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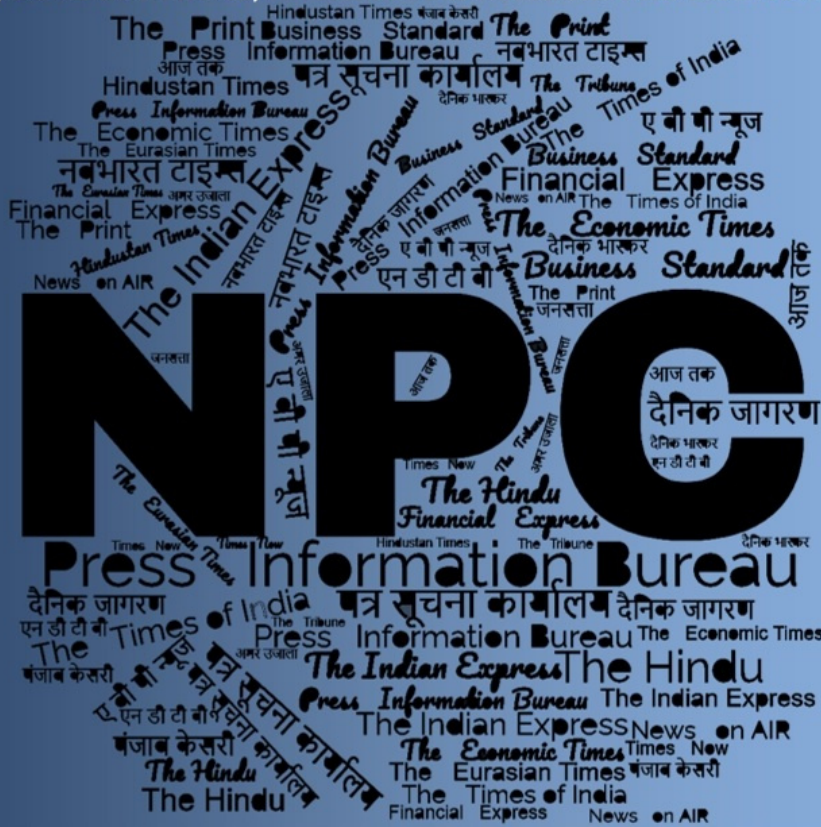
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# समाचार पत्रों से चयनित अंश Newspapers Clippings

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

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quantum key-distribution scheme

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# Defence News

## MoS to Attend Key Ceremonies in Kenya, Madagascar

*Source: The Statesman, Dt. 22 Jun 2025*

An Indian delegation led by Minister of State for Defence Sanjay Seth is scheduled for a three-day visit to Kenya and Madagascar beginning Monday.

In the first leg, Seth will visit Kenya for the joint unveiling of Commemorative Pillar (War memorial honouring the fallen soldiers of India and Kenya) at Taita-Taveta County followed by the Minister's visit to Madagascar for the celebrations of the 65th Anniversary of the Independence of Madagascar and the creation of the Malagasy Armed Forces, at Antananarivo on June 26.

A statement from the Ministry of Defence stated that India and Kenya are maritime neighbours. The contemporary ties between the two countries are marked by high-level exchanges, robust trade and investment, medical value travel from Kenya, as well as extensive people-to-people contacts. The two nations share a common legacy of struggle against colonialism. Many Indians participated and supported the freedom struggle of Kenya.

India and Madagascar enjoy a multifaceted relationship rooted in historical ties, shared values and a commitment to regional stability and development. The partnership spans across political, military, economic, and diplomatic domains underscoring a shared vision for mutual growth and collaboration, the statement added.

The visit to the two African nations comes following invites by Cabinet Secretary, Ministry of Defence, Kenya (Minister of Defence, Kenya) and Minister of Armed Forces of Madagascar.

<https://www.thestatesman.com/india/mos-to-attend-key-ceremonies-in-kenya-madagascar-1503448415.html>

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## The spy next door: Decrypting China's Ministry of State Security, the world's largest and most secretive intelligence agency

*- By Major (Retd) Amit Bansal and Nirmal John*

*Source: The Economic Times, Dt. 22 Jun 2025*

In June 2020, India and China were engaged in a skirmish along their 3,488-km border. Just four months later, around 10 in the morning on October 12, power went off in Mumbai. It was a Monday, and the outage crippled India's city of dreams—millions were affected as mobile networks and public transport, including local trains, went down. The grid failure was resolved in a few hours, and an inquiry was ordered.

The preliminary report pointed to a cyberattack, with experts laying the blame at the doors of China, which, many in cybersecurity circles concluded, had penetrated India's power grid to send a

message after the June skirmishes. There were reasons for this attribution. China is among the few countries that can do it, having built significant muscle in cyber warfare, and much of it stems from investments in its principal intelligence agency, the Ministry of State Security (MSS).

The what, you ask? From KGB to CIA. From ISI to MI6. From FSB to Mossad and R&AW. Intelligence agencies from around the world have always worried governments and offered fodder to writers of spy fiction. In this alphabet soup, the little-known MSS doesn't exactly conjure up images of secret agents in tuxedos gambling in the casinos of Monte Carlo.

Yet, nestled away from the glare, China's MSS has become the largest intelligence agency in the world. Its headcount is pegged between 350,000 and 800,000 with operations in over 100 countries (even KGB at its peak only had about 300,000 operatives). Its annual budget, as per estimates, is more than \$20 billion.

On the back of such investments, MSS has upped its game over the last decade. The latest? A few weeks back, Americans alleged that two Chinese researchers were trying to smuggle a fungus into US, in what is being viewed as part of a strategy of using students to infiltrate the country.

Despite its reported hand in multiple such ops, large and active footprints, fast growth and direct or indirect involvement in nearly every country's affairs, MSS has remained under a shroud. In a world in a geopolitical flux, a broader understanding of it is critical.

### **PARTY, NOT THE NATION MSS**

MSS wasn't always this big or active. A big expansion started in 2012 when Xi Jinping took over the reins of the country, believing that intel and covert ops are critical cogs to keep the Chinese Communist Party (CCP) in power.

**MSS: A SNAPSHOT**

**MSS is China's Ministry of State Security**

- Founded in 1983
- The largest spy agency in the world
- Estimated personnel is 350,000 to 800,000
- Controls Chinese domestic surveillance along with international ops
- Active in 100+ countries
- Estimated budget is \$20 billion
- Reports to the Communist Party of China
- Growth hypercharged by Xi Jinping since 2013

BCCL

So, unlike most national spy organisations whose agenda mirror that of the nation, MSS is tasked with protecting CCP, as Sriparna Pathak, professor of China studies at the Jindal School of

International Affairs, points out. Timothy R Heath, senior international and defence researcher at Rand Corporation, a global think tank, says, because of MSS's mandate, its ops mainly focus on regime security, suppression of challengers to CCP rule, espionage, influence operations and targeted missions against Chinese dissidents abroad.

