मई
May
2025

खंड/Vol. : 50 अंक/Issue :88

16/05/2025

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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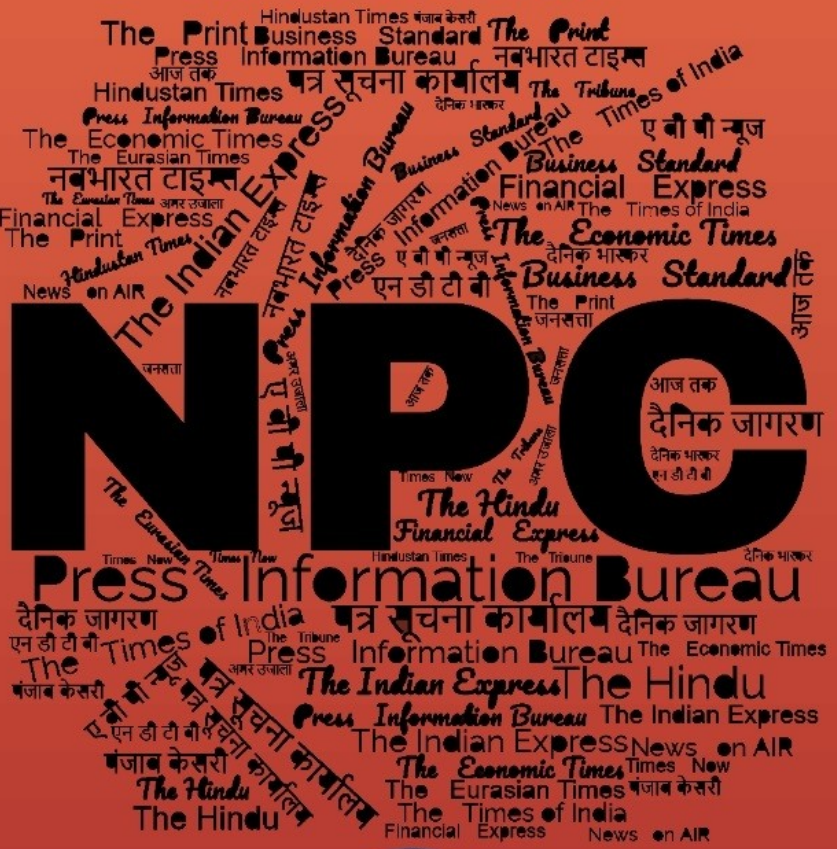

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DRDO News

"DRDO's Performance In Op Sindoor Was Stellar": Top Missile Scientist In NITI Aayog

Source: NDTV, Dt. 15 May 2025,
URL: https://www.ndtv.com/india-news/drdos-performance-in-op-sindoor-was-stellar-top-missile-scientist-dr-vk-saraswat-in-niti-aayog-8424148

Operation Sindoor was a true showcase of India's indigenous competencies developed by the Defence Research and Development Organisation's (DRDO) deep capabilities, said Dr V.K. Saraswat, a missile scientist, who is a member (S&T) of NITI Aayog. All efforts to demolish DRDO should be buried once and for all, he asserted.

The morale at DRDO, which is home to 5,000 scientists, was hit since two high-powered committees tried to restructure it at a mega level. In 2016, a government-mandated committee headed by Dr P Rama Rao, former secretary of the Department of Science and Technology, was constituted to conduct a comprehensive review of the Defence Research and Development Organisation (DRDO).

It led to the creation of seven technology domain-based clusters headed by separate Directors General. It only added to more bureaucracy, said Dr Saraswat.

Subsequently, in 2023, another nine-member committee was set up to "reform" the DRDO, headed by Dr K Vijay Raghavan, a basic science researcher by training and former Principal Scientific Advisor to the Government of India. The report was never made public, but experts said it had suggested dismembering the DRDO and hiving off its units to other ministries.

"It was a futile exercise", asserts Dr Saraswat.

In an exclusive interview with NDTV, Dr Saraswat said, "Operation Sindoor has demonstrated the capacity and capability of DRDO to build the modern weapon systems in the strategic, air defence, air surveillance system and integrated command and control system sectors for air defence of the country. The success of missiles like Akash, BrahMos, hitting the Pakistani targets in pinpoint accuracy, engaging the Chinese aircraft, demonstrates that DRDO has the capability and capacity to build such a system."

Dr Saraswat, a well-known missile scientist, added, "DRDO has the capacity and capability. And all the talk, which normally people keep saying that DRDO is not performing, has been completely denied and debunked today by the performance of what its weapon system has done."

There was a time when the DRDO acronym was expanded as "Defenceless Research and Dud Organisation" by some critics.

Dr Saraswat said, "I think it's time that all the criticism of the DRDO, which has been going on for so many decades, should be put to rest today because DRDO has demonstrated its capability in all

fields of military technology. This was an Atmanirbhar war fought by India with the indigenous weapon systems and technologies developed by DRDO."

"I think people who have been carrying this message through different reports, which have been done, the first report was done by Prof. P Ramarao when I was the secretary of DRDO and the latest report, which has been done by Prof. K VijayRaghavan, former Principal Scientific Advisor to the Government of India, completely shows that their thinking, their process of looking at how DRDO should perform, is completely out of tune."

"DRDO has a very robust system of managing research and development along with industry, academia and within the 39 laboratories of the country. We have a very cohesive method of doing things. We have no regimentation. We have a democratic process of doing research and development, and we are in a position to do all that with the Indian industry," Dr Saraswat said.

"You see the example of Akash. When we realised that Akash had to be manufactured in large numbers to meet future requirements, we went to two production agencies, Bharat Electronics Ltd and Bharat Dynamics Ltd. A large number of subsystems of Akash were coming from the private sector," he added.

"I think Operation Sindoor and many past events have demonstrated that DRDO scientists can design, develop, and manufacture state-of-the-art weapon systems, whether they are ground-based, missiles, aircraft or electronic warfare systems. There is no segment of weaponry which is not handled by DRDO. Such a wide spectrum, I don't think anywhere it is available."

"DRDO is the only organisation which covers every aspect of it, with the support of the armed forces to fight battles at sea, in high altitudes and cold climates. I don't think that there is an organisation equal to DRDO in the country which can provide that kind of a canvas," he said.

"Since I am part of the DRDO, and will remain always, we feel that scientists of DRDO should feel very-very proud that they have done a great service to the nation by working relentlessly together in a harmonious manner for the last 50-60 years and brought our country to this level of excellence," Dr Saraswat further said.

After a period of flagging spirits, Dr Saraswat added that after Operation Sindoor, the "josh" is back, and it is also high at the premier defence research organisation.

He added that if India has to become a developed country, it has to protect itself through atmanirbhar defence systems

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Defence News

Defence Strategic: National/International

PM Modi has redefined India's policy against terrorism, any attack on Indian soil will be considered as an act of war: Raksha Mantri in Srinagar

Source: Press Information Bureau, Dt. 15 May 2025,
URL: https://www.pib.gov.in/PressReleasePage.aspx?PRID=2128840

"Prime Minister Shri Narendra Modi has redefined India's policy against terrorism which now says that any attack on Indian soil will be considered as an act of war," said Raksha Mantri Shri Rajnath Singh while addressing the brave Indian Army soldiers at Badami Bagh Cantt, Srinagar on May 15, 2025.

Raksha Mantri emphasised that India has always prioritised peace and never supported war, however, when its sovereignty is attacked, it is necessary to respond. If Pakistan continues to support terrorism, it will pay a heavier price, he said.

Shri Rajnath Singh termed Operation Sindoor as the biggest action taken by India against terrorism in history, and a testament to the nation's commitment to go to any extent to eliminate the menace.

"Operation Sindoor was a commitment demonstrated by India of not just carrying out defence, but taking bold decisions whenever needed. It was a dream of every soldier that we will reach every terrorist hideout and destroy them. Terrorists killed Indians based on their religion, we killed them for their deeds. It was our dharma to eliminate them. Our forces gave the right direction to their anger and took revenge for Pahalgam with great courage & discretion," he said.

Raksha Mantri added that Operation Sindoor has sent a loud and clear message to the terrorist organisations hiding in Pakistan and their masters that they are not safe anywhere. "Our forces have shown to the world that their aim is precise & pin-point and the task of counting is left to the enemies," he said.

Shri Rajnath Singh added that India's unwavering resolve against terrorism can be gauged from the fact that it was not deterred by Pakistan's nuclear blackmail, pointing out that the world has witnessed how irresponsibly Islamabad has issued nuclear threats to New Delhi several times.

"I raise this question before the world: Are nuclear weapons safe in the hands of such an irresponsible and rogue nation? Pakistan's nuclear weapons should be taken under the supervision of the International Atomic Energy Agency (IAEA)," he said.

Shri Rajnath Singh stated that through the Pahalgam incident, an attempt was made to break the social unity of India, and the Armed Forces responded to the terror attack by hitting the heart of the adversary.

He recalled Pakistan's declaration about 21 years ago in front of the then Prime Minister late Atal Bihari Vajpayee that terrorism will no longer be exported from its land. Raksha Mantri said Pakistan has been deceiving India, and it must stop sheltering anti-India and terrorist organisations & not allow its land to be used against India, he said.

Raksha Mantri added that Pakistan has reached a state where it has sought loan from the International Monetary Fund (IMF), while India falls in the category of those countries which provide funds to IMF so that they can help poor countries.

Shri Rajnath Singh reasserted that no unwarranted action should be taken from across the border, which is the base of the understanding reached between the two countries. He reiterated Prime Minister Modi's views that terrorism & talks cannot go together, and if talks are held, it will only be on terrorism and PoK.

Raksha Mantri paid homage to the innocent civilians who were killed in a terror attack in Pahalgam, and the soldiers who made the supreme sacrifice in the service of the motherland during Operation Sindoor. He commended the courage of the injured soldiers and wished for their speedy recovery.

Shri Rajnath Singh expressed gratitude to the brave soldiers who destroyed the Pakistani posts & bunkers across the border, sending a clear message to the enemy. "I come here today with a message from the people of India: 'We are proud of our Forces'," he added.

While Raksha Mantri praised the valour and dedication of the Armed Forces, he reiterated the Government's commitment to continue equipping the soldiers with advanced weapons & platforms and modern infrastructure.

"Our Government has ensured that our forces are prepared for every situation. Many new generation equipment like modern rifles, missile defence shields, and drones are being rapidly manufactured in India itself. Connectivity has been ensured along LoC and LAC like never before. The devotion and readiness with which our soldiers serve the country, the government is trying to serve you," he said.

Shri Rajnath Singh added that the Government and the people of the country stand shoulder-to-shoulder with the Armed Forces at every step, in every situation. He exuded confidence that with the cooperation of the military, India will soon eradicate terrorism in the region, so that no one dares to cast an evil eye on the sovereignty of the nation.

Lieutenant Governor of Jammu & Kashmir Shri Manoj Sinha, J&K Chief Minister Shri Omar Abdullah, Chief of the Army Staff General Upendra Dwivedi and other senior officials of the Indian Army were present on the occasion.

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Defence Minister Rajnath Singh to visit Bhuj Air Force Station today

Source: The Economic Times, Dt. 16 May 2025,
URL: https://economictimes.indiatimes.com/news/defence/defence-minister-rajnath-singh-to-visit-bhuj-air-force-station-today/articleshow/121200386.cms

Defence Minister Rajnath Singh is set to visit the Bhuj Air Force Station in Gujarat on Friday, a day after concluding his visit to the Badami Bagh Cantt in Jammu and Kashmir's Srinagar, where he met and interacted with Indian Army soldiers.

