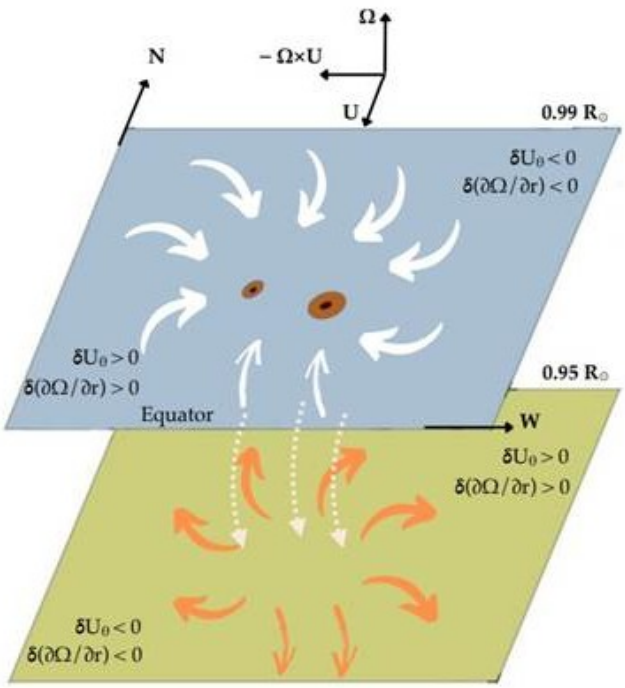

***Fig 2**. Sketch showing the Coriolis force mediated average flow structures around active regions in the northern hemisphere of the Sun. The labels depict the signs of residuals in meridional flows, δU_θ , and that in resulting residual rotational shear, $\delta(\partial\Omega/\partial r)$, for the two depths, 0.99 and 0.95 R_{sun} which mark the radial boundaries of the NSSL. Figure Artwork Credit: Amrita Rajaguru*

The Coriolis effect swirls and shifts those inflows and outflows into a subtle but powerful sculptor of how the Sun spins at different depths, modifying the rotational shear (the gradient of rotation with depth). Yet intriguingly, these local currents do not power the Sun's larger-scale zonal flows—known as torsional oscillations—suggesting that these global flows, which ripple through the Sun's vast interior, must be powered by something deeper and more mysterious.

Zooming In and Looking Ahead

"To validate our findings, we zoomed in on a massive sunspot region using 3D velocity maps. The localized flow patterns we observed matched the global trends—confirming both surface inflows and deeper outflows," said lead author Anisha Sen.

"This is a stunning look into how the Sun's inner weather patterns form and evolve," says Professor S.P. Rajaguru one of the authors of the paper. "Understanding these hidden patterns is not just academic—solar activity influences space weather that can disrupt satellites, power grids, and communications on Earth. This work brings us closer to understanding and building realistic models to predict the Sun's behaviour." The study group also included Abhinav Govindan Iyer and other international collaborators.

These findings give us a better understanding of how the Sun's magnetic activity is linked to its internal flows and hint that we might still be missing something lurking in deeper layers that truly drives its global dynamics.

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First-of-its-kind collaboration between a government-backed apex research institution and a philanthropic private foundation

Source: Press Information Bureau, Dt. 29 April 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2125194

In a significant move to accelerate the transformation of India's research ecosystem, the "Anusandhan National Research Foundation" (ANRF) and the "Wadhwani Foundation" exchanged a landmark "Letter of Intent" at the "Innovation Conclave" "YUGM" held at Bharat Mandapam here in the presence of Prime Minister Narendra Modi, Union Science and Technology Minister, Dr. Jitendra Singh and Union Education Minister, Dharmendra Pradhan.

The partnership signals a first-of-its-kind collaboration between a government-backed apex research institution and a philanthropic private foundation, aimed at co-funding and scaling up research that can drive tangible societal impact. The agreement is also the inaugural step in ANRF's strategy to foster expansive public-private partnerships across critical sectors of national relevance.

Dr. Jitendra Singh, who has been at the forefront of India's science and innovation transformation, said the initiative reflects the government's resolve to create an enabling environment where research transcends academic silos and reaches the ground. "This is a step towards institutionalizing synergy between government, industry, and philanthropy," he said, underlining the need for collaborative models that amplify both funding and outcomes.