- It is different from other agencies in many ways.
- It is the only agency looking at both domestic and external ops.
- It has a highly complex structure with multiple divisions and sections.
- It has invested massively in offensive cyber ops.

When Chen Yixin was appointed as the minister of state security in 2022, he was tasked with pushing the boundaries further. After Covid-19 broke out, Chen, a Xi loyalist, was chosen to handle the fallout and “manage” anti-China narratives across the world. True to his brief, Chen made MSS more diversified, lethal and mysterious.

### **Operations In India**

Because of its mandate to target Chinese dissidents, the longest running aspect of MSS' ops in India is said to be the targeting of the Tibetan government-in-exile, led by the Dalai Lama, whom Beijing considers a political dissident. But MSS has widened its tentacles over the last few years. In February 2024, I-Soon, a Chinese contractor who works for government agencies, including MSS, had a data leak that gave clues regarding its operations in India.

The leak revealed that China, through cyber ops, had collected 95.2 GB of immigration data from India, along with data indicating it might have been behind the 2018 hack of the Employees' Provident Fund Organisation.

There were also indications that other entities, including Reliance and Air India, were attacked. As intelligence expert Lieutenant Colonel (retd) Pavithran Rajan says, the widening tentacles “translate into aggressive cyber-espionage, targeting our critical infrastructure, from power grid to vaccine manufacturing”.

In 2018, a Chinese national, Luo Sang aka Charlie Peng, was arrested in Delhi for money laundering and espionage. Reports suggest that he was in the country from 2014, having crossed over from Nepal, and had even attained an Aadhaar card while laundering money.

“On the human intelligence front, they run sophisticated networks,” says Rajan, adding that the Chinese strategy is to use every available lever —cyber, economic and human —to gain strategic advantage over India. “They also engage with insurgent groups in the Northeast and coordinate with Pakistani intelligence organisations,” he adds.

Its outreach is vast. In the neighbourhood, it has reportedly had a hand in overthrowing governments. As Lieutenant-General (retd) Deependra Singh Hooda, cofounder of Delhi-based Council for Strategic and Defense Research, says, a critical threat for India is the codification in Chinese law that all entities must work with MSS.

Their National Intelligence Law says, “All organisations and citizens shall support, assist and cooperate with national intelligence efforts in accordance with law, and shall protect national intelligence work secrets they are aware of.”

This, says Hooda, makes for a significant national security threat for India, given the prominent presence of Chinese companies across sensitive sectors like power and telecom.



## The Structure

Countering MSS starts with understanding MSS. The structure of MSS is all about specialised tasks, with analysts estimating 12-20 bureaus within it. The biggest by manpower is the Bureau of Internal & Political Affairs, which keeps a close eye on the internal affairs of China and is responsible for the security of top CCP leaders. As part of monitoring its own people, it carries out extensive technical surveillance.

Meanwhile, members of the Bureau for Foreign Intelligence Collection operate abroad in the guise of diplomats, journalists, tourists, academicians, students and businesspersons. There is also the Bureau of Hong Kong, Macau and Taiwan working not only to spread communist ideology in these geographies, but also to monitor residents closely.

The Bureau of Technical Support & Cyber Operations, which is probably one of the biggest bureaus of MSS, is tasked with cyber espionage and plants technical operatives in Chinese companies and embeds trojan horses in Chinese equipment. Today, its footprint is visible across the world. This is where top talents of China are recruited to carry out technical espionage using unindexed proxy servers and private networks, many of which are located on isolated islands in the Yalu River bordering North Korea.

The Bureau of Counterintelligence keeps diplomats, agents and visitors under close watch. As part of its counterintelligence grid, they have a special team that carries out investigations into any intelligence breach. It has a WeChat account where anyone can report suspected intelligence breaches.

Members of the Bureau of Economic Intelligence & Industrial Espionage work to steal intellectual property (IP). Xu Yanjun, a Chinese engineer, was arrested in Belgium in 2018 for stealing data related to turbine engines from General Electric and the French firm Safran. In the US, FBI is investigating more than 2,000 such cases, with nearly 85% believed to be attributable to MSS.

China gathers a lot of data, domestic and international, and sends it to the Intelligence Analysis Bureau where AI systems analyse it. The smaller Internal Security & AntiCorruption Bureau monitors officials—their loyalty, actions that threaten internal security and corruption. The Bureau of Counter Terrorism carries out extensive surveillance on ethnic minorities like the Uyghurs and the Tibetans.

**FOOTPRINTS OF MSS**

**IN INDIA**

- During Operation Sindoor in 2025, China reportedly provided crucial intel as well as real-time satellite imagery to Pakistan through the Bureau of Liaison, part of MSS
- A major power outage in October 2020 in Mumbai is believed to have been caused by malware planted by China in the Maharashtra State Electricity Board servers

**IN US**

- In June 2025, two Chinese nationals were accused of smuggling a fungus – *Fusarium graminearum* – into US. FBI called it a biological pathogen
- In 2022, a secret Chinese 'police station' was uncovered in New York, run with the intent of targeting dissidents in exile

The Bureau of Recruitment and Training is based in Hangzhou. It conceals its identity as Jiangnan Social University, while its real purpose is believed to be to provide training and tools in tradecraft, counterintelligence, surveillance, foreign languages, cryptography, cyber ops and ideological loyalty.

The Signal Intelligence Bureau houses the cipher division as well as monitors signal intelligence from across the globe. The China Institutes of Contemporary International Relations (CICIR) is seen as a front for influencing foreign diplomats, bureaucrats and academics. The China International Culture Exchange Centre (CICEC) works in a similar fashion to CICIR and in the shroud of a cultural organisation.

Both CICIR and CICEC are important tools for recruitment of MSS agents. Since deploying Chinese nationals in other countries could give the game away, it recruits people from other ethnicities as agents and that's where these two organisations play a vital role. They arrange conferences, meets, conventions and other events across the world in the name of cultural or academic activities, invite people, provide unimaginable hospitality and recruit people for their purposes.

The China Information Technology Security Evaluation Centre (CNITSEC) works to keep China safe from technical vulnerabilities. The Special Operations Bureau works on a multi-dimensional spectrum and handles high-risk, sensitive and covert activities, including extrajudicial killings. Meanwhile, the Bureau of Liaison connects with friendly countries like North Korea, Russia and Pakistan, facilitating intelligence-sharing and joint operations.