Defence Minister Singh, during his visit to Srinagar, highlighted India's firm stance against terrorism, evident in its refusal to be intimidated by Pakistan's repeated nuclear threats, which have been issued irresponsibly on several occasions.

In his first interaction with troops after Operation Sindoor at Badami Bagh Cantt, he said that Operation Sindoor has sent a loud and clear message to the terrorist organisations hiding in Pakistan and their masters that they are not safe anywhere.

"Our forces have shown the world that their aim is precise and pinpoint, and the task of counting is left to the enemies," he said.

"I raise this question before the world: Are nuclear weapons safe in the hands of such an irresponsible and rogue nation? Pakistan's nuclear weapons should be taken under the supervision of the International Atomic Energy Agency (IAEA)," he added.

Singh also expressed gratitude to the brave soldiers who destroyed the Pakistposts & bunkers across the border, sending a clear message to the enemy. "I come here today with a message from the people of India: 'We are proud of our Forces'," he added.

Singh reasserted that no unwarranted action should be taken from across the border, which is the base of the understanding reached between the two countries. He reiterated Prime Minister Narendra Modi's views that terrorism and talks cannot go together, and if talks are held, it will only be on terrorism and PoJK.

The Defence Minister paid homage to the innocent civilians who were killed in a terror attack in Pahalgam and the soldiers who made the supreme sacrifice in the service of the motherland during Operation Sindoor. He commended the courage of the injured soldiers and wished for their speedy recovery.

Lieutenant Governor of Jammu and Kashmir Manoj Singh, J-K Chief Minister Omar Abdullah, Chief of the Army Staff General Upendra Dwivedi and other senior officials of the Indian Army were present on the occasion.

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DG of Israeli Defence Ministry speaks to Defence Secretary, lauds Operation Sindoor: MoD

Source: The Economic Times, Dt. 15 May 2025,
URL: https://economictimes.indiatimes.com/news/defence/dg-of-israeli-defence-ministry-speaks-to-defence-secretary-lauds-operation-sindoor-mod/articleshow/121194101.cms

The director general of Israel's Ministry of Defence Maj Gen (Res) Amir Baram on Thursday spoke with Defence Secretary Rajesh Kumar Singh, extending Israel's full support to India's "rightful fight against terrorism" while lauding the "success of Operation Sindoor", officials said. The Indian Ministry of Defence shared the information in a post on X.

Both sides also reaffirmed their commitment to "deepen bilateral" defence ties and discussed a "future road map" to further strengthen strategic cooperation, officials said.

"DG, Israel Ministry of Defence Maj Gen (Res) Amir Baram today spoke with Defence Secretary Shri Rajesh Kumar Singh, extending Israel's full support to India's rightful fight against terrorism while lauding the success of #OperationSindoor," it posted on X.

Indian armed forces carried out precision strikes on nine terror targets in Pakistan-occupied Kashmir (PoK) and Pakistan on May 7 under Operation Sindoor, in retaliation for the April 22 Pahalgam terror attack.

In the post, the Ministry of Defence also said, "Both sides reaffirmed their commitment to deepen bilateral #defenceties and discussed a future roadmap to further strengthen strategic cooperation. #IndiaIsrael #DefencePartnership #OpSindoor #CounterTerrorism".

Ambassador of Israel to India, Reuven Azar, in a post on X on May 7, said, "Israel supports India's right for self defense. Terrorists should know there's no place to hide from their heinous crimes against the innocent. #OperationSindoor".

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Indian Army conducts successful 'Teesta Prahar' in Teesta field firing range

Source: The Economic Times, Dt. 15 May 2025,
URL: https://economictimes.indiatimes.com/news/defence/indian-army-conducts-successful-teesta-prahar-in-teesta-field-firing-range/articleshow/121185241.cms

The Indian Army carried out a large-scale integrated field exercise titled 'Teesta Prahar' at the Teesta field firing range on Thursday, showcasing its operational readiness and coordination among combat and support arms in riverine terrain, according to a Defence PRO statement.

The exercise witnessed active participation from key combat and support arms, including the Infantry, Artillery, Armoured Corps, Mechanised Infantry, Para Special Forces, Army Aviation, Engineers, and Signals.

A key highlight of the drill was the deployment and validation of newly inducted next-generation weapon systems, military platforms, and advanced battlefield technologies, as a part of the Indian Army's emphasis on modernisation.

In addition, the exercise emphasised jointness, synergy, and seamless coordination, reinforcing the Army's ability to operate swiftly and effectively across varied terrain and adverse weather conditions. The statement further said it featured tactical drills, battle rehearsals, and adaptive manoeuvres aimed at refining responses to dynamic combat scenarios.

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Army chief visits forward areas in J&K, lauds troops for their role in Op Sindoor

Source: The Indian Express, Dt. 16 May 2025,
URL: https://indianexpress.com/article/india/army-chief-visits-forward-areas-in-jk-lauds-troops-for-their-role-in-op-sindoor-10009152/

Army Chief General Upendra Dwivedi Thursday lauded soldiers for their stellar role during Operation Sindoor during his visit to forward locations in Srinagar, Uri and Unchi Bassi, including the Dagger Division of Chinar Corps Thursday.

As per Army sources, apart from operational review, the visit also focused on saluting the courage and spirit of troops from all arms and services who played a pivotal role in thwarting Pakistani aerial and ground attacks.

They added that the Chief of Army Staff praised their “collective grit, high morale, and seamless coordination in countering multiple threat vectors.”

General Dwivedi, sources said, commended their “valour, josh (spirit), and unwavering vigilance” in dominating the LoC during intense engagements, while lauding their precise actions which helped destroy terror sites in Pakistan-occupied Jammu & Kashmir — a key operational success under Operation Sindoor.

He is also learnt to have appreciated the role played by troops in providing relief and assistance to civilians affected by Pakistan’s unprovoked cross-LoC shelling.

Festive offer Army chief visits forward areas in J&K, lauds troops for role in Op Sindoor Chief of Army Staff General Upendra Dwivedi during his visit to the forward locations on Thursday. (PTI)

General Dwivedi emphasised the Army’s legacy of honour and its readiness to meet any future challenge with decisive force, while reaffirming the Army’s resolve to safeguard national sovereignty and maintain a state of high operational readiness in the evolving threat environment.

Sources said the visit significantly lifted morale and reinforced the deep bond between the Army leadership and the rank and file.

“He also interacted with the troops of the IAF and BSF. He complimented their unshakable resolve that successfully defeated multiple attempts of the enemy to target the vital assets within the two establishments,” the Army said on X, adding that the Army Chief also thanked the civil administration for cooperation.

General Dwivedi said the bravery, courage and selfless dedication of the point air defence gun crews of the L-70 and Zu-23 guns of the Army Air Defence, which effectively thwarted Pakistan’s aerial attacks, will always be remembered with pride.

Gen Dwivedi is likely to address senior officers at various headquarters virtually this week, sources said.

The Indian Express had reported that the Army’s air defence equipment, along with the IAF, had played a key role in countering Pakistan’s aerial attacks during Operation Sindoor.

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Lt Gen Sengupta visit to IIT-K to strengthen army-academia tie-up

Source: Hindustan Times, Dt. 16 May 2025,
URL: https://www.hindustantimes.com/cities/lucknow-news/lt-gen-sengupta-visit-to-iit-k-to-strengthen-army-academia-tieup-101747331187242.html

Lieutenant General Anindya Sengupta, general officer commanding-in-chief (GOC-in-C), Central Command, on Thursday visited Indian Institute of Technology, Kanpur (IIT-K) as part of an initiative to strengthen collaboration between the Indian Army and the academic research community.

The visit, which came amidst India-Pakistan tensions, featured demonstrations of ongoing research, particularly in advanced robotics -- including quadruped and rotary systems -- as well as developments in metamaterials with potential defence applications.

Start-ups incubated at the IIT-K, including Terraqua UAV, Aethrone Aerospace, and Nitrodynamics Private Limited, presented their indigenous technological solutions tailored to India's defence ecosystem.

Commending the research underway at the institute, Lt Gen Sengupta said: "It is heartening to witness the depth of scientific inquiry and innovation here. Collaborations like these are vital for strengthening indigenous defence capabilities. The armed forces are keen to support and engage with academia in finding scalable, practical solutions."

The army commander also toured key research centres at the institute, including those focused on cybersecurity, intelligent systems, vertical take-off and landing (VTOL) technology, and unmanned aerial vehicles (UAVs).

According to IIT-K director Prof Manindra Agrawal, the institute has focused extensively on deep-tech innovation in recent years in areas such as intelligent systems, cybersecurity, drones, and robotics. "These are domains of increasing relevance to defence. We believe that through sustained dialogue and joint ventures, academic research can serve as a powerful catalyst for national security," he added.

Also present on the occasion were the nodal faculty incharge of the Indian Army Cell at IIT-Kanpur, officials from DRDO's DIA-CoE, and the dean of research and development.

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India's precision strikes and drones achieved two-fold goal

Source: Hindustan Times, Dt. 16 May 2025,
URL: https://www.hindustantimes.com/india-news/indias-precision-strikes-and-drones-achieved-twofold-goal-101747336895135.html

India resorted to a mix of precision strikes with drones targeting key Pakistani security and intelligence facilities and attacks with heavier long-range weapons such as the BrahMos cruise missile on terrorist and military infrastructure during Operation Sindoor, people familiar with the matter said on Thursday, adding that the purpose was twofold.

The drone strikes carried out in the initial stage, particularly on May 8, that targeted important military installations were meant to signal the reach of the weaponry of the armed forces. The use of heavier weaponry, particularly the BrahMos missile, which has a range of about 450km for the air-launched version and about 800km for the land version, was meant to inflict greater damage on terrorist infrastructure and military facilities, the people said on condition of anonymity.

Among the locations that were targeted with drones in the strikes on May 8 were the Pakistan Army's General Headquarters, the Strategic Plans Division (SPD) and a wing of the Inter-Services Intelligence (ISI) dealing with Kashmir in Rawalpindi, the residence of the army's corps

commander in Lahore in Punjab province, and a few locations within Malir cantonment in Karachi in Sindh province, the people said.

To be sure, the drone strikes didn't cause widespread damage and were carried out more to demonstrate the reach of the weaponry of the armed forces, the people said.

Several of these strikes – such as the ones in Rawalpindi on the army's General Headquarters, the Strategic Plans Division, and the Joint Intelligence-North wing of the ISI, which deals with Kashmir, and on the National Defence Complex (NDC) in Attock district, which builds transporter-erecter-launcher vehicles for missiles, saw the drones hitting the periphery of the complexes, the people said.

According to reports in the Pakistani media, at least one person was killed in a drone strike near the cricket stadium in Rawalpindi, which is adjacent to the ISI facility, while another person was killed in a drone strike in Attock in the area where the NDC complex is located.

The BrahMos missile was used in the strike on the Jaish-e-Mohammed (JeM) complex at Bahawalpur in Punjab province on May 7, when India targeted terrorist infrastructure at nine locations in Pakistan and Pakistan-occupied Kashmir (PoK), the people said.

The JeM base was among the first few targets struck on May 7 and it was targeted with the "most potent weapons available" with India's armed forces, one of the people cited above said. The BrahMos missiles were also used to target eight Pakistani airbases, including the Nur Khan airbase in Rawalpindi and the Bholari airbase at Jamshoro district of Sindh province, the people said.

The people declined to go into the details of these strikes but most of the information available in the open domain appeared to suggest that the air-launched version of the missile was used in these strikes. Experts who analysed a video that was posted on social media of the May 7 strikes on Bahawalpur also said that the impact appeared to have been caused by a powerful missile.