The ANRF, established under the National Education Policy 2020, was envisioned as a transformative body to democratize research, catalyze innovation, and bridge the long-standing gaps between academia, policy, and industry. With this new partnership, ANRF aims not only to fund cutting-edge science, but also to translate research into scalable, impactful solutions by aligning with national priorities and global challenges alike.

Wadhwani Foundation's involvement adds a crucial layer of experience in fostering entrepreneurship and innovation-driven development, especially among youth and start-ups. Together, the two entities will work to raise the scale and impact of late-stage translational research —projects that are often closest to delivering real-world outcomes but remain underfunded.

The collaboration also marks a turning point in how research will be funded and delivered in India in the times to come—emphasizing inclusivity, interdisciplinary, and grassroots reach. In line with ANRF's broader vision, this partnership aims to promote equitable access to resources and

opportunities across the country, including tier-2 and tier-3 institutions, thereby fostering a more distributed and resilient research culture.

The announcement at Conclave, a platform designed to bring together thought leaders across government, academia, and industry, set the tone for a new era in Indian innovation policy. As India strives to become a global research hub, this partnership is expected to play a pivotal role in shifting the focus from fragmented efforts to outcome-oriented, collaborative science.

The move reinforces India's march toward becoming a knowledge-based economy, with Prime Minister Modi's vision of "Atmanirbhar Bharat" rooted not only in self-reliance but also in scientific excellence and societal good.

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How machine learning can spark many discoveries in science and medicine

Source: The Indian Express, Dt. 30 April 2025,
URL: https://indianexpress.com/article/technology/science/machine-learning-can-spark-many-discoveries-in-science-and-medicine-9972364/

Machine learning is reshaping the nature of discovery across fields like biology, chemistry, and This new weekly column seeks to bring science into view — its ideas, discoveries, and debates — every Tuesday. We'll journey through the cosmos, across the quantum world, and alongside the tools that shape our understanding of reality.

We may be living in a golden age of discovery — not just because we know more than ever before, but because the very way we do science is undergoing a profound transformation.There will soon be widespread methods for the prediction of sepsis or diabetic retinopathy or for the early detection of Alzheimer's.

There will be custom-made drugs and treatments that take into account your age, gender and genetic type. In fact, the developments have been so rapid and extraordinary that some have predicted the end of conventional disease, as we know it, in a decade. Seasonal rainfall and cyclones will be predicted with more accuracy. Even before new drugs are synthesised, computers will figure out how efficient they could be.

Why is scientific discovery changing?

Throughout most of human scientific history, discovery was driven by patient human effort. Data was precious, experiments were hard-won, and scientists would painstakingly design algorithms — fitting functions, solving equations, building models — to extract insights. The amount of data available was modest, and the number of researchers able to work on it was sufficient. In that world, human ingenuity could keep pace with information.

Today, that balance has broken. Across fields, the volume of data has exploded. Telescopes generate terabytes nightly. Genome sequencers run around the clock. Simulations churn out petascale outputs. Hardware — both observational and computational — has advanced dramatically.

But human attention and the number of scientists have not scaled in the same way. Algorithms hand-crafted by experts that require constant tuning are no longer sufficient when data volumes dwarf our collective capacity to engage with them manually.

Remarkably, just as this problem became acute, machine learning rose to meet it. Though the foundations of artificial intelligence stretch back decades, it is only in the past ten years — and especially the past five — that self-learning algorithms have matured into powerful and scalable scientific tools.

The coincidence is striking: at the very moment that science risked drowning in its own data, machines emerged that could swim.

Machine learning as a widely adopted method

The rise of these algorithms itself is a story of convergence. Until the early 2010s, computers recognised patterns only when engineers wrote explicit rules. That changed with two watershed moments.

First, a public contest called the ImageNet challenge provided a million labelled photographs to compete on. One entrant, a deep neural network dubbed AlexNet, learnt to identify objects by tuning its internal connections through trial and error on graphics processors originally built for video games. Without any hand-coded feature detectors, AlexNet halved the error rate of all previous systems. This proved that with enough data and compute, machines could learn complex patterns on their own.