### The MSS Era

Due to their secretive nature and overlapping roles, the exact way all these bureaus come together is difficult to gauge, but unlike other countries that have separate intel orgs for domestic, foreign and specialised ops, the umbrella structure is believed to help MSS in efficiency.

But optimising for efficiency may not work everywhere. As Heath points out, in countries like US, the separation of foreign and domestic spy duties is designed to prevent concentration of power and reduce risks of governments using spy agencies to monitor their own citizens and violating their rights and privacy. Rajan says, "On the one hand, this integrated model can be highly efficient for a state like China that views internal dissent and foreign threats as intertwined. However, this consolidation of power creates immense risks." He says, it "can lead to a monolithic groupthink, stifling the diverse analysis that competing agencies might provide".

For the moment, what is clear is that the world is living through the era of the MSS.

<https://economictimes.indiatimes.com/news/defence/the-spy-next-door-decrypting-chinas-ministry-of-state-security-the-worlds-largest-and-most-secretive-intelligence-agency/articleshow/122000678.cms?from=mdr>

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## भारतीय नौसेना रूस में स्टेल्थ फ्रिगेट युद्धपोत को करेगी कमीशन, 26 प्रतिशत उपकरण स्वदेशी; जानिए इसकी खासियत

**Source: Dainik Jagran, Dt. 22 Jun 2025**

भारतीय नौसेना एक जुलाई को रूस के कैलिनिनग्राद में अपने नवीनतम, विध्वंसक और रडार से बच निकलने में सक्षम बहुद्वैतीय स्टेल्थ फ्रिगेट युद्धपोत 'तमाल' का जलावतरण करने के लिए पूरी तरह से तैयार है। इस जहाज में 26 प्रतिशत उपकरण स्वदेशी हैं, जिनमें समुद्र और जमीन दोनों पर निशाना साधने के लिए लंबी दूरी की क्रूज मिसाइल ब्रह्मोस भी शामिल है।

यह युद्धपोत 125 मीटर लंबा और 3900 टन वजनी घातक जहाज है। तमाल भारतीय और रूसी अत्याधुनिक तकनीकों एवं युद्धपोत निर्माण में सर्वोत्तम कार्य प्रणालियों का एक प्रभावशाली मिश्रण है। इस जहाज का नया डिजाइन इसे उन्नत विध्वंसक विशेषताएं प्रदान करता है। भारतीय नौसेना के विशेषज्ञों और रूस के सेवेरनोये डिजाइन ब्यूरो के सहयोग से जहाज की स्वदेशी सामग्री को 26 प्रतिशत तक बढ़ाया गया है।

### युद्धपोत का नाम तमाल रखा

इस युद्धपोत का नाम तमाल रखा गया है, जो देवताओं के राजा इंद्र द्वारा युद्ध के लिए इस्तेमाल की जाने वाली पौराणिक तलवार का प्रतीक है। इस जहाज का शुभंकर भारतीय पौराणिक कथाओं के अमर भालू राजा 'जाम्बवंत' और रूसी राष्ट्रीय पशु - यूरोशियन भूरे भालू की समानता से प्रेरित है। इस विध्वंसक युद्धपोत के चालक दल के सदस्य सामूहिक रूप से स्वयं को 'द ग्रेट बियर्स' कहलाने में बहुत गर्व महसूस करते हैं।

तमाल लंबे समय से चले आ रहे भारत-रूस सहयोग और मित्रता का प्रमाण है, जो समय की कसौटी पर खरा उतरता है। तमाल का आदर्श वाक्य, 'सर्वदा सर्वत्र विजय' है। यह प्रत्येक मिशन में परिचालन उत्कृष्टता हेतु भारतीय नौसेना की अटूट प्रतिबद्धता को दर्शाता है। पश्चिमी नौसेना कमान के फ्लैग आफिसर कमांडिंग-इन-चीफ वीएडीएम संजय जे. सिंह मुख्य अतिथि के रूप में इस समारोह की अध्यक्षता करेंगे। जलावतरण के महत्वपूर्ण अवसर पर भारत और रूस के कई उच्चस्तरीय रक्षा अधिकारी भी उपस्थित रहेंगे।

### चालक दल में 250 से अधिक कर्मी

यह युद्धपोत पिछले दो दशकों में रूस से प्राप्त किए गए क्रिवाक श्रेणी के फ्रिगेट की श्रृंखला में आठवां घातक जंगी जलयान है। तमाल तुशील श्रेणी का ऐसा दूसरा युद्धपोत है, जो अपने पूर्ववर्ती जहाजों तलवार और तेग श्रेणी का उन्नत संस्करण व गोपनीयता से कार्य करने वाला जलपोत है। इसके चालक दल में 250 से अधिक कर्मी हैं, जिन्होंने रूस के सेंट पीटर्सबर्ग और कैलिनिनग्राद की अत्यंत चुनौतीपूर्ण शीतकालीन परिस्थितियों में कठोर तटीय तथा जलगत प्रशिक्षण प्राप्त किया है।

तमाल ने लगातार तीन महीनों में व्यापक समुद्री परीक्षण पूरे कर लिए हैं, जिससे इसकी प्रणालियों, हथियारों और सेंसरों का परीक्षण हो चुका है। तमाल युद्धपोत नौसेना में शामिल होने के बाद पश्चिमी नौसेना कमान के अंतर्गत भारतीय नौसेना की 'स्वार्ड आर्म', पश्चिमी बेड़े में तैनात हो जाएगा। यह न केवल भारतीय नौसेना की बढ़ती हुई क्षमताओं का प्रतीक होगा, बल्कि भारत-रूस साझेदारी की सहयोगी शक्ति का भी विशिष्ट उदाहरण पेश करेगा।

<https://www.jagran.com/news/national-navy-set-to-commission-latest-stealth-frigate-tamal-in-russia-in-july-40000980.html>

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## Navy set to commission latest stealth frigate Tamal in Russia in July

*Source: The Indian Express, Dt. 23 Jun 2025*

The Navy is set to commission its latest stealth multi-role frigate Tamal on July 1 at Russia's Kaliningrad, making it the eighth in the series of Krivak class frigates inducted from Russia over the past two decades.

Tamal will join the 'Sword Arm' of the Navy, the Western Fleet, under the Western Naval Command and is the second ship of the Tushil Class — the upgraded versions of their predecessors, Talwar and Teg classes.