India launched Operation Sindoor on May 7 by targeting terrorist infrastructure at nine locations linked to groups such as the JeM, Lashkar-e-Taiba (LeT) and Hizbul Mujahideen. This triggered four days of strikes and counter-strikes with drones, missiles and long-range weapons before the two sides reached an understanding on stopping firing and military actions on May 10.

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How India's missile message to Pakistan may echo in China's weapons market

Source: The Economic Times, Dt. 15 May 2025,
URL: https://economictimes.indiatimes.com/news/defence/how-indias-missile-message-to-pakistan-may-echo-in-chinas-weapons-market/articleshow/121188546.cms

Pakistan's reliance on the Chinese-made HQ-9 air defence missile system faced a major credibility crisis after it failed to intercept any Indian aerial incursions during India's recent cross-border operation.

The system, considered a budget-friendly rival to the US Patriot and Russia's S-300, did not manage to identify or engage a single Indian aircraft or missile during the high-stakes confrontation.

The HQ-9's performance raised serious red flags among military analysts and prospective foreign buyers. Rather than delivering the advertised multi-layered protection, the system appeared ineffective against India's precision strikes. The issues may stem from broader flaws in detection systems, missile launch response times, or engagement protocols—problems far beyond a mere technical glitch.

India sidesteps Chinese tech

India revealed that its Air Force avoided Pakistani air defences altogether using sophisticated jamming and electronic warfare strategies.

Indian aircraft successfully executed strikes against multiple terror-linked targets inside Pakistan-controlled territory, all within a 23-minute window, without entering Pakistani airspace.

Government statements stressed that India's homemade air defence network played a critical role, especially during Pakistan's retaliatory attempts involving missile and drone attacks. While Pakistan depended heavily on imported tools, India's strategic use of its own technology and superior coordination outmatched every incoming threat.

Pakistan's arsenal becomes China's embarrassment

The operational breakdown of Chinese-supplied equipment has cast a shadow over Beijing's status as an emerging defence exporter.

A significant portion of Pakistan's military inventory—nearly four-fifths—comes from China. However, the systems deployed during this conflict, including long-range PL-15 missiles and HQ-9 batteries, fell short of expectations.

Of particular concern was the failure of the PL-15 missile, fired from Chinese-supplied J-10C fighters. These missiles, which China touts as capable of rivalling the American AIM-120D, missed their intended targets or malfunctioned mid-flight.

Blow to China's export prospects

The poor performance of Chinese hardware didn't just stay on the battlefield—it reverberated through stock markets.

Defence-sector stocks in China dropped as much as 9%, erasing recent gains driven by anticipated sales boosts amid India-Pakistan tensions. As satellite imagery and confirmed reports about the failures trickled in, investor confidence in China's arms industry took a hit.

Nations in Africa, the Middle East, and parts of Southeast Asia that had considered purchasing Chinese systems like the HQ-9 may now reevaluate their options.

The weapons that looked viable on paper have proven unreliable under fire—at a time when many buyers prioritise combat-tested reliability over cost.

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Why does Pakistan buy defective Chinese weapons?

Source: The Economic Times, Dt. 15 May 2025,
URL: https://economictimes.indiatimes.com/news/defence/why-does-pakistan-buy-defective-chinese-weapons/articleshow/121184183.cms

Pakistan's recent acquisition of Chinese-made weapons like the HQ-9 air defence system and PL-15 missiles points at a significant shift in the country's defense procurement strategy. While the US and Europe remain important suppliers of military technology to Pakistan, the growing reliance on China marks a new phase in Pakistan's defense modernization, However, this shift is not without challenges.

In 2022, Pakistan, the largest importer of Chinese military equipment, found that at least four Chinese frigates, F-22P commissioned in July 2009, were giving nightmares to Pakistani Navy officers, as per a report in Geopolitica. Three of these frigates were bought from the China Shipbuilding Trading Company, while one was built at the Karachi Shipyard and Engineering Works on the basis of a technology transfer from the Chinese company. These included defects in on-board imaging device of the missile system, infra-red sensor system and SR 60 radars, and low engine speed caused by high turbocharger exhaust temperatures, the report said. Defective critical components and poor service from Chinese manufacturers have forced the Pakistani Navy to operate these four frigates with degraded operational capabilities.

Defective performance is the price Pakistan pays for buying cheap Chinese military equipment for financial and geopolitical reasons. No wonder, its HQ-9 air defence system procured from China failed during Operation Sindoor to protect from onslaughts of Indian missiles which struck nine sites of terror infrastructure such as the Muridke headquarters of Lashkar-e-Taiba with pinpoint accuracy as well as more than a dozen air bases where before and after satellites images provided by Indian military show precise hits on high-value targets. Similarly, Pakistan's PL-15 air-to-air missile too failed to hit targets, as shown by the Indian military. Its Chinese-made J-10C fighter jets, which various source-based reports claim downed a few of India's more advanced jets, actually failed to deter India's massive air offensive nor could hit inside India.

A RAND report highlighted risks of Chinese military exports

A report published two years ago by American think tank RAND Corporation, with close ties to the Pentagon, said China's defense industry had exported malfunctioning and defective military equipment in recent years — leaving countries short of what's needed for their security while also draining military budgets.

Citing examples of faulty fighter jets sold to Nigeria and Myanmar and Pakistan's malfunctioning Chinese equipment, the report by Cindy Zheng said, "China attracts customers for its military equipment with cut-rate pricing and financing, but there are hidden costs—especially when gear malfunctions. A lack of technological compatibility with the Chinese military equipment can prove particularly expensive. Countries often do not have the personnel with the expertise and training to resolve issues. They also can have difficulty acquiring replacement parts.

"Chinese suppliers have demonstrated little accountability for maintenance or repair. That has pushed some countries to recruit help from third countries. For instance, the Myanmar military forged partnerships with Pakistani technicians to solve its technical problems with the JF-17. Delays in getting equipment working can significantly slow down recipient countries' military modernization timeline," the report said.

The allure of Chinese military equipment

The primary reason why countries like Pakistan increasingly purchase Chinese-made weapons is cost. In a world where defence budgets are often limited, the financial burden of procuring military technology can be overwhelming. Chinese systems, including air defence systems, fighter jets and missiles, are often significantly cheaper than equivalent systems from the US, Europe or Russia. This affordability is particularly appealing to nations with limited defense spending power.

Beyond the lower upfront costs, China also offers easier financing options. Countries that are unable to immediately fund large defense procurements can benefit from loans, extended payment plans, or deferred payments offered by Chinese defense manufacturers. These financing terms allow countries to procure advanced weapons without the immediate financial strain that would come from Western or Russian alternatives, which often require substantial upfront payments or have more restrictive credit terms. For Pakistan, for example, which has faced financial instability and external pressure due to its military expenditures, Chinese military deals are appealing because they allow the country to modernize its defense systems without putting a significant strain on its economy. This is a stark contrast to Western suppliers like the US or European nations, which often impose stringent conditions and have been reluctant to offer financing that is as favorable as what China provides.

Another RAND report in 2022 found that during 2018–2021 as many as 48 countries received Chinese weapons or private security contractors during, including 14 countries that received both. The research showed that these were smaller countries in Asia, Africa and Latin America. "Its largest customers are in South Asia and Africa, though it has also made a push into South America. China has also benefited as countries in the Middle East and North Africa have sought to reduce their dependency on Western military suppliers. Soft power and image-building are China's major motivators in these regions, setting the foundation for ties in the same way that its Belt and Road infrastructure projects do," the previously cited RAND report said.

The report went on to say that China fills the gap where bigger countries go missing. "China also isn't particularly discerning in who it will or won't sell to. Its arms deals have few political contingencies involved. In Africa, sales appear driven by profit and trying to grab market share from Russia. If a country worries its human rights records, financial credibility, or regime stability might harm its eligibility to purchase military equipment from Western suppliers, China is always an option," the report said.

However, the low quality of Chinese military equipment did bring down its arms exports. As per data from the Stockholm International Peace Research Institute, there was a 23 percent decrease in China's arms exports between the four-year periods of 2013–17 and 2018–22. "Affordability will remain an issue for developing countries looking to bolster their hardware and supplies. They also may have few alternatives. But if recipient countries continue to view Chinese military equipment

as unreliable long term, or find training and maintenance contracts lacking, they may not want to become completely dependent on Chinese suppliers," the RAND report said.

The appeal of Chinese military systems lies primarily in their affordability and financing terms. For smaller countries, these systems offer a way to modernize their forces without the crippling financial burden posed by more advanced Western or Russian alternatives. The HQ-9 and PL-15, while not as reliable or sophisticated as the U.S.-made Patriot or Aegis air defense systems, or the Meteor missile systems from Europe, represent an affordable path to keeping pace with regional military developments.

Smaller nations, especially those like Pakistan, which find themselves in volatile geopolitical environments, may choose to take this risk because the immediate financial benefits far outweigh the concerns about long-term reliability. In the case of Pakistan, the broader China-Pakistan strategic partnership and easy financing options provided by China make the acquisition of Chinese systems like the HQ-9 and PL-15 appealing, even if these systems are not as tested or dependable as their Western or Russian counterparts.

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सर्वत्र इज्जत–ओ–इकबाल: स्वदेशी फील्ड गन ने LoC पर सिखाया पाकिस्तान को सबक

Source: NavBharat Times, Dt. 15 May 2025,
URL: https://navbharattimes.indiatimes.com/india/indian-army-indigenous-artillery-rains-fire-on-pakistan-across-loc-targeting-terrorist-launchpads/articleshow/121193344.cms

सर्वत्र इज्जत–ओ–इकबाल (हर जगह सम्मान और गौरव के साथ), ये भारतीय सेना की आर्टिलरी रेजिमेंट का आदर्श वाक्य है। इसी आदर्श वाक्य के साथ लाइन ऑफ कंट्रोल पर आर्टिलरी रेजिमेंट की तोपों ने पाकिस्तान पर कहर बरसाया। इंडियन आर्म्ड फोर्सेस ने जब 6–7 मई की रात ऑपरेशन सिंदूर लॉन्च किया उसके कुछ वक्त बाद से ही पाकिस्तानी सेना ने लाइन ऑफ कंट्रोल पर ताबड़तोड़ गोले बरसाना शुरू कर दिया। जिसका जवाब भारतीय सेना ने करारा दिया। भारतीय सेना की स्वदेशी 105 एमएम फील्ड गन ने पाकिस्तानी पोस्ट को ही निशाना नहीं बनाया बल्कि आतंकी लॉन्च पैड पर भी गोले दागे। 10 मई की शाम पांच बजे से फायरिंग रोकने के लिए दोनों देशों के बीच समझौता हुआ और उससे पहली रात तक लगातार एलओसी पर गोलीबारी होती रही थी।

स्वदेशी फील्ड गन ने किया काफी तनाव

भारतीय सेना के पास जो फील्ड गन हैं वे स्वदेशी हैं। इसका एम्युनिशन भी स्वदेशी है। फील्ड गन की रेंज 17 किलोमीटर है। एलओसी पर भारतीय सेना की पोजिशन और पाकिस्तानी सेना की पोजिशन बहुत ज्यादा दूर नहीं है। 7 किलोमीटर से लेकर 11–12 किलोमीटर के दायरे में पाकिस्तान की सारी पोस्ट आ जाती हैं। इसलिए भारतीय सेना की तरफ से सबसे ज्यादा फील्ड गन का इस्तेमाल किया गया। ये फील्ड गन हल्की होने की वजह से ऊंचाई वाली जगह के लिए मुफीद हैं। हल्की होने की वजह से ईस्टर्न लद्दाख में भी चीन के साथ तनाव के वक्त सबसे ज्यादा 105 एमएम तोपें ही तैनात की गई थी। वैसे भारतीय सेना में मिडियमाइजेशन की प्रक्रिया चल रही है यानी सभी आर्टिलरी गन (तोप) 155 एमएम कैलिबर की करने पर काम हो रहा है। लेकिन 105 एमएम की फील्ड गन अभी भी बेहद अच्छा कर रही हैं।