Then in 2016, DeepMind's AlphaGo – designed to play the ancient board game Go – demonstrated the power of reinforcement learning, an approach where a system improves by playing repeatedly and rewarding itself for wins. In a historic five-game match, AlphaGo defeated world champion Lee Sedol, surprising professionals by playing sequences of moves never before seen.

In Go, the possible board configurations exceed those of chess by orders of magnitude. After Game Two's unexpected "Move 37", Lee admitted, "I am speechless," a testament to the machine's capacity to innovate beyond human intuition.

Breakthroughs across disciplines

This convergence has opened the door to breakthroughs across disciplines. In biology, the protein-folding problem exemplifies the impact. A typical protein is a chain of 200–300 amino acids that can fold into an astronomical number of shapes, yet only one produces the correct biological function.

Experimental methods to determine these structures can take months or fail outright. In 2020, DeepMind's AlphaFold2 changed that. Trained on decades of known protein structures and sequence data, it now predicts three-dimensional shapes in seconds with laboratory-level accuracy.

Such accuracy accelerates drug discovery by letting chemists model how candidate molecules fit into their targets before any synthesis. Enzyme engineers can design catalysts for sustainable chemistry, and disease researchers can understand how mutations disrupt function. In recognition

of this leap, the 2024 Nobel Prize in Chemistry was awarded to Demis Hassabis, John Jumper, and David Baker.

Machine learning has since become routine in fields ranging from chemistry and astronomy to genomics, materials science, and high-energy physics, where it mines vast datasets for insights no human could extract unaided. In addition to the power of the technique, the purchase that the technique now has in modern society may in part be attributed to the democratisation of software tools such as PyTorch and TensorFlow and the large number of online courses and tutorials which are freely available to the public.

Can machine learning replace scientists?

At present, the answer is no. The imagination required to frame the right questions, the intuition to know when a result matters, and the creativity to connect diverse ideas remain uniquely human strengths. Machine learning models excel at finding patterns but rarely explain why those patterns exist.

Yet this may not be a permanent limitation. In time, systems could be trained not only on raw data but on the entire scientific literature — the published papers, reviews, and textbooks that embody human understanding. One can imagine, perhaps within decades, an AI that reads articles, extracts key concepts, identifies open questions, analyses new experiments, and even drafts research papers: a “full-stack scientist” handling the loop from hypothesis to publication autonomously.

We are not there yet. But we are laying the foundations. Today’s scientific machine learning is about augmentation — extending our reach, accelerating our pace, and occasionally surprising us with patterns we did not think to look for. As more of science becomes algorithmically accessible, the frontier will be defined not by what we can compute but by what we can imagine.

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Axiom space mission: Indian astronaut Shubhanshu Shukla to fly to International Space Station on May 29

Source: The Hindu, Dt. 30 April 2025,
URL: https://www.thehindu.com/sci-tech/science/axiom-space-mission-indian-astronaut-shubhanshu-shukla-to-fly-to-international-space-station-on-may-29/article69506273.ece

Indian astronaut Group Captain Shubhanshu Shukla’s mission to the International Space Station (ISS) is scheduled to be launched on May 29 2025 from NASA’s Kennedy Space Center in Florida. Group Captain Shukla will be the pilot of the Axiom-4 mission (Ax-4) and the launch is targeted no earlier than 1:03 p.m. EDT (Eastern Day Time) on May 29, NASA announced on Tuesday. The Axiom Mission 4 crew will be launched aboard a SpaceX Dragon spacecraft to the ISS and will spend up to 14 days at the orbiting laboratory.

Group Captain Shukla, who is also one of the four astronaut-designates selected for Gaganyaan mission of ISRO, will become the first Indian astronaut to go to the ISS, and the first Indian to go to space in the last 40 years.

Former NASA astronaut Peggy Whitson will command the commercial mission, European Space Agency project astronauts Sławosz Uznański-Wiśniewski from Poland and Tibor Kapu from Hungary are also part of the crew. Axiom Space said that the Ax-4 research complement includes around 60 scientific studies and activities representing 31 countries, including the U.S., India, Poland, Hungary, Saudi Arabia, Brazil, Nigeria, UAE, and nations across Europe.