The commissioning comes six months after the first warship of the Tushil class, INS Tushil, was commissioned at Kaliningrad.

As part of the contract for construction of four Tushil class warships, India is building two similar frigates as INS Tushil and Tamal called the Triput class at Goa Shipyard Limited with transfer of technology and design assistance from Russia.

Once the construction of this series of ships is completed, the Navy will be operating 10 ships with similar capabilities and commonality in equipment, weapon and sensor fit over four different classes, the Navy said in a statement Sunday.

According to the Navy, Tamal's construction was closely overseen by an Indian team of specialists from the Warship Overseeing Team stationed at Kaliningrad, under the aegis of the Embassy of India, Moscow. At the Naval Headquarters, the project was steered by the Directorate of Ship Production under the Controller of Warship Production and Acquisition.

The Navy said that Tamal has been built at Yantar Shipyard in Kaliningrad and is the last warship to be inducted from a foreign source in view of India's push to be self-reliant in defence. The warship has 26% indigenous components, including the BrahMos long-range cruise missile for targeting both at sea and land.

Other indigenous systems include Surface Surveillance Radar complex and HUMSA NG Mk II sonar with the anti-submarine weapon firing complex among other weapons and sensors.

It also features modern communication and data-link systems, navigation equipment and critical infrastructure. BrahMos Aerospace Private Ltd, Bharat Electronics Ltd, Keltron, Nova Integrated Systems from Tata, Elcome Marine, Johnson Controls India were among those involved.

Upgrades in the warship include vertically launched surface-to-air missiles, improved 100 mm gun, new age EO/IR (Electro-Optical/Infrared) system in addition to the standard 30 MM CIWS (Close-In Weapon System, heavyweight torpedoes, urgent-attack anti-submarine rockets, and a host of surveillance and fire control radars and systems.

The ship also includes Air Early Warning and Multi Role helicopters, which can operate from its deck.

"The combat capability of the ship is augmented by a host of Network Centric Warfare capabilities and advanced Electronic Warfare suite. Tamal punches well above its weight with a very high tonnage to firepower ratio, extended endurance, and a top speed in excess of 30 knots," the Navy said.

It added that the 125 m-long and 3,900-ton warship blends Indian and Russian cutting-edge technologies and best practices in warship construction.

According to the Navy, the crew, comprising over 250 personnel, have undergone rigorous ashore and afloat training in challenging winter conditions of St. Petersburg and Kaliningrad.

Tamal has completed extensive sea trials undertaken over three months, the Navy added.

<https://indianexpress.com/article/india/navy-commission-stealth-frigate-tamal-in-russia-in-july-10081989/>

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## **Israel-Iran conflict: Why Indian military supplies may not be hit as of now**

**Source: The Indian Express, Dt. 23 Jun 2025**

The ongoing Israel-Iran conflict may not have an immediate impact on Indian military hardware and maintenance support, except if it turns into another protracted conflict stretching several months, officials closely monitoring the conflict told The Indian Express.

"The war is too new as of now to show any displayable impact on Indian military spares or hardware," a senior military official said, adding that any diversion of weapons stock can take place if the conflict is drawn out.

This is significant as India is actively working on replenishing much of its Israeli-origin weapons which have been extensively used for Operation Sindoor against Pakistan last month in response to the April 22 Pahalgam terror attack, killing 26 people.

Over the last decade, India has purchased a range of military equipment and weapons from Israel covering missiles, unmanned aerial vehicles, sensors and radars, air defence systems and small arms.

According to Stockholm International Peace Research Institute (SIPRI) data, in 2020-24, Israel accounted for 3.1% of global arms exports, eighth largest exporter globally. The largest single importer of Israeli arms was India at 34%, followed by the US at 13% and the Philippines at 8.1%, according to SIPRI data.

Some of these include SkyStriker loitering munitions — they can “loiter” or hover in the air close to the designated target before self-destructing on impact — Heron and Searcher UAVs, Derby Beyond Visual Range Air to Air Missiles, SPICE 2000 guided bombs, Spike anti-tank guided missiles, Spyder surface to air missile system, Barak 8 air defence system and Negev light machine guns and network radio communication equipment.

Many of these Israeli weapons and platforms acquired by India — particularly loitering munitions and air defence systems — were used during Operation Sindoor.

Retaliating to Pakistan’s attack following Operation Sindoor, India has used its latest loitering munitions such as the Israeli HAROPs and the HARPYS.

Several Israeli companies have partnered and formed joint ventures with Indian companies and that will also help keep supplies to India going despite the war.

“A range of high precision engineering companies in India carrying out contract manufacturing for Israelis is likely to ensure sustenance of Israeli-origin equipment remains unaffected,” an official said.

This is in contrast with the impact another ongoing global conflict — the prolonged Russia-Ukraine war — initially had on Indian military spare supplies and delayed delivery schedule of the S-400 Triumf long-range surface-to-air missile system units.

Officials explained this was because many of the big platforms in the Indian military such as fighter aircraft, transport aircraft, warships, air defence systems and small arms are of Soviet origin, requiring huge maintenance support from Russia, compared to the Israeli military hardware India has acquired over the years.

The impact was significant even as India has started the maintenance of many Soviet-era military equipment indigenously.

Another big factor that affected Russian military supplies to India was that the country was facing the Countering America’s Adversaries Through Sanctions Act (CAATSA) in 2017. Russia was subjected to more stringent economic sanctions from the west after the war started.

Before Operation Sindoor, the Indian Air Force had used the Israeli SPICE 2000 guided bombs for the Balakot air strikes in February 2019. The Army has procured advanced Heron drones from the country in the last two years to amplify surveillance along the Line of Actual Control amid the military standoff with China.