फील्ड गन के अलावा ये भी हथियारभारतीय सेना के पास फील्ड गन के अलावा 130 एमएम की गन भी हैं, लेकिन ये संख्या में कम हैं। 155 एमएम की बोफोर्स गन, धनुष और एम–777 भी एलओसी पर तैनात हैं। बोफोर्स गन स्वीडन से ली थी। इसकी रेंज 30 से 34 किलोमीटर है। 1999 के कारगिल युद्ध में इसने महत्वपूर्ण भूमिका निभाई। इसकी सटीकता और पहाड़ी क्षेत्रों में प्रभावशीलता इसे खास बनाती है। धुनष की रेंज 27 से 36 किलोमीटर है। इसकी खासियत है उच्च सटीकता, मैदानी और पहाड़ी इलाकों में प्रभावी है। M777 अल्ट्रा–लाइट हॉवित्जर की रेंज 32 से 40 किलोमीटर है। चिनूक हेलिकॉप्टर से भी एक जगह से दूसरी जगह पहुंचाई जा सकती है। पहाड़ी इलाकों में तेजी से तैनात की जा सकती है।

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India makes significant pledges at UN peacekeeping Ministerial in Berlin

Source: The Tribune, Dt. 15 May 2025,
URL: https://www.tribuneindia.com/news/india/india-makes-significant-pledges-at-un-peacekeeping-ministerial-in-berlin/

India, which is among the largest troop contributing countries to UN peacekeeping, has made key pledges at a peacekeeping ministerial meeting, including a quick reaction force company and one women-led formed police unit (FPU).

India pledged a Quick Reaction Force company, an armed police or mixed armed police unit, one women-led Formed Police Unit and a counter-improvised explosive devices/explosive ordnance disposal unit as well as a K-9 unit and a SWAT police unit, the UN Department of Peace Operations said in a post on X. “Thank you India for your support”, UN peacekeeping said.

The United Nations peacekeeping ministerial 2025 concluded in Berlin, Germany Wednesday. More than 130 member states and international partners – over a thousand participants in total – came together to reaffirm their support for UN peacekeeping and to announce concrete pledges aimed at enhancing the effectiveness and adaptability of peace operations in the face of evolving global challenges. A total of 74 member states made pledges.

“In troubled spots around the world, Blue Helmets can mean the difference between life and death. Now more than ever, the world needs the United Nations. And the United Nations needs peacekeeping that is fully equipped for today's realities and tomorrow's challenges,” United Nations Secretary-General António Guterres said in his opening remarks at the ministerial meeting on ‘Future of Peacekeeping'.

Guterres said that the international community owes it to peacekeepers — and the populations they protect — to continue strengthening their ability to answer the call to peace and to do so in the face of daunting challenges, such as complex, intertwined and frequently borderless conflicts; growing polarisation and division around the globe; terrorism and transnational crime, which find fertile ground in instability and the ongoing climate crisis that is exacerbating conflict while leaving more of the planet uninhabitable.

Guterres underscored the need for shaping peacekeeping operations that are fit for the future and making peacekeeping operations more adaptable and flexible.

Hosted by the Government of Germany, the two-day high-level meeting marked a significant milestone in the ongoing efforts to strengthen Member State support and help shape the future of UN peacekeeping. The Ministerial focused on the Future of Peacekeeping, reflecting the need for innovative approaches to address complex conflicts, leverage emerging technologies, and address threats such as mis- and disinformation, a press release by UN Peacekeeping said.

Guterres welcomed member states' political statements of support for peacekeeping as well as their pledges of military and police capabilities, new partnerships and technological support. “This meeting is also about something more fundamental: the future of peacekeeping itself,” Guterres added.

German minister of Foreign Affairs Johann Wadephul said in the statement released by UN Peacekeeping that “in an interconnected world, no nation can achieve peace and security for its citizens on its own.

“We all agree that setting up strong and effective peacekeeping missions is our joint responsibility. We want to tailor future missions to the exact needs of the host countries and increase their acceptance and effectiveness. This is the way forward in a world in which peacekeeping is more important now than ever before, but where the challenges are greater than at any time in the past,” he said.

Key outcomes of the peacekeeping ministerial included 53 member states pledging uniformed capabilities, including 88 military and police units, as well as various critical capabilities, airlift, individual experts, staff officers and individual police officers.

Fifty-nine member states pledged specialised training on critical issues such as peacekeeping-intelligence, protection of civilians, gender and the prevention of sexual exploitation and abuse; 18 member states made pledges related to technological advancements and data-driven approaches to improve mission effectiveness.

Thirty-eight member states made pledges to further implement the Women, Peace and Security agenda, including gender-responsive peacekeeping and women in peacekeeping. Sixteen member states pledged capabilities and projects to enhance the safety and security of peacekeepers. Eleven member states made pledges related to the conduct and accountability of peacekeepers and UN peacekeeping's fight against sexual exploitation and abuse.

“This response includes targeted contributions to the Trust Fund for victims and eight member states made pledges to support the UN's strategic communications efforts and contribute resources to strengthen information integrity.

India ranks among the top contributors to UN peacekeeping missions with 5,384 personnel, including 153 women, across 10 missions as of September 2024. Nearly 180 Indian peacekeepers have been killed in action, the highest number by far from any troop-contributing country. India deployed the first all-female FPU to Liberia in 2007.

The Berlin Ministerial is part of a series of high-level meetings aimed at galvanising political support and generating tangible commitments to improve UN peacekeeping. It follows previous Ministerial meetings held in Accra (2023), Seoul (2021), New York (2019) Vancouver (2017) and

London (2016). The 2025 Ministerial also coincides with the 80th anniversary of the UN and the 10-year anniversary of the Leaders' Summit on Peacekeeping.

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Rs 50,000 Crore Boost For India's Military After Operation Sindoor: Sources

Source: NDTV, Dt. 16 May 2025,
URL: https://www.ndtv.com/india-news/india-defence-budget-increased-rs-50000-crore-operation-sindoor-india-pakistan-news-8426848

India's defence budget may get a Rs 50,000 crore boost as a result of Operation Sindoor, government sources told NDTV Friday morning. The boost, which will likely be provided through the supplementary budget, will take overall defence allocation past Rs 7 lakh crore, source said.

A record Rs 6.81 lakh crore had been set aside for the armed forces in the 2025/26 budget presented by Finance Minister Nirmala Sitharaman on February 1. This year's allocation was already a significant 9.2 per cent increase from the Rs 6.22 lakh crore in 2024/25.

The increased budget - approval for which will be sought in Parliament's Winter Session - will likely be used for research and development, and the purchase of weapons, ammunition, and other necessary equipment, sources told NDTV.

Defence has been a focus of the Narendra Modi administration since 2014; the Defence Ministry had been given Rs 2.29 lakh crore in 2014/15, the first year of the BJP government.

The current allocation is the highest of all ministries and is 13 per cent of the total budget.

India's defence readiness and the (likely) increased budget allotment comes amid continuing tension with Pak, particularly after the April 22 Pahalgam terror attack and India's military response - Operation Sindoor - that targeted terror camps in Pak and Pak-occupied Kashmir.

Op Sindoor spotlighted the Indian military's potent synergy - tactical astuteness wed to advanced air defence systems comparable to Israel's famed 'Iron Dome'. The spotlight has also been on homegrown elements in that network, including the Akash missile defence system.

Since then the armed forces have also tested Bhargavastra - a new, low-cost, counter-drone system in 'hard kill' mode. The micro-rockets used in this system underwent rigorous testing at the Seaward Firing Range in Gopalpur in Odisha this week, and the test met all objectives.

NDTV, meanwhile, spoke to Dr Prahlada Ramarao, a former Defence Research and Development Organisation scientist who developed the Akash system, which can intercept even highly manoeuvrable aircraft like the United States-made supersonic F-16 fighter jets, which are among those Pak pilots fly.

Dr Ramarao told NDTV his tagline for Akash is 'sara akash hamara', or 'the whole sky is ours'.

In the aftermath of the 100-hour India-Pak 'war', Defence Minister Rajnath Singh pushed for greater domestic production of defence equipment, arguing it is the long-term solution.

"If we buy defence equipment from other countries, it means we are outsourcing it and leaving our security in the hands of someone else. This cannot be a long-term solution."

The Pahalgam Attack And Op Sindoor

Terrorists from a proxy of the Pak-based Lashkar-e-Taiba killed 26 people, many civilians, in the Jammu and Kashmir tourist hotspot last month, triggering outrage.

After an initial raft of non-military measures, including suspending the critical Indus Waters Treaty, India launched Op Sindoor - precision air strikes at nine terror camps in Pak and Pak-occupied Kashmir.

The Pak Army, told their bases would not be hit and warned against retaliating, responded by firing a barrage of drones and missiles at Indian military facilities and civilian population centres. Most of these were either shot down or neutralised by India's advanced air defence network, which includes the indigenously-developed Akash and the Russian-made S-400.

India then countered by launching further precision strikes, destroying Pak radar systems and damaging Pak Air Force bases, prompting Islamabad to reach out for a ceasefire.

On Monday, in his first speech since Op Sindoor, Prime Minister Narendra Modi put terrorists in Pak, which supports and funds terror activities, on notice, saying India would strike again to protect its territory and citizens, and that Delhi's doctrine on terror had forever changed.

Mr Modi also said India would not talk to Pak on Kashmir except to disable terrorist infrastructure in that country and arrange for the return of illegally occupied Kashmir.

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The race to build the fighter planes of the future

Source: Hindustan Times, Dt. 15 May 2025,
URL: https://www.hindustantimes.com/science/the-race-to-build-the-fighter-planes-of-the-future-101747271254228.html

“THERE’S NEVER been anything even close to it—from speed to manoeuverability…to payload,” gushed Donald Trump, as he announced on March 21st that America’s future fighter jet, the F-47, would be built by Boeing, an aerospace giant. The jet is one of several so-called sixth-generation aircraft on drawing boards around the world.

In December China showed off what was believed to be a prototype of the J-36, an imposing plane with stealthy features and a large flying-wing design. Britain, Italy and Japan are co-developing their own plane, in Britain provisionally called the Tempest, which is due to enter service in 2035. France, Germany and Spain hope that their Future Combat Air System (FCAS) will be ready by 2040. Together, these represent the future of aerial warfare.

Fighter jets tend to be categorised by their age, features and sophistication. The first generation appeared in the 1940s and 1950s. Many of those in NATO service today, like America’s ubiquitous F-16, are fourth-generation ones, built from the 1970s to the 1990s. The latest fifth-generation

planes, such as the F-35 and F-22, the latter perhaps the leading fighter jet in operation today, tend to enjoy stealth, the capacity for sustained supersonic flight and advanced computer systems.

By comparison with earlier planes, the sixth generation of jets all have one thing in common—they're big. Early images of the F-47 have been heavily obscured and edited, and might bear little resemblance to the final plane. But photos of the J-36 and models of the Tempest (pictured) indicate aircraft far larger than the fourth-generation Chinese J-20 and European Typhoon or fifth-gen American F-35 and F-22. The similarity suggests that all these countries have similar prognoses about the future of war in the air.