Axiom Space on Tuesday in a press conference shared details on the experiments, microgravity research, and technology demonstrations that will be a part of Axiom Mission 4 (Ax-4). ISRO has already shortlisted seven microgravity research experiments proposed by Indian Principal Investigators (PIs) from various national R&D laboratories and academic institutions for implementation on the ISS.

“On our maiden mission to the ISS we have as set of experiments being investigated by some of the leading academic institutions and research labs from India the experiments range from search of growth of microalgae and cyanobacteria to muscle regeneration experiments, sprouting in space, studying resilience of tardigrades, seeds experiment and human computer interactions in space,” said Tushar Phadnis, Group Head for Microgravity Platforms and Research, ISRO.

Indian astronaut Shubhanshu Shukla set for space travel in MayReplying to a query on why three of India’s seven experiments are related to food Mr. Phadnis said, “ISRO would like to explore specifically India centric food for example we have a sprouting experiment to sprout green gram or moong and Fenugreek which is believed to have medicinal properties.”

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Insufficient support for deep tech start-ups in India: study

Source: The Hindu, Dt. 30 April 2025,
URL: https://www.thehindu.com/news/national/insufficient-support-for-deep-tech-startups-by-public-funded-rd-study/article69506163.ece

Only about one in four public-funded research and development organisations in India give incubation support to start-ups and only one in six provide support to ‘deep tech’ startups. Only 15% collaborated with industry overseas and only half of them opened their facilities to outside researchers and students, say the findings of a study commissioned by the Office of the Principal Scientific Advisor and executed by the Confederation of Indian Industry (CII) and the Centre for Technology, Innovation, and Economic Research.

The study, via a detailed questionnaire, asked labs to rate themselves and supply data on 62 parameters such as their spend on R&D, number of young scientists, patents filed, technologies developed, participation of women scientists and their contribution to ‘national missions’ such as Deep Ocean Mission, National Quantum Mission, etc.

Labs of the ‘strategic sector’ such as those belonging to defence research, space, atomic energy research — all of which constitute the lion’s share of India’s overall Research and Development (R&D) spend — were excluded from the study due to the “sensitive nature of their work”. The labs studied were those affiliated to the Council of Scientific and Industrial Research, the Department of Science and Technology, the Ministry of Electronics and Information Technology, etc.

The Central government expenditure on R&D was around ₹55,685 crore in 2020-21, the figure cited in the study and the latest available. Excluding the expenditure of the strategic departments like DRDO (Defence), DAE (Atomic energy) and DoS (Space), the spending by key scientific agencies and other Central government departments was ₹24,587 crore.

Around 25% of the participating institutions reported spending between 75% and 100% of their budget on R&D. The organizations that reported less than the median share of spending on R&D and S&T (Science and Technology) in the overall budget were largely from ICAR (Agricultural research), CSIR, ICMR (Medical research), Ministry of AYUSH (Ayurveda and traditional medicine) and DST (Science and Technology).

Staff strength down

A large number of labs/institutes reported a decrease in the number of permanent staff in 2022-23 compared to the previous year and an increased reliance — from 17,234 to 19,625 — on contractual staff. The median share of young researchers increased in 2022-23 to around 58 per cent from 54 per cent in the previous year. In the previous exercise, for around 193 organisations that had participated, this number was around 63 per cent to 65 per cent for the period from 2017-18 to 2019-20.

“This is the second time that we have had such an analysis. What we intend is that the data from such a study be closely analysed by institutions so that they can identify areas of improvement,” said Dr. Ajay Sood, Principal Scientific Adviser, “Overall, several researchers seem to have oriented themselves from being centres of scientific inquiry to innovation centres. I see that as a positive development. Academia and product innovation must go hand in hand.”

As part of its recommendation, the report advocates that every lab should be “mandated to review their existing mandates” and align themselves to Viksit Bharat goals. The mandate should focus on “critical technologies” as directed by the government and be taken on a “war footing” by public-funded R&D organisations. They should work closely with industry as well as with each other.