<https://indianexpress.com/article/india/israel-iran-conflict-affect-indian-military-supplies-10081822/>

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## ड्रोन माउंटेड एमएमजी छिपे हुए दुश्मनों पर भी बरसाएगी गोलियां, प्रोटोटाइप तैयार

Source: Dainik Jagran, Dt. 22 Jun 2025

आपरेशन सिंदूर में पाकिस्तान को ब्रह्मोस मिसाइल और ड्रोन से दहलाने वाली भारतीय सेना के पास जल्द ही एक नया ड्रोन माउंटेड हथियार होगा। रक्षा मंत्रालय की तीन पीएसयू को इस हथियारबंद ड्रोन पर अनुसंधान व विकास का काम शुरू कर दिया है। टूप कम्फर्ट्स लिमिटेड (टीसीएल), एडवांस्ड वेपन्स एंड इक्विपमेंट इंडिया लिमिटेड (एडब्ल्यूईआइएल), म्यूनिशंस इंडिया लिमिटेड (एमआइएल) ने ड्रोन माउंटेड मीडियम मशीन गन (एमएमजी) का प्रोटोटाइप तैयार कर लिया है।

टीसीएल द्वारा तैयार होने वाला ये ड्रोन दुश्मन के इलाके में 40 मिनट तक 10 किमी के दायरे में मशीन गन से 18 सौ मीटर की दूरी तक दुश्मनों पर गोलियां बरसाने में सक्षम होगा। इस ड्रोन में छिपे बैठे दुश्मन की पहचान करने की भी क्षमता होगी। ड्रोन को अत्याधुनिक कैमरे और सेंसर्स से भी युक्त किया जाएगा।

टीसीएल के अधिकारी के मुताबिक अभी तक दुनिया में तुर्किए के साथ आस्ट्रेलिया के पास ही चार सौ मीटर की रेंज में गोलियां बरसाने वाली ड्रोन माउंटेड गन हैं। रक्षा मंत्रालय की पीएसयू उससे चार गुणा से अधिक रेंज की ड्रोन माउंटेड एमएमजी बनाने जा रही हैं। उससे सेना की फायर पावर तो बढ़ेगी ही दूसरे देशों में निर्यात की संभावना भी बढ़ जाएगी। टीसीएल कंपनी, कानपुर के अधीन ओईएफ, हजरतपुर (फिरोजाबाद) में महाप्रबंधक अमित सिंह के निर्देशन में 35 किलो तक के वजन की गन उठाकर उड़ने वाले ड्रोन निर्माण पर काम चल रहा है।



### हर मौसम में दुश्मन का सफाया करने में होगा समक्ष

ये ड्रोन न्यूनतम माइनस पांच डिग्री सेल्सियस से लेकर अधिकतम 55 डिग्री सेल्सियस तक के तापमान में ये उड़ सकेंगे। ऐसे में ड्रोन सिस्टम हिमालय के ऊंचे पहाड़ों से लेकर राजस्थान के गर्म रेगिस्तान में भी दुश्मनों का सफाया करने में सक्षम होगा।

एडब्ल्यूईआइएल कंपनी ड्रोन माउंटेड मशीन गन बनाकर देगी। उसको कंट्रोल रूम से विशेषज्ञ टीम संचालित करेगी। एमआइएल मशीन गन में लगने वाली बुलेट्स बनाएगी। प्रोटोटाइप तैयार होने के बाद अब तीनों कंपनियों के संयुक्त प्रयास से ड्रोन माउंटेड मशीन गन का परीक्षण भी जल्द शुरू होगा।

सेना की जरूरत के अनुसार इसमें बदलाव किए जाएंगे। ड्रोन माउंटेड एमएमजी का सफल परीक्षण होने के बाद इसे भारतीय सेना को सौंपा जाएगा।

<https://www.jagran.com/uttar-pradesh/kanpur-city-drone-mounted-mmg-will-fire-bullets-even-on-hidden-enemies-prototype-ready-40000896.html>

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## Defence Secy: China did not play active role in India-Pak skirmish

*Source: The Tribune, Dt. 21 Jun 2025*

Defence Secretary Rajesh Kumar Singh has said that while China supported Pakistan with satellite imagery and military equipment, it did not take an active part in the recent skirmish with India.

Speaking in a podcast with a news agency, Singh was asked about reports of Chinese military and diplomatic officials being present in Pakistani war rooms. He responded, “Collusion, yes — in terms of equipment, supplies, perhaps satellite imagery as well — all that probably could have happened. But definitely, they (the Chinese) did not play an active role.”

He added, “It is clear there was no direct support from them, but yes, in terms of equipment... Pakistanis don’t have many resources, so they obviously rely on begging or borrowing from Turkey or China.”

On India-China relations, Singh said the two countries must strike a delicate balance — maintaining diplomatic engagement while remaining militarily vigilant. “Trust is low, but we should be cautiously optimistic because they (China) have also shown interest in dialogue as a mode of dispute resolution,” he said, adding that conversations are ongoing at the Special Representative (SR) level. National Security Adviser Ajit Doval and Chinese Foreign Minister Wang Yi are the SRs on either side.

Commenting on the ceasefire process with Pakistan, Singh clarified, “It was Pakistan that capitulated on May 10. They came forward asking for time, seeking talks and eventually requested cessation of hostilities. That sequence should be clear — they were the ones who asked for the ceasefire.”

He noted that transcripts and records of discussions between the two Director Generals of Military Operations (DGMO) are available to support this account.

On Pakistan army chief Field Marshal Asim Munir’s meeting with US President Donald Trump, Singh remarked, “It must be an embarrassment for any country when the military chief is invited while the Prime Minister is nowhere to be seen. It’s a very strange, structurally imbalanced state.”

Regarding Operation Sindoor, Singh said, “The operation was marked by excellent tri-service synergy and strong coordination with intelligence agencies. We achieved 100 per cent of our objectives.”

<https://www.tribuneindia.com/news/india/defence-secy-china-did-not-play-active-role-in-india-pak-skirmish/>

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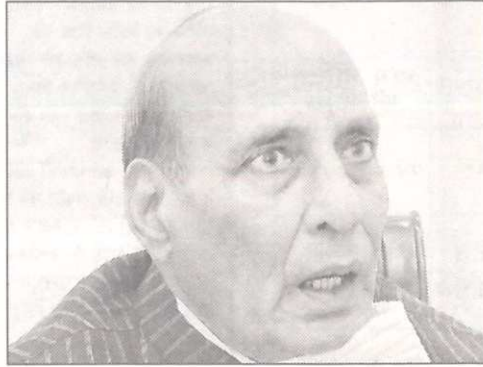
## 'ऑपरेशन सिन्दूर' सबूत है कि नया भारत अब आतंकवाद का शिकार नहीं होगा

Source: Jansatta, Dt. 21 Jun 2025

जनसत्ता ब्यूरो  
नई दिल्ली, 20 जून।

रक्षा मंत्री राजनाथ सिंह ने शुक्रवार को कहा कि 'आपरेशन सिन्दूर' इस बात का सबूत है कि नया भारत दृढ़ निश्चयी है और अब आतंकवाद का शिकार नहीं होगा। सिंह शुक्रवार को दो दिवसीय दौरे पर उधमपुर पहुंचे थे। वह शनिवार को अंतरराष्ट्रीय योग दिवस कार्यक्रम में हिस्सा लेंगे और उधमपुर छावनी में सशस्त्र बलों के जवानों से बातचीत करेंगे।