One shift they all predict is more, and better, surface-to-air missile systems, a lesson reinforced by the strong performance of air-defences in Ukraine. That requires more stealth to keep planes hidden from enemy radar. Stealth, in turn, requires smooth surfaces—bombs and missiles cannot hang off the wing, but must be tucked away inside a larger body.

Keeping their distance

A second shift is in the increasing range of air combat. For the past 40 years, the proportion of air-to-air kills that occur "beyond visual range" has grown steadily—from a tiny fraction of all in the 1970s to more than half between 1990 and 2002. Since then air-to-air missiles have been able to travel ever farther. Europe's Meteor, with a 200km range, was at the forefront of technology when it was first tested a decade ago. America's AIM-174B and China's PL-17 can now hit things 400km away. That means planes need better sensors to spot and fire at targets from farther away; they also need better electronic warfare equipment to parry incoming threats. These technologies require more space to generate power and remove all the heat that electronics tend to produce.

Finally, planes are especially vulnerable to long-range missiles when they are on the ground. That means they need to fly from more distant airfields, requiring larger fuel tanks and less drag for more efficient flight. The huge wings seen on the Tempest and the J-36 allow for both those things, notes Bill Sweetman, an aviation expert. Range is a particular concern for America. Its airbases in Japan are within reach of vast numbers of Chinese ballistic missiles. It plans to disperse its planes more widely in wartime and to fly them from more distant runways, such as those in Australia and on Pacific islands.

Long-range planes are appealing for several reasons. "We're talking about really extreme ranges," notes Group Captain Bill, the Royal Air Force (RAF) officer in charge of thinking through how the service will use the Tempest, speaking recently (without his surname) on the "Team Tempest" podcast, which is produced by the consortium building the aircraft. The plane will need to be able to cross the Atlantic Ocean on a single tank of fuel, he says, a journey that would require today's Typhoon jet to be refuelled three or four times. One reason for that might be that big refuelling tankers, which once sat safely to the rear of the front line, are increasingly vulnerable to new air-to-air missiles, like China's PL-17. Another is that the Tempest could then take circuitous routes, avoiding Russian air defences along the obvious paths.

Put all this together and you get planes that look like old-fashioned bombers. Mr Sweetman compares the hulking J-36, with massive wings and cavernous weapon bays, to an "airborne cruiser", optimised for range, stealth and carrying capacity over dogfighting agility. The single

most important requirement for the Tempest is the ability to carry a lot of weapons, says Group Captain Bill, noting that it will have roughly double the payload of the beefiest F-35. That makes sense: if you can deliver more firepower per sortie, you can destroy a target with fewer risky flights into enemy airspace. “The same answers tend to pop up for all,” says Mike Pryce, who has advised Britain’s defence ministry on combat air design. “Stand off, don’t be seen, shoot first, don’t get into a knife fight.”

As the planes get bigger, their insides are also evolving into what are essentially “flying supercomputers”, says Roberto Cingolani, the CEO of Leonardo, an Italian company that is developing the wider Tempest programme along with Britain’s BAE Systems and Japan’s Mitsubishi. Leonardo says that the Tempest will be able to “suck up” a medium-sized city’s worth of data in one second, according to Tim Robinson of the Royal Aeronautical Society. That could include anything from radio traffic to the emissions of air-defence radars. The point is to share that data with friendly forces, including tanks and ships, says Mr Cingolani, perhaps via satellite, with a “central artificial intelligence” making decisions—presumably which targets should be attacked, by what, and when. Some might suggest “that’s science fiction,” he says. “No, that’s a vision.”

Flying together

Perhaps the most contentious design choice is whether sixth-generation planes should have pilots. Elon Musk, Mr Trump’s aide, recently mocked the fact that “Some idiots are still building manned fighter jets.” In practice, most air forces believe that artificial intelligence (AI) and autonomy are not yet mature enough to allow a computer to replace a human pilot entirely; that will take until 2040, reckons the RAF. Images of the F-47, though unreliable guides to the final product, depict “a relatively large bubble canopy”, notes Thomas Newdick of the War Zone, a website, “providing the pilot with excellent vision”. Some missions are particularly sensitive: France will use the FCAS to deliver nuclear weapons, a task that may always remain a human prerogative.

Nevertheless, the prevailing idea is that sixth-generation planes will be the core of a larger “combat air system”, in which a human in the cockpit controls a larger fleet of uncrewed drones, known, in American parlance, as collaborative combat aircraft (CCA). “The concept is that you have an aircraft-carrier that is flying,” says Mr Cingolani. “It’s an entire fleet that moves in the sky and makes decisions.” The human in the cockpit is best described not as a pilot, says Group Captain Bill, but as a “weapons system officer”, the RAF’s term for someone managing sensors and weaponry.

On May 1st America’s air force announced that it had begun ground testing its two CCA prototypes in advance of flight tests later this year. Current order numbers suggest that each F-47 will get two CCAs. The drones might scout ahead, spot targets or carry weapons themselves—all within line-of-sight and under “tight control”, notes Frank Kendall, a former air-force secretary. Much of the intensive computing required to carry out these tasks will need to take place on board the crewed mothership, with relevant data shared to all craft instantaneously, says Mr Cingolani, speaking in the context of the Tempest. He emphasises that the communication links have to be secure. “I’m not sure in ten years we can make it.”

If he and his company can pull it off, it will cost a pretty penny. Mr Kendall, in the Biden administration, paused the development of the F-47 in large part because it was expected to cost

twice as much as the F-35—perhaps as much as $160m-180m apiece—which would mean the government could afford only a small fleet of 200 or so planes. Many in the Pentagon wanted a greater emphasis on building CCAs to complement the existing fleet of F-35s, rather than pouring money into a new platform that might not turn up until long after a war with China.

In Britain, Justin Bronk, an air power expert at the Royal United Services Institute, expresses similar concerns, drawing an analogy with the experimental versus war-winning weapons of the second world war. “Pouring all the money that defence can spare…into a programme that, in the best case, will not deliver a fully operational capability before 2040 feels to me like the UK concentrating all Air Ministry resources on Avro Vulcan development in 1936,” he says, citing a plane that did not appear until a decade after the war was over, “rather than Hurricanes, Spitfires, Blenheims, Whitleys and Wellingtons.”

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Trump floats possible new F-55 warplane and F-22 upgrade

Source: CNN World, Dt. 15 May 2025,
URL: https://edition.cnn.com/2025/05/15/world/trump-f55-fighter-jet-intl-hnk-ml

The United States is examining development of a twin-engined warplane to be known as the F-55, as well as an upgrade to its Lockheed Martin F-22 Raptor called the F-22 Super, US President Donald Trump said on Thursday.

Trump was speaking at a meeting of business leaders including the heads of Boeing and GE Aerospace in Doha, a day after announcing a string of business deals including an order from Qatar for 160 Boeing commercial jets.

Trump referred to the F-55 both as an upgrade to the Lockheed F-35 and a new development in comments that appeared to echo talk by the US arms giant of a “best value” alternative, after losing out to Boeing to replace the F-22 superfighter.

An F-35A Lightning II, known as “Frankenjet” and assigned to the 4th Fighter Generation Squadron, 388th Fighter Wing, returns to Hill Air Force Base on March 26, 2025. The aircraft previously underwent final maintenance at Lockheed Martin’s facility in Fort Worth, Texas, before reentering operational service.

He also highlighted the role of the new air dominance platform called the F-47, recently awarded to Boeing, opens new tab, and said the United States was simultaneously looking at upgrading the stealth fighter that it is designed to replace, the F-22.

“We’re going to do an F-55 and – I think, if we get the right price, we have to get the right price – that’ll be two engines and a super upgrade on the F-35, and then we’re going to do the F-22,” Trump said.

“I think the most beautiful fighter jet in the world is the F-22, but we’re going to do an F-22 Super, and it’ll be a very modern version of the F-22 fighter jet,” he said.

“We’re going to be going with it pretty quickly,” he added.

Trump last month awarded Boeing the contract for the F-47 – a replacement for the Lockheed F-22 stealth fighter featuring a crewed aircraft flanked by a cohort of drones and seen as America's most advanced or sixth-generation fighter.

Lockheed Martin, which lost out to Boeing in that Next Generation Air Dominance (NGAD) competition and was dropped from a separate contest for a new US Navy stealth jet, has said it is now looking at plans for a "fifth-generation-plus" fighter.

CEO James Taiclet told analysts last month that Lockheed was looking at ways of applying technology developed for its losing bid for the F-47 contract to the F-35, delivering 80% of the capability for half the cost.

"We're basically going to take the chassis and turn it into a Ferrari," he told analysts.

A Lockheed spokeswoman said "We thank President Trump for his support of the F-35 and F-22 and will continue to work closely with the Administration to realize its vision for air dominance."

'New aircraft'

Lockheed is separately in the midst of a delayed technology and software upgrade for the existing generation of F-35 strike fighter to boost cockpit displays and processing power.

Analysts said it was not immediately clear how Trump's list of potential developments fitted into known programs and spending plans, or the timing of existing programs.

Agency Partners aerospace analyst Nick Cunningham said the F-55 may alternatively refer to the F/A-XX program, intended to replace the US Navy's aging Boeing F/A-18 Super Hornet fleet with the service's own sixth-generation stealth fighter.

The Navy and Congress are battling with the administration to keep the plans moving forward, Reuters reported on Wednesday. Announcement of a winning bidder had been expected as early as March.

Funding of the radar-evading F-22, which is designed to combat other fighters, has been fiercely debated for years as Congress blocked plans by the Air Force to speed up retirements to focus on the next generation blueprint that became the F-47.

Any significant upgrade to the out-of-production F-22 would be costly, while Trump's reference to two engines implies the F-55 would not be a straightforward derivative of the single-engined F-35 but imply an ambitious new platform, analysts said.

"Adding an engine to the F-35 makes it a new aircraft," UK-based defense analyst Francis Tusa said.

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Science & Technology News

India to Study Sustainability of Human Life in Space, as an important initiative under the BioE3 Biotechnology policy launched by PM Sh Narendra Modi, Announces Dr. Jitendra Singh

Source: Press Information Bureau, Dt. 15 May 2025,
URL: https://www.pib.gov.in/PressReleasePage.aspx?PRID=2128904

In a historic announcementDr. Jitendra Singh, Union Minister of State (Independent Charge) for Science & Technology, Minister of State (Independent Charge) for Earth Sciences, MoS PMO, Department of Atomic Energy and Department of Space, MoS Personnel, Public Grievances and Pensions revealed that India is set to conduct its first-ever biological experiments aboard the International Space Station (ISS) to study the sustainability of Human life in Space, as an important initiative under the BioE3 Biotechnology policy launched by PM Sh Narendra Modi.

These unique experiments, spearheaded by the Indian Space Research Organisation (ISRO) in collaboration with the Department of Biotechnology (DBT), will be carried out as part of the upcoming International Space Station (ISS) mission AXIOM-4, with Indian astronaut Group Captain Shubhanshu Shukla as a crew member.

Dr. Jitendra Singh shared that the first experiment at the International Space Station will examine the impact of microgravity and space radiation on the growth of edible microalgae, a nutrient-rich potential food source for long-duration space missions. Rich in proteins, lipids, and bioactive compounds, microalgae are promising for safe and sustainable space-based nutrition.

This project is a joint initiative of ISRO, NASA, and DBT and aims to analyze key growth parameters and changes in transcriptomes, proteomes, and metabolomes of different algal species in space, as compared to Earth-based controls. The results will help identify the most suitable microalgal species for use in space environments, he added.