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Three Bengaluru-based institutions among winners of C-CAMP AMR Challenge 2024-25

Source: The Hindu, Dt. 29 April 2025,
URL: https://www.thehindu.com/sci-tech/science/four-bengaluru-based-institutions-among-winners-of-c-camp-amr-challenge-2024-25/article69503969.ece

Three Bengaluru-based institutions, including the Indian Institute of Science (IISc.), are among the winners of the Centre for Cellular and Molecular Platforms (C-CAMP) Anti-microbial Resistance (AMR) Challenge 2024-25.

C-CAMP said that the national AMR Challenge was launched in August 2024. They received about 200 applications from innovators and start-ups across India for funding and ecosystem support to enable scale up, production, adoption and societal integration of winning solutions to tackle AMR in the environment.

The nine winners

Of them, nine were declared winners of the C-CAMP AMR Challenge 2024-25.

The winners are:

1) Indian Institute of Science (IISc) for tackling AMR emergence through effluent treatment using robust catalytic enzyme mimetics. The MONZymes based technology, as developed by Dr. Subinoy Rana and his team, is capable of effectively degrading residual antibiotics from effluent wastewater and also exhibit antibacterial activity, through advanced (photo)catalytic activity.
2) Foundation for Neglected Diseases Research (FNDR) for developing a device to deplete antimicrobial residues from wastewater, using a cartridge-based device with a patented mixture of activated charcoal and plant-based materials.
3) Biomoneta Research Private Limited: qAMI (Quantitative Airborne Microbial Index) for coming up with a singular technology combining detection of air-borne total microbial load and pathogenic microbes in hospital set-ups, using AI/ML platform and encompassing different microbial attributes, combined with the classic microbiological approach.
4) D-NOME Private Limited for its D-NOME's pocket PCR device, which can help in rapid and accurate on-field detection and identification of Antibiotic-Resistant Bacteria (ARB) & Antibiotic Resistance Genes (ARGs) in aquaculture farms and other wastewater sources.
5) Vividew Innovations Private Limited for its novel innovation to remove residual antibiotics & antibiotic-resistant bacteria from wastewater in hospital sewage treatment plants (STPs).
6) Diagopreutic Private Limited for its detection of residual antibiotic and pathogen identification in water samples from aquaculture farm effluents, using a colorimetric method, based on the differential nitro-reductase activity of the bacteria and their ability to grow in presence of the specific antibiotic.
7) Mylab Discovery Solutions Private Limited for its rapid detection of pathogens from wastewater samples, and detection of environment-related ARGs. The technology involves an in-house developed nucleic acid extraction kit and an advance multiplexed quantitative RT-PCR technology, capable of identifying a diverse array of pathogens as well as an extensive spectrum of ARGs.
8) Huwel Life Sciences Private Limited: Quantiplus® Environmental Surveillance Kit for Real-Time PCR detection for typhoid and ARGs in environmental samples. The RT-PCR kit detects a wide spectrum of ARGs, as well as the typhoid specific gene along with its resistance genes.
9) Amrita Vishwa Vidyapeeth for the development of affordable POT (Point of Testing) device for monitoring of AMR in the environment, by an impedance-based microfluidic device, using a lytic phage-based detection technology. The innovation, as proposed by Dr.

Bipin Nair and his team, is capable of detecting and identifying various pathogens of clinical relevance and can be used for rapid and accurate detection of specific bacteria.

Nature of support

The winners will be supported by C-CAMP in India in collaboration with the UK Department of Health and Social Care's Global AMR Innovation Fund (GAMRIF) to foster the identification and development of world-class AMR-focused innovative solutions to tackle various aspects of AMR in the environment in India, and for the benefit of low and middle-income countries (LMICs).

"Antimicrobial resistance in the environment is a serious issue because of unchecked effluents from agriculture and industry reaching our water bodies, air and land. The problem has assumed alarming proportions across the entire world. I am heartened to see that innovators and scientists in India are developing cutting-edge innovations that hold promise not only in India and LMICs, but for the world," said Prof. Ajay K. Sood, principal Scientific Adviser to the Govt. of India.

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