सिंह ने उधमपुर उत्तरी कमान मुख्यालय में सैनिकों से बातचीत करते हुए कहा कि 'ऑपरेशन सिन्दूर' इस बात का सबूत है कि नया भारत दृढ़ निश्चयी है और अब आतंकवाद का शिकार नहीं होगा। यह ताकत और रणनीति के साथ जवाब देगा। उन्होंने कहा कि भारत अब आतंकवाद को बर्दाश्त नहीं करेगा और अगर उसकी एकता और अखंडता को नुकसान पहुंचाया गया तो इसका मुंहतोड़ जवाब



दिया जाएगा। 'आपरेशन सिन्दूर' अभी खत्म नहीं हुआ है। यह बस एक विराम है। मैं अपने पड़ोसी देश को यह बताना चाहता हूँ। रक्षा मंत्री ने कहा कि आतंकवाद के प्रति भारत की नीति में बदलाव देश के सैनिकों की अद्वितीय वीरता और समर्पण का परिणाम है। इस अवसर पर उनके साथ सेना प्रमुख जनरल उपेंद्र द्विवेदी, उत्तरी कमान के जीओसी-इन-चीफ लेफ्टिनेंट जनरल प्रतीक शर्मा और वरिष्ठ सैन्य अधिकारी भी मौजूद थे।

## अगले सप्ताह एससीओ बैठक के लिए चीन जाएंगे

नई दिल्ली, 20 जून (ब्यूरो)।

रक्षा मंत्री राजनाथ सिंह की शंघाई सहयोग संगठन (एससीओ) के रक्षा मंत्रियों की बैठक के लिए अगले हफ्ते 25-27 जून के बीच चीन यात्रा पर जाएंगे। रक्षा मंत्री की यह प्रस्तावित यात्रा पूर्वी लद्दाख के सीमावर्ती इलाके में भारत-चीन में जारी गतिरोध के बाकी बचे मुद्दे का हल निकालने की दिशा में महत्वपूर्ण साबित हो सकती है।

एससीओ देशों के रक्षा मंत्रियों की यह बैठक चीन के किंगदाओ में हो रही है। पूर्वी लद्दाख में अक्टूबर 2024 में सैन्य गतिरोध खत्म करने की दोनों देशों की ओर से हुई बड़ी फहल के बाद राजनाथ की यह यात्रा चीन में पहली भारतीय मंत्रिस्तरीय वार्ता भी होगी।

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## Operation Sindoor not over, paused after Pakistan pleading: Rajnath Singh

Source: The Times of India, Dt. 22 Jun 2025

Operation Sindoor was paused only after Pakistan pleaded for a ceasefire, defence minister Rajnath Singh said Saturday, adding that the operation was not over yet, and India was ready to take any action against terrorism.

Addressing troops of Army's Udhampur-based Northern Command on the 11th International Day of Yoga, Singh said: "Operation Sindoor is the natural progression of surgical strike of 2016 and the airstrike of 2019. It was executed in such a way that Pakistan requested for a ceasefire, and only then we put a pause. As I have said earlier, Operation Sindoor is not over yet. India is fully prepared to take all kinds of action against terrorism.

"Singh warned Pakistan that the military operation - a response to the Pahalgam attack - was a clear message that it will face the consequences for supporting terror activities against India.

Stating that the country's social and communal unity was targeted through the Pahalgam attack, Singh asserted that Operation Sindoor had conveyed to Pakistan that its policy of bleeding India with thousand cuts would not succeed.

Pakistan wanted to weaken India from within, but it should never forget that just like Major Somnath Sharma, Brigadier Usman, too, had sacrificed his life for the unity and integrity of the country, Singh said.

Singh appreciated the inclination of the armed forces towards yoga, saying it had a direct impact on their discipline and focus. "Yoga gives clarity to the people in chaos. It is an art, science, philosophy and spirituality. It makes us proactive, not reactive."

<https://timesofindia.indiatimes.com/india/sindoor-not-over-paused-after-pakistan-pleading-rajnath/articleshow/121998439.cms>

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## US's stealth tour de force: B-2 Spirit

Source: Hindustan Times, Dt. 23 Jun 2025

The US used its B-2 Spirit stealth bombers in the strikes on Iran's nuclear sites. The aircraft, though decades old, is still at the cutting-edge of attack and stealth technologies

172 feet  
Wingspan

17 feet  
Height

69 feet  
Length

**\$2.1 billion**

Cost of each B-2, making it the most expensive military aircraft ever made

### TOP SPEED

1,010km/hour at 40,000 ft altitude  
or Mach 0.95 at sea level

### Under the radar

The B-2's stealth technology incorporates radar-absorbing materials and angular design features that minimise detection. Its radar cross-section is reportedly comparable to that of a small bird, making it nearly invisible to conventional radar.

### The payload: 'Bunker-busters'

The B-2 can carry payloads of over 13,500kg and is the only aircraft that can carry the US's GBU-57A/B Massive Ordnance Penetrator, a precision-guided "bunker buster" used to attack Iran's nuclear sites, in what is the weapon's first use in combat. The bomb can travel depths of 60m before exploding.

### A DECADE IN THE MAKING

Made by Northrop Grumman, B-2 began its production run in the late 1980s. The aircraft was built with the Cold War in mind, but the fall of the Soviet Union meant the original order, meant to be over 130 units, was curtailed.

**21** Units of the B-2 made after the Pentagon's planned acquisitions were truncated

### LONG-RANGE AIRCRAFT

The bomber's range of over 11,000km without refueling enables global strike capabilities from continental US bases. With aerial refueling, the B-2 can reach virtually any target worldwide, as demonstrated in missions from Missouri to Afghanistan and Libya.

On Sunday morning, seven B-2 Spirit bombers flew 18 hours nonstop from the US to Iran to bomb the Islamic Republic's nuclear sites, with multiple refuellings.



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# Science & Technology News

## भारतीय विज्ञानियों ने किया कमाल, पानी से ग्रीन हाइड्रोजन बनाने वाला उपकरण किया विकसित

**Source: Dainik Jagran, Dt. 22 Jun 2025**

लगातार गर्म होती धरती को बचाने के लिए भारत केवल हवा हवाई बातें नहीं करता बल्कि अपने कदमों से साबित करता है कि भारतीय यूं ही धरती को माता नहीं कहते।

भारत ने न केवल आगे बढ़कर 2070 तक शून्य कार्बन उत्सर्जन का लक्ष्य रखा है बल्कि इस लक्ष्य को हासिल करने के लिए कई कदम उठा रहा है। इसी सिलसिले में भारतीय विज्ञानियों ने ऐसा उपकरण बनाया है जिससे सौर ऊर्जा का उपयोग करके पानी से ग्रीन हाइड्रोजन बनाया जा सकेगा।

### ग्रीन हाइड्रोजन सबसे स्वच्छ ईंधनों में से एक

गौरतलब है कि ग्रीन हाइड्रोजन सबसे स्वच्छ ईंधनों में से एक है, जो उद्योगों को कार्बन उत्सर्जन से मुक्त करने, वाहनों को चलाने और अक्षय ऊर्जा संग्रहीत करने में सक्षम है, किंतु ग्रीन हाइड्रोजन बनाने में काफी फंड की जरूरत होती है।

अब तक ग्रीन हाइड्रोजन बनाने का किफायती उपकरण या तरीका नहीं था। इस उपकरण को विकसित कर भारतीय विज्ञानियों ने एक बार फिर अपनी मेधा का लोहा मनवाया है। साबित किया कि फंड की कमी में भी भारतीय बेहतरीन परिणाम दे सकते हैं।

### बेंगलुरु के विज्ञानियों की टीम ने अगली पीढ़ी का यह उपकरण विकसित किया

विज्ञान और प्रौद्योगिकी विभाग के स्वायत्त संस्थान, सेंटर फार नैनो एंड साफ्ट मैटर साइंसेज (सीईएनएस), बेंगलुरु के विज्ञानियों की टीम ने अगली पीढ़ी का यह उपकरण विकसित किया है, जो जीवाश्म ईंधन या महंगे संसाधनों पर निर्भर किए बिना, केवल सौर ऊर्जा और पृथ्वी पर प्रचुर मात्रा में मौजूद सामग्रियों का उपयोग करके पानी के अणुओं से ग्रीन हाइड्रोजन का उत्पादन करता है।

इस उपकरण ने असाधारण दीर्घकालिक स्थिरता का प्रदर्शन किया, क्षारीय परिस्थितियों में 10 घंटे से अधिक समय तक लगातार काम किया और प्रदर्शन में गिरावट केवल चार प्रतिशत रही जो एसआइ-आधारित फोटोइलेक्ट्रोकेमिकल सिस्टम में दुर्लभ उपलब्धि है।

### बड़े पैमाने पर ग्रीन हाइड्रोजन का उत्पादन भी किया जा सकता है

इस शोध का नेतृत्वकर्ता सीईएनएस के डॉ. आशुतोष के. सिंह ने कहा, स्मार्ट सामग्रियों का चयन करके और उन्हें हेटेरोस्ट्रक्चर में संयोजित करके, हमने ऐसा उपकरण बनाया है जो न केवल प्रदर्शन को बढ़ाता है, बल्कि बड़े पैमाने पर ग्रीन हाइड्रोजन का उत्पादन भी किया जा सकता है। इसके साथ ही हम किफायती और बड़े पैमाने पर सौर ऊर्जा -से-हाइड्रोजन ऊर्जा प्रणालियों के और करीब पहुंच गए हैं। इस शोध को जर्नल आफ मेटेरियल केमेस्ट्री ए में प्रकाशित किया गया है।

### प्रयोगशाला में मिली सफलता से कहीं अधिक है यह उपलब्धि

यह उपलब्धि एक प्रयोगशाला में मिली सफलता से कहीं अधिक है। उपकरण ने 600 एमवी का उत्कृष्ट फोटोवोल्टेज हासिल की, जिससे यह सौर ऊर्जा के तहत हाइड्रोजन उत्पन्न करने में अत्यधिक प्रभावी हुआ।

## यह उपकरण कई कारणों से आकर्षक

यह उपकरण कई कारणों से आकर्षक है, जिसमें उच्च दक्षता, कम ऊर्जा इनपुट, मजबूत स्थायित्व और किफायती सामग्री शामिल हैं, ये सभी एक पैकेज में हैं। इसने बड़े पैमाने पर सफल प्रदर्शन दिखाया, जिसमें 25 सेंटीमीटर के वर्गाकार फोटोएनोड ने पानी से ग्रीन हाइड्रोजन बनाने में बेहतरीन परिणाम दिए।

अनुसंधानकर्ताओं का मानना है कि यह सिर्फ शुरुआत है। भविष्य में यह प्रौद्योगिकी घरों से लेकर कारखानों तक, हाइड्रोजन-आधारित ऊर्जा प्रणालियों को ईंधन दे सकती है, जो पूरी तरह सूर्य पर निर्भर होगी।

## इस तरह डिजाइन किया उपकरण

शोधकर्ताओं की टीम ने डॉ. आशुतोष के. सिंह के नेतृत्व में अत्याधुनिक सिलिकान-आधारित फोटोएनोड को इनोवेटिव एन-आइ-पी हेटेरोजंक्शन आर्किटेक्चर का उपयोग करके डिजाइन किया। इसमें स्टैकड एन-टाइप टीआईओ<sub>2</sub>, आंतरिक (अनडाप्ड) एसआई, और पी-टाइप एनआईओ सेमीकंडक्टर परतें शामिल हैं, जो चार्ज सेपरेशन और परिवहन दक्षता को बढ़ाने के लिए साथ काम करते हैं।

मैटेरियल को मैग्नेट्रान स्पटरिंग का उपयोग करके डिपोजिट किया गया था, जो एक मापनयोग्य तकनीक है। यह तकनीक सटीकता और दक्षता भी सुनिश्चित करती है। इस दृष्टिकोण से बेहतर प्रकाश अवशोषण, तीव्र चार्जिंग और रिकांबिनेशन के मामले में कम हानि सुनिश्चित हुई, जो सौर ऊर्जा से-हाइड्रोजन बनाने के लिए महत्वपूर्ण हैं।

<https://www.jagran.com/news/national-bengaluru-scientists-develop-device-that-splits-water-to-make-green-hydrogen-40000589.html>

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## India's solar leap to produce Green Hydrogen by splitting water molecules using only solar energy

*Source: Press Information Bureau, Dt. 20 Jun 2025*

Scientists have developed a scalable next-generation device that produces green hydrogen by splitting water molecules using only solar energy.

Green hydrogen is one of the cleanest fuels known, capable of decarbonizing industries, powering vehicles, and storing renewable energy. Yet, until now, scalable and affordable production methods remained elusive.

In a major leap in this direction, scientists from the Centre for Nano and Soft Matter Sciences (CeNS), Bengaluru, an autonomous institute of the Department of Science and Technology (DST), have developed a next-generation device that produces green hydrogen by splitting water molecules using only solar energy and earth-abundant materials, without relying on fossil fuels or expensive resources.

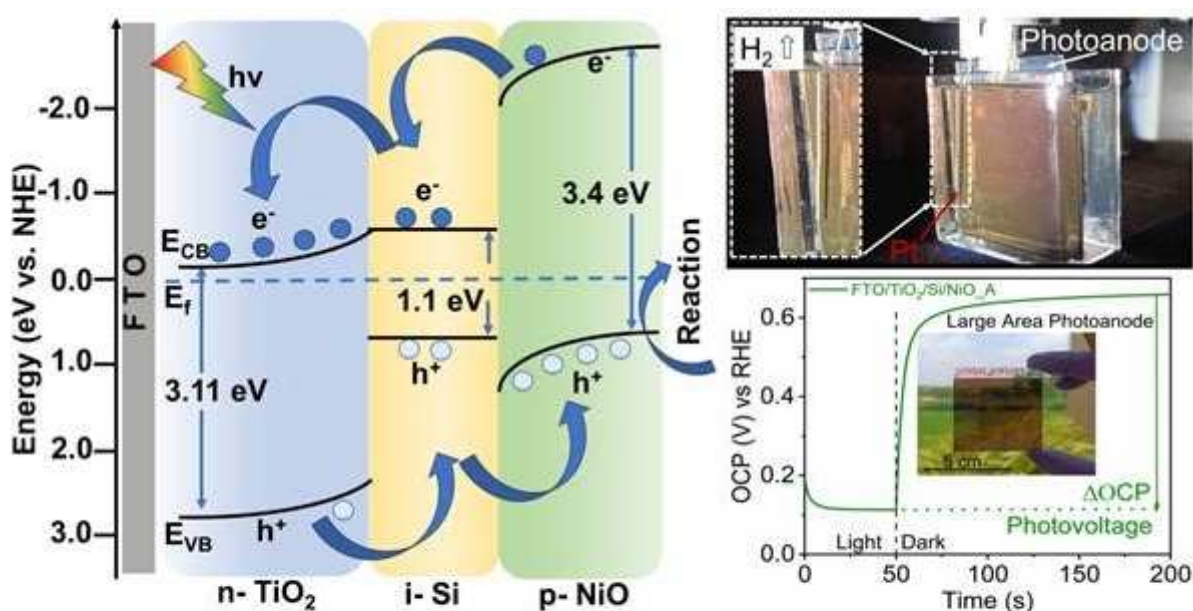
Led by Dr. Ashutosh K. Singh, the research team designed a state-of-the-art silicon-based photoanode using an innovative n-i-p heterojunction architecture, consisting of stacked n-type TiO<sub>2</sub>, intrinsic (undoped) Si, and p-type NiO semiconductor layers, which work together to enhance charge separation and transport efficiency.

The materials were deposited using magnetron sputtering, a scalable and industry-ready technique that ensures precision and efficiency. This thoughtful engineering approach allowed

better light absorption, faster charge transport, and reduced recombination loss, key ingredients for efficient solar-to-hydrogen conversion.

This is more than just a lab success. The device achieved an excellent surface photovoltage of 600 mV and a low onset potential of around 0.11 VRHE, making it highly effective at generating hydrogen under solar energy. Even more impressively, it showcased exceptional long-term stability, operating continuously for over 10 hours in alkaline conditions with only a 4% performance drop, a rare feat in Si-based photoelectrochemical systems.

This new device is attractive for several reasons, including high efficiency, low energy input, robust durability, and cost-effective materials, all in one package. It even demonstrated successful performance at a large scale, with a 25 cm<sup>2</sup> photoanode delivering excellent solar water-splitting results.



*Fig: Schematic illustration of the n-i-p heterojunction photoanode showing charge transfer pathways for efficient solar water splitting. Inset images highlight the large-area photoanode (25 cm<sup>2</sup>) generating hydrogen under solar energy and its surface photovoltage response demonstrating strong photoelectrocatalytic activity and scalability.*

“By selecting smart materials and combining them into a heterostructure, we have created a device that not only boosts performance but can also be produced on a large scale,” said Dr. Singh. “This brings us one step closer to affordable, large-scale solar-to-hydrogen energy systems.”

The work has been published in Journal of Materials Chemistry A, published by the Royal Society of Chemistry, and the researchers believe this is just the beginning. With further development, the technology could fuel hydrogen-based energy systems, from homes to factories, all powered by the sun.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=2138051>

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## ISRO readies SpaDeX-2 mission to dock satellites in elliptical orbit

*Source: The Indian Express, Dt. 22 Jun 2025*

After successfully bringing together two satellites in space, scientists at the Indian Space Research Organisation (ISRO) are drawing up plans for a second SpaDeX mission — this time to dock two satellites in an elliptical orbit. The ability to join two satellites in space, known as docking, is critical for India's upcoming Chandrayaan-4 mission and the proposed Bharatiya Antariksh Station, the country's planned space station.

In the first SpaDeX mission, two 220-kg satellites were launched into a 470-km circular orbit. With a small relative velocity introduced between them, the satellites were allowed to drift apart before being progressively brought closer. On January 16, they successfully docked. The experiment also demonstrated power sharing between the satellites and their ability to receive commands as a single composite unit. With this, India became only the fourth country, after the US, Russia, and China, to demonstrate in-space docking capabilities. However, the feat was carried out in a relatively easier circular orbit.

“Docking in a circular orbit is much easier than docking in an elliptical orbit. This is because the trajectory and velocity of the satellites remain constant in a circular orbit, whereas they keep changing on an elliptical orbit. What this essentially means is that calculations done for one point will not be relevant after a few minutes,” said a scientist in the know of the matter. “This is, however, what the SpaDeX 2 experiment will attempt.”

This capability is likely to play a vital role in future missions, such as Chandrayaan-4, where multiple modules may be launched separately, and docking and undocking will be required in both Earth and lunar orbits. For moon missions, ISRO typically launches spacecraft into an elliptical Earth orbit, gradually raising the apogee (farthest point) through engine burns at perigee (closest point) to use minimal fuel. This process sets up a slingshot trajectory toward the Moon, making docking in elliptical orbits a practical requirement for complex missions.

The first docking operation took a considerable amount of time, as the agency approached it with extreme caution. “This was the first time ISRO was attempting docking and undocking, so everything had to be meticulously planned and tested. In fact, several of the sensors being used were developed for this mission itself and had to be calibrated to readings in space. Once that was done, the readings were used to conduct several simulations on Earth before the actual docking was attempted