Microalgae offer several key advantages that make them ideal candidates for sustaining life in space. They have an extremely short life cycle, with some species growing in as little as 26 hours, allowing for rapid biomass production. Their high photosynthetic efficiency enables them to absorb carbon dioxide and produce oxygen effectively, contributing to air revitalization in closed environments like spacecraft. Additionally, microalgae can generate a higher biomass yield in photobioreactors compared to traditional plants, making them a more efficient and space-saving option for producing food and oxygen during long-duration space missions.

The second experiment at the International Space Station will study the growth and proteomic responses of cyanobacteria, such as Spirulina and Synechococcus, under microgravity conditions using urea- and nitrate-based media.

Dr. Jitendra Singh emphasized the need to recycle carbon and nitrogen from human waste during prolonged space travel to achieve self-sustainability in spacecraft and future extraterrestrial colonies. Cyanobacteria, due to their fast growth and efficient photosynthesis, are ideal agents for such recycling systems.

According to the Minister of State for Space, the experiment aims to explore Spirulina as a "superfood" due to its high protein and vitamin content, compare growth of cyanobacterial cells in urea versus nitrate environments, and study the effect of space conditions on their metabolic profiles.

The experiments have been developed in association with scientists from the International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi, under the broader ISRO-DBT research collaboration.

The Minister shared these developments during his formal visit to the newly inaugurated DBT-ICGEB Biofoundry, a state-of-the-art facility funded by the Department of Biotechnology and hosted at ICGEB, New Delhi. The Biofoundry was virtually inaugurated by Dr. Singh during the 31st Meeting of the ICGEB Board of Governors.

The DBT-ICGEB Biofoundry will operate on the principle of the Design, Build, Test, and Learn (DBTL) cycle. The Design component of the Biofoundry includes the use of AI, big data, computational biology, and bioinformatics, as well as specific domain knowledge for DNA sequencing, pathway analysis, host selection, and experimental design. The Build component includes DNA assembly, combinatorial assembly, and organism transformation.

The Biofoundry supports microbial platforms such as bacteria and yeast and aims to develop biotech products for food, agriculture, chemicals, pharmaceuticals, and energy sectors. With an in-house production capacity of up to 20 liters, the facility is equipped to scale innovations to industrial levels and enable technology transfer to startups and manufacturers.

Dr. Jitendra Singh credited Prime Minister Narendra Modi for his visionary leadership and unwavering support in elevating India's biotechnology sector to a position of global leadership.

He also highlighted the significance of the BioE3 (Biotechnology for Economy, Environment & Employment) Policy, approved by the Union Cabinet in 2024, which aims to accelerate high-performance biomanufacturing. This national framework supports innovation and scale-up across six priority sectors, such as bio-based chemicals and enzymes, smart proteins and functional foods, precision therapeutics, climate-resilient agriculture, carbon capture and utilization, and marine and space research.

President ICGEB Board of Governors, Dr Jelena Begovic appreciated India’s efforts in ushering Space biotechnology.

Dr Rajesh Gokhale and Sr Adviser, DBT, Dr Alka Sharma; Dr Ramesh Sonti, Director, ICGEB New Delhi were also present during the visit and briefing.

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"Aatmnirbhar Bharat" in Quantum Tech: Standards & Indigenous Approaches Discussed at CSIR-NPL

Source: Press Information Bureau, Dt. 15 May 2025,
URL: https://www.pib.gov.in/PressReleasePage.aspx?PRID=2128824

The CSIR-National Physical Laboratory (NPL), India's national measurement institute, hosted a pivotal "Focused Interaction Meeting on Indigenous Approaches to Quantum Technologies, Measurements, and Standardization" on May 6, 2025.

The meeting convened a diverse group of stakeholders from various Ministries and Institutions to address the critical need for developing indigenous standards and measurement capabilities to support India's rapidly growing quantum technologies sector.

The focused meeting was attended by over 40 invited delegates including Dr. Ajai Chowdhry, Co-founder, HCL & Chairman, Mission Governing Board, National Quantum Mission (NQM), Prof. V. Kamakoti, Director, Indian Institute of Technology- Madras (IIT-M), Chennai, Prof. Venu Gopal Achanta, Director, CSIR-NPL, Dr. Sivakumar Kalyanaraman, CEO, Anusandhan National Research Foundation (ANRF), New Delhi and representatives of Indian Army, Indian Navy, ISRO, DRDO, TIFR Mumbai, IITs-Madras, Delhi, Tirupati, IISER-Pune, BIS-New Delhi, DoT-New Delhi, MeitY-New Delhi, TEC- New Delhi, DIAT-Pune, MCTE-Mhow, C-DOT-New Delhi along with teams from CSIR-NPL and IIT-M Pravartak Technologies Foundation, Chennai.

Participants emphasized that the development of precise measurements, robust standards, and the pursuit of technological sovereignty are fundamental to building reliable and trustworthy quantum technologies.

It was highlighted that homegrown quantum approaches, capabilities, and advancements are essential for driving national and international standardization efforts, fostering business opportunities, and ensuring the practical utility of quantum technology. The participants deliberated and strongly felt the need for specific standards in the field.

The event served as a platform for expert dialogue among metrologists, quantum technology experts, strategic sector leaders, and policymakers. The meeting spurred discussions on strategic collaborations to accelerate the development and deployment of indigenous quantum technologies and on formulating policy frameworks to nurture a self-reliant quantum technology ecosystem.

A central theme of the discussions was the critical importance of the four pillars necessary for the smooth adoption and advancement of quantum technologies in India: characterization/calibration, standardization, validation, and certification. Several prominent figures felt strongly that CSIR-NPL should play a vital role in the NQM, especially considering the urgent requirement of standardization of emerging quantum technologies under the umbrella of the ambitious and futuristic NQM Program. Prof. Venu Gopal Achanta, Director of CSIR-NPL, delivered a keynote address on "Quantum Metrology and Metrology for Quantum Technologies".

He provided an overview of NPL's role in India's National Quality Infrastructure as the custodian of national standards. Prof. Achanta emphasized the importance of quantum metrology and

standardization in developing India's Quantum Technology ecosystem. He also presented NPL's R&D activities and efforts toward developing new quantum standards and made a strong case for CSIR-NPL's inclusion in the ongoing NQM.

Dr. Ajai Chowdhry, Co-founder, HCL & Chairman, Mission Governing Board, National Quantum Mission (NQM), delivered a keynote address on "Accelerating the Indigenization Quotient in Quantum Technologies through Certification and Characterization". Dr. Chowdhry echoed the importance of metrology and standardization for the successful outcome of the NQM.

He stressed the need for technology sovereignty through indigenous quantum technologies, supported by Indian standards, metrology, accreditation, and certification, to bolster India's Quantum R&D, startups, and armed forces.

Dr. Chowdhry urged institutions under NQM, including NPL, C-DOT, and Pravartak, to collaborate on a policy framework that integrates metrology and standardization as essential components of the NQM, specifically advocating for the onboarding of CSIR-NPL.

Prof.V.Kamakoti, Director, Indian Institute of Technology-Madras (IIT-M), Chennai, delivered a keynote address on "Towards the Confluence of a Computer Scientist and a Metrologist to aid Strides in Quantum Technology". Prof. Kamakoti emphasized the indigenous development and standardization of quantum computers and quantum communication systems.

The Indian Armed Forces, represented by Maj. Gen. Subhasis Das (Army) and Rear Admiral T. Ajit (Navy), highlighted their push to adopt quantum technologies. They stressed the urgent need for collaboration between R&D institutions and the military to develop and deploy relevant quantum solutions, emphasizing the critical role of India- specific standards, especially for secure communication and quantum cryptography.

Representatives from C-DOT and TEC expressed their strong willingness in partnership with CSIR-NPL for developing India-specific standards and relevant documentation required for upcoming quantum technologies.

Several keynote addresses and technical talks were followed by an engrossing panel discussion. In the panel discussion, all members unanimously agreed on the necessity of indigenous development of quantum technologies and their standards, as well as metrology, for a "Sashakt" (Strong) and "Aatmnirbhar" (Self-Reliant) Bharat.

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ISRO’s 101st launch, EOS-09 mission, scheduled for May 18

Source: The Hindu, Dt. 15 May 2025,
URL: https://www.thehindu.com/sci-tech/science/isros-101st-launch-eos-09-mission-scheduled-for-may-18/article69579607.ece

The Indian Space Research Organisation (ISRO) is all geared up for its 101st launch with the PSLV-C61 / EOS-09 mission, which is scheduled to be launched on May 18 at 5.59 a.m. from the Satish Dhawan Space Centre in Sriharikota.

ISRO successfully launches NVS-02 satellite; creates history with the 100th launch from SriharikotaISRO on Thursday (May 15, 2025) said the PSLV was moved from the Payload Integration Facility to the Mobile Service Tower at the spaceport in Sriharikota for further integration.

EOS-09 is an earth observation satellite which is expected to boost India's surveillance capabilities in all-weather conditions. The satellite is equipped with C-band synthetic aperture radar enabling capturing of high-resolution images of the Earth's surface under all-weather conditions 24/7.

Chandrayaan-5/LUPEX missionISRO and JAXA, the space agency of Japan, jointly conducted the third face-to-face Technical Interface Meeting (TIM-3), for the Chandrayaan-5/ Lunar Polar Exploration (LUPEX) mission, in ISRO Headquarters, Bengaluru on May 13 and 14.

The meeting was attended by senior officials, project executives, and technical team members from ISRO, JAXA, and the Mitsubishi Heavy Industries (MHI), Japan.

"Following the legacy of Chandrayaan-1, Chandrayaan-2 (orbiter-based lunar exploration), Chandrayaan-3 (lander-rover based in-situ exploration) and the forthcoming Chandrayaan-4 (India's first lunar sample return mission), the Chandrayaan-5 / LUPEX mission will be the fifth mission in the Chandrayaan series of lunar missions, in collaboration with JAXA, to study the lunar volatile materials, including lunar water, in the vicinity of a Permanently Shadowed Region in the lunar south pole," ISRO said.

The mission will be launched by JAXA onboard its H3-24L launch vehicle, carrying the ISRO-made lunar lander, which will carry the MHI, Japan-made lunar rover. ISRO, apart from developing the lunar lander, is also responsible for developing a few scientific instruments for the mission.

The scientific instruments for this mission would be contributed by ISRO, JAXA, ESA and NASA, all thematically connected with the exploration and in-situ analysis of the volatiles reserved in the lunar polar region.

The approval for the Chandrayaan-5 / LUPEX mission was received from the Government of India on March 10, 2025, in the form of financial sanction.

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ISRO, Japanese space agency hold technical meet on Chandrayaan-5 mission

Source: The Economic Times, Dt. 15 May 2025,
URL: https://economictimes.indiatimes.com/news/science/isro-japanese-space-agency-hold-technical-meet-on-chandrayaan-5-mission/articleshow/121193847.cms

ISRO on Thursday announced that it has conducted the third face-to-face Technical Interface Meeting (TIM-3) with JAXA, the Japanese space agency, for the Chandrayaan-5/LUPEX (LUnar Polar EXploration) mission. The Chandrayaan-5 / LUPEX mission is expected to be a significant milestone in India's lunar exploration odyssey, which envisions Indian Gaganyatris (astronauts) landing on the Moon by 2040, it said. The meeting during May 13-14 at the ISRO headquarters in

Bengaluru, was attended by senior officials, project executives, and technical team members from ISRO, JAXA, and the Mitsubishi Heavy Industries (MHI), Japan.

According to ISRO, building on the legacy of Chandrayaan-1, Chandrayaan-2 (orbiter-based lunar exploration), Chandrayaan-3 (lander-rover based in-situ exploration) and the forthcoming Chandrayaan-4 (India's first lunar sample return mission), Chandrayaan-5 / LUPEX mission will be the fifth in the Chandrayaan series of lunar missions, in collaboration with JAXA, to study the lunar volatile materials, including lunar water, in the vicinity of a Permanently Shadowed Region (PSR) in the lunar South pole.

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The scientific instruments for the mission would be contributed by ISRO, JAXA, ESA (European Space Agency) and NASA (National Aeronautics and Space Administration), all thematically connected with the exploration and in-situ analysis of the volatiles reserved in the lunar polar region, the space agency said. The approval for Chandrayaan-5 / LUPEX mission was given by the Centre on March 10, 2025, in the form of financial sanction.

During the meeting, M Ganesh Pillai, Scientific Secretary, ISRO congratulated both teams for the technical achievements so far and emphasized on the importance of the collaborative endeavour for the scientific and technical aspects of the mission. Tirtha Pratim Das, Director of Science Programme Office, ISRO Headquarters, briefed about the major milestones achieved in terms of the landing site selection, payload optimization, mission design, as well as the ground segment and communication aspects.

G Ravi Chandra Babu, study team leader of Chandrayaan-5/LUPEX, outlined the technical configurations arrived, and stressed the need for clear definition of the milestones, timeline and deliverables of the project. Dai-Asoh of JAXA, in his opening address, discussed the technical progress made towards the development of the rover and the interfaces related. The two-day face-to-face meeting deliberated on the various technical interfaces, joint mission implementation plan, as well as the potential landing sites for the mission, it said.

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भारत करने जा रहा बड़ी पहल... अंतरिक्ष में इंसानों के रहने के लिए तलाशी जाएंगी संभावनाएं, एक्सिओम-4 मिशन में होगा जैविक प्रयोग

Source: Amar Ujala, Dt. 16 May 2025,
URL: https://www.jagran.com/news/national-axiom-4-mission-india-returns-to-space-with-iaf-pilot-shubhanshu-shukla-23938778.html

अंतरिक्ष अन्वेषण के क्षेत्र में कई इतिहास रच चुका भारत अब अंतरिक्ष में इंसानों के रहने की संभावना तलाशने के लिए कमर कस चुका है। दुनिया में पहली बार भारत अंतरिक्ष में इंसानों के रहने की संभावना का अध्ययन करने के लिए जैविक प्रयोग करने वाला है। विज्ञान और प्रौद्योगिकी राज्यमंत्री जितेंद्र सिंह ने पोस्ट किया, दुनिया में अपनी

तरह की पहली ऐतिहासिक पहल के तहत भारत अंतरिक्ष में मानव जीवन की स्थिरता का अध्ययन करने के लिए अंतरराष्ट्रीय अंतरिक्ष स्टेशन (आईएसएस) पर जैविक प्रयोग करने जा रहा है।

एक्सिओम-4 मिशन के तहत होंगे प्रयोग

भारतीय अंतरिक्ष अनुसंधान संगठन (इसरो) द्वारा जैव प्रौद्योगिकी विभाग (डीबीटी) के सहयोग से एक्सिओम–4 मिशन के तहत ये प्रयोग किए जाएंगे। इस मिशन में भारतीय अंतरिक्ष यात्री ग्रुप कैप्टन शुभांशु शुक्ला शामिल होंगे। यह परियोजना इसरो, नासा और डीबीटी की संयुक्त पहल है। इसका उद्देश्य पृथ्वी की तुलना में अंतरिक्ष में विभिन्न शैवाल प्रजातियों के विकास मापदंडों और परिवर्तनों का विश्लेषण करना है। सरल शब्दों में कहें तो देखा जाएगा कि धरती पर जिस तरह से इन प्रजातियों का विकास होता है, उसकी तुलना में अंतरिक्ष में वे किस तरह विकसित होते हैं।

सूक्ष्म शैवाल प्रजातियों की पहचान

मिशन के दौरान खाद्य माइक्रोएल्गी की तीन प्रजातियों की वृद्धि, आनुवंशिक गतिविधि पर माइक्रोग्रैविटी के प्रभाव का भी अध्ययन किया जाएगा। इससे अंतरिक्ष वातावरण में उपयोग के लिए सबसे उपयुक्त सूक्ष्म शैवाल प्रजातियों की पहचान करने में मदद मिलेगी। दूसरे प्रयोग में यह पता लगाया जाएगा कि स्पाइरुलिना और साइनोकोकस जैसे साइनोबैक्टीरिया किस प्रकार बढ़ते हैं और यूरिया तथा नाइट्रेट आधारित पोषक माध्यमों का उपयोग करते हुए सूक्ष्मगुरुत्व में किस प्रकार प्रतिक्रिया करते हैं। इससे अंतरिक्षयात्रियों के लिए विश्वसनीय खाद्य स्त्रोत सुनिश्चित हो सकेगा। अंतरिक्ष में मांसपेशियों पर माइक्रोग्रैविटी के प्रभाव का भी अध्ययन किया जाएगा।

अब आठ जून को स्पेस स्टेशन जाएंगे शुभांशु शुक्ला

- वायुसेना के ग्रुप कैप्टन शुभांशु शुक्ला अब आठ जून को आईएसएस के सफर पर रवाना होंगे। एक्सिओम–4 मिशन के तहत ग्रुप कैप्टन शुभांशु के साथ अमेरिका, हंगरी और पोलैंड के अंतरिक्षयात्री भी होंगे। शुभांशु आईएसएस की यात्रा करने वाले पहले भारतीय होंगे।
- राकेश शर्मा 1984 में सोवियत संघ के सोयूज अंतरिक्षयान से अंतरिक्ष में गए थे। राकेश शर्मा भारत के पहले अंतरिक्षयात्री हैं। एक्सिओम–4 मिशन को 29 मई को लांच होना था, लेकिन इस मिशन में देरी हुई है। अब यह मिशन आठ जून को फ्लोरिडा के केनेडी स्पेस सेंटर से भारतीय समयानुसार शाम 6:41 बजे लांच किया जाएगा।
- अमेरिका स्थित वाणिज्यिक मानव अंतरिक्ष उड़ान कंपनी एक्सिओम स्पेस और नासा ने यह घोषणा की है। शुभांशु स्पेसएक्स के 'ड्रैगन' अंतरिक्षयान से उड़ान भरेंगे। वह आईएसएस में 14 दिन रहेंगे। इस दौरान वह इस दौरान वह सात प्रयोग करेंगे। इन प्रयोगों में भारत के पारंपरिक खाद्य पदार्थों जैसे कि मेथी और मूंग को अंतरिक्ष में अंकुरित करने का परीक्षण भी शामिल है।

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Scientists make strange 2D metals sought for future technologies

Source: The Hindu, Dt. 15 May 2025,
URL: https://www.thehindu.com/sci-tech/science/scientists-finally-make-strange-2d-metals-sought-for-future-technologies/article69574853.ece

A quantum dot is a type of semiconductor that's only a few nanometres wide. It has a wide range of applications, including in LED lighting, medical diagnostics, printing, semiconductor

fabrication, and solar panels. They're very small but they've had a big impact on our world as we know it. This is why the people who found a quick, reliable way to make quantum dots were awarded the Nobel Prize for chemistry in 2023.

Quantum dots get their curious but powerful abilities from a phenomenon called quantum confinement. When you throw a switch, a bulb comes on. This is because electrons flow from a power source to the bulb through copper wires. Because the wires are fairly thick (from an electron's perspective) and very long, the electrons aren't tightly packed in and move freely. But in a quantum dot, there isn't much space and the electrons are relatively more close to each other. So even though they're free to move around the entire quantum dot, and not be confined to their atoms, their movement is still restricted.

In this situation, the amount of energy each electron can have changes. In a copper wire in your house's circuit, if an electron gains some extra energy in some way, it can simply move around faster. But in a quantum dot there's nowhere to go, so the electrons can't simply acquire more energy even if, say, you increase the voltage on the dot. Instead, the electrons can have only specific amounts of energy each. This is exactly how electrons in an atom behave: they have limited energy levels. It's like they're in a movie hall. The copper-wire electrons are free to fill any seats they like. But in an atom, some rows are closed off and in the other rows, only specific seats are available. Because all the electrons in a quantum dot behave in this way, the dot itself behaves like a giant atom.

The materials not in 3D

The restrictions the electrons feel because they're so packed in is said to be due to quantum confinement. A material is described as 1D or 2D depending on how much it confines its electrons. A quantum dot is considered to be a zero-dimensional material: while its electrons can technically move in three dimensions, the volume available is so small that it might as well be a point in space.

Likewise, graphene is a famous 2D material: it consists of a single sheet of carbon atoms bonded to each other in a hexagonal pattern. The electrons in this sheet can only move around in two dimensions, thus 2D. As a result they behave as if they don't have mass, for example, giving rise to properties not seen in other materials. The unusual material properties quantum confinement gives rise to are clearly of great real-world value. This is why scientists have also been trying to create 2D metals — but they've been running into a thorny problem.

If one graphene sheet is placed above another, the two sheets will develop weak links between them called a van der Waals interaction. They're very weak bonds: they can keep the sheets from drifting apart but if you tug even one sheet just a little, the interaction will break and allow the sheets to be separated. The scientists who discovered graphene also found that by attaching some cellophane tape on graphite, then pulling it in one smooth motion, they could get a few layers of graphene to come off with the tape.

Really, really flat metals

This wouldn't have been possible if carbon had been a metal. The problem with a metal atom is that it likes to bond with all the same atoms around itself. Put differently, the atom readily forms bonds in 3D. Forcing it to form bonds only in 2D is very difficult. This is why materials scientists

have been trying for a decade to create 2D metals using different techniques, to no avail. They've tried carefully depositing metal atoms on a substrate, sandwiching metal slices between a 2D material and a substrate, even hammering metal pieces down.

They've only been able to manage metal sheets a few nanometres thick. This isn't good enough: atomically thin sheets are 10-times thinner, at best a few angstroms (Å) deep. Scientists have also found the surface of these materials to be uneven and that often the metal atoms interact with oxygen in the atmosphere to form oxide compounds.

Yet they've been motivated to keep going because 2D metals are expected to have highly unique properties that can be exploited for next-generation technologies, including super-sensitive sensors with applications ranging from medicine to the military. 2D bismuth and tin in particular are expected to be exotic materials called topological insulators, conducting electric currents only along their edges, not anywhere else. In such a state, the material can become magnetised in small islands — a phenomenon physicists have said can be exploited to make faster computers of the future.

A high-pressure sandwich

Now, if a study published recently in Nature is to be believed, there may finally be light at the end of the 2D tunnel. A team of scientists from the Beijing National Laboratory for Condensed Matter Physics and Institute of Physics, the University of Chinese Academy of Sciences (both in Beijing), and Songshan Lake Materials Laboratory (Dongguan) has reported a way to produce 2D sheets of bismuth, gallium, indium, tin, and lead. The team's technique isn't complicated either — although that's partly because the necessary technologies have taken a long time to get to their current advanced state.

It goes roughly like this: (i) Create a pure powder of a metal, say bismuth. (ii) Lay it on a plate made of sapphire on top of which a single layer of molybdenum disulphide (MoS2) has been deposited. This is the bottom anvil. (iii) As the bottom anvil is heated, the metal powder on top of it will melt and spread out. (iv) The droplet is overlaid with the top anvil, which also consists of a single MoS2 layer pasted on a sapphire substrate. At this point the droplet is sandwiched between two layers of MoS2, which in turn are sandwiched between two layers of sapphire. (v) The top anvil is twisted by a small angle and then the two anvils are pressed together. The pressure is kept up until the anvils have cooled to room temperature, then removed. (vi) The smooshed sheet of metal is peeled off.

According to the team, the bismuth sheet was just 6.3 Å thick — a depth of roughly two atoms and sufficient for electrons in the metal to be confined in 2D.

The use of MoS2 and sapphire wasn't accidental. MoS2 has a Young's modulus — the amount of force required to deform it — of 430 billion pascal (Pa) and sapphire, of 300 billion Pa. That's more than a million-times the atmospheric pressure at sea level. The squeeze the scientists applied to make 2D bismuth was 'just' 200 million Pa. Both MoS2 and sapphire also have smooth surfaces, which means their atoms don't try to bond with the bismuth atoms near them.

The researchers also found the bismuth sheet thus produced exhibit a strong field effect and a nonlinear Hall effect. A field effect means how well the sheet conducts electricity can be changed

by applying an external electric field. The nonlinear Hall effect was more peculiar: when an electric field was applied, the bismuth sheet acquired a voltage in the perpendicular direction. Both the strong field effect and the nonlinear Hall effect occur in 2D metals, not in 3D metals.

To change the world

The new effort is "not the first to grow thin crystals between layers of van der Waals materials. In the past year, there have been reports of single-atom-thick graphene nano-ribbons grown between layers of hexagonal boron nitride, and of gold nanocrystals just a few nanometres thick grown between flakes of MoS2," University of California, Irvine, condensed-matter physics researcher Javier Sanchez-Yamagishi wrote in a commentary accompanying the paper. "My own group has also produced ultra-thin crystals of bismuth by squeezing the metal between layers of hexagonal boron nitride, although the minimum thickness of our crystals was 5 nanometres."

"A key difference between our method and that of Zhao and colleagues is that they used large (centimetre-scale) sapphires covered with MoS2, which might be crucial for making atomically thin metals," he added. Sanchez-Yamagishi also wrote that the new technique represents a "substantial improvement over what can be made using more expensive and complex techniques". Since it's a first attempt, more opportunities as well as new challenges await. For example, researchers can look for ways to use the technique to make 2D sheets composed of multiple metal species, not just one.

For another, the geometric arrangement of bismuth atoms in the 2D sheet the team made allows it to become a topological insulator only in particular conditions. Future research can improve the technique to make room-temperature topological insulators in a more reliable way — just the way the 2023 chemistry Nobel Prize laureates changed the world when they discovered a simple, reliable way to make quantum dots. Yet another opportunity is to refit the procedure to make 2D metals of larger area.

Ultimately, scientists stand to learn more about 2D metals themselves, especially hitherto unknown properties. "Even less is known about the electronic properties of the other 2D metals prepared in the study," Sanchez-Yamagishi wrote. "The stability and large sizes of these materials open up many possibilities for integrating them with other materials and for making new electrical or photonic devices."

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OpenAI's latest AI models report high 'hallucination' rate: What does it mean, why is this significant?

Source: The Indian Express, Dt. 15 May 2025,
URL: https://indianexpress.com/article/explained/explained-sci-tech/openai-models-hallucination-rate-10006255/

A technical report released by artificial intelligence (AI) research organisation OpenAI last month found that the company's latest models — o3 and o4-mini — generate more errors than its older models. Computer scientists call the errors made by chatbots "hallucinations".

The report revealed that o3 — OpenAI's most powerful system — hallucinated 33% of the time when running its PersonQA benchmark test, which involves answering questions about public figures. The o4-mini hallucinated at 48%.

To make matters worse, OpenAI said it does not even know why these models are hallucinating more than their predecessors. Here is a look at what AI hallucinations are, why they happen, and why the new report about OpenAI's models is significant.

What are AI hallucinations?

When the term AI hallucinations began to be used to refer to errors made by chatbots, it had a very narrow definition. It was used to refer to those instances when AI models would give fabricated information as output. For instance, in June 2023, a lawyer in the United States admitted using ChatGPT to help write a court filing as the chatbot had added fake citations to the submission, which pointed to cases that never existed. Today, hallucination has become a blanket term for various types of mistakes made by chatbots. This includes instances when the output is factually correct but not actually relevant to the question that was asked.

Why do AI hallucinations happen?

ChatGPT, o3, o4-mini, Gemini, Perplexity, Grok and many more are all examples of what are known as large language models (LLMs). These models essentially take in text inputs and generate synthesised outputs in the form of text. LLMs are able to do this as they are built using massive amounts of digital text taken from the Internet. Simply put, computer scientists feed these models a lot of text, helping them identify patterns and relationships within that text, and predict text sequences and produce some output in response to a user's input (known as a prompt).

Note that LLMs are always making a guess while giving an output. They do not know for sure what is true and what is not — these models cannot even fact-check their output against, let's say, Wikipedia, like humans can.

LLMs "know what words are and they know which words predict which other words in the context of words. They know what kinds of words cluster together in what order. And that's pretty much it. They don't operate like you and me," scientist Gary Marcus wrote on his Substack, Marcus on AI. As a result, when an LLM is trained on, for example, inaccurate text, they give inaccurate outputs, thereby hallucinating.

However, even accurate text cannot stop LLMs from making mistakes. That's because to generate new text (in response to a prompt), these models combine billions of patterns in unexpected ways. So, there is always a possibility that LLMs give fabricated information as output. And as LLMs are trained on vast amounts of data, experts do not understand why they generate a particular sequence of text at a given moment. Also in explained | What it means for AI models to 'reason', with OpenAI's 'smartest' new o3 and o4-mini models launched

Why is OpenAI's new report significant?

Hallucination has been an issue with AI models from the start, and big AI companies and labs, in the initial years, repeatedly claimed that the problem would be resolved in the near future. It did seem possible, as after they were first launched, models tended to hallucinate less with each

update. However, after the release of the new report about OpenAI's latest models, it has increasingly become clear that hallucination is here to stay. Also, the issue is not limited to just OpenAI. Other reports have shown that Chinese startup DeepSeek's R-1 model has double-digit rises in hallucination rates compared with previous models from the company.

This means that the application of AI models has to be limited, at least for now. They cannot be used, for example, as a research assistant (as models create fake citations in research papers) or a paralegal-bot (because models give imaginary legal cases).

Computer scientists like Arvind Narayanan, who is a professor at Princeton University, think that, to some extent, hallucination is intrinsic to the way LLMs work, and as these models become more capable, people will use them for tougher tasks where the failure rate will be high. In a 2024 interview, he told Time magazine, "There is always going to be a boundary between what people want to use them [LLMs] for, and what they can work reliably at… That is as much a sociological problem as it is a technical problem. And I do not think it has a clean technical solution."

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Princeton Engineers Develop "Metabot" That Is Both a Material and a Robot

Source: SciTech Daily, Dt. 15 May 2025,
URL: https://scitechdaily.com/princeton-engineers-develop-metabot-that-is-both-a-material-and-a-robot/

In a study that echoes scenes from the Transformers movie franchise, engineers at Princeton University have developed a material capable of expanding, changing shape, moving, and responding to electromagnetic commands like a remotely controlled robot even though it lacks any motor or internal gears.

"You can transform between a material and a robot, and it is controllable with an external magnetic field," said Glaucio Paulino, the Margareta Engman Augustine Professor of Engineering at Princeton.

In a study recently published in Nature, the researchers explain how they took inspiration from origami, the art of paper folding, to design a structure that bridges the gap between robotics and materials science. The result is a metamaterial, a type of engineered material whose unique properties stem from its physical structure rather than its chemical makeup.

The team created it using a blend of basic plastics and specially designed magnetic composites. By applying a magnetic field, they could alter the material's structure, enabling it to expand, move, and bend in various directions, all without direct contact.

Origami-inspired metabot invention

The team called their creation a "metabot" – a metamaterial that can shift its shape and move.

"The electromagnetic fields carry power and signal at the same time. Each behavior is very simple but when you put them together the behavior can be very complex," said Minjie Chen, an author of

the paper and an associate professor of electrical and computer engineering and Andlinger Center for Energy and the Environment at Princeton. “This research has pushed the boundaries of power electronics by demonstrating that torque can be passed remotely, instantaneously, and precisely over a distance to trigger intricate robotic motions.”

Princeton scientists have created a magnetic, shape-shifting metamaterial, part robot, part origami, that could revolutionize fields from robotics to medicine. Credit: Princeton University

The metabot is a modular conglomeration of many reconfigurable unit cells that are mirror images of each other. This mirroring, called chirality, allows for complex behavior. Tuo Zhao, a postdoctoral researcher in Paulino’s lab said the metabot can make large contortions — twisting, contracting, and shrinking — in response to a simple push.

Xuanhe Zhao, an expert in materials and robotics who was not involved in the research, said the “work opens a new and exciting avenue in origami design and applications.”

“The current work has achieved extremely versatile mechanical metamaterials by controlling the assembly and chiral state of the modules,” said Zhao, the Uncas and Helen Whitaker Professor at MIT. “The versatility and potential functionality of the modular, chiral origami metamaterials are truly impressive.”

Promising uses across fields

Davide Bigoni, a professor of solid and structural mechanics at the Universita’ di Trento in Italy, called the work groundbreaking and said it could “drive a paradigm shift across multiple fields including soft robotics, aerospace engineering, energy absorption, and spontaneous thermoregulation.”

Exploring the technology’s robotics applications, Tuo Zhao, an author of the paper, used a laser lithography machine at the Princeton Materials Institute to create a prototype metabot that was 100 microns in height (a little thicker than a human hair). The researchers said similar robots could one day deliver medicines to specific parts of the body or help surgeons repair damaged bones or tissue.

The researchers also used the metamaterial to create a thermoregulator that works by shifting between a light-absorbing black surface and reflective one. In an experiment, the researchers exposed the metamaterial to bright sunlight and were able to adjust the surface temperature from 27 degrees Celsius (80 degrees Fahrenheit) to 70 C (158 F) and back again.

Another possible use lies in applications for antennae, lenses, and devices that deal with wavelengths of light.

Kresling pattern and magnetic control

Geometry holds the key to the new material. The researchers built plastic tubes with supporting struts arranged so the tubes twist when compressed, and compress when twisted. In origami, these tubes are called Kresling Patterns. The researchers created the building blocks of their design by connecting two mirror-image Kresling tubes at the base to make one long cylinder. As a result, one

end of the cylinder folds when twisted in one direction and the other end folds when twisted in the opposite direction.

This simple pattern of repeating tubes makes it possible to move each section of the tube independently using precisely engineering magnetic fields. The magnetic field causes the Kresling tubes to twist, collapse, or pop open, creating complex behaviors.

Paulino said that one consequence of chirality – the mirror-image sections – is that the material can defy the typical rules of actions and reactions in physical objects. “Usually, if I twist a rubber-beam clockwise and then counter-clockwise, it returns to its starting point,” Paulino said. The group created a simple metabot that collapses when twisted clockwise, then reopens when twisted counterclockwise – a normal behavior. However, if twisted in the opposite sequence – counterclockwise then clockwise – the same device collapses, then collapses further.

Paulino said this asymmetrical behavior simulates a phenomenon called hysteresis, in which a system’s response to a stimulus depends on the history of changes within the system. Such systems, which are found in engineering, physics, and economics, are difficult to model mathematically. Paulino said the metamaterial offers a way to directly simulate these systems.

A more distant use for the new material would be to design physical structures that mimic the performance of logic gates made with transistors in a computer.

“This gives us a physical method to simulate complex behavior, such as non-commutative states,” Paulino said.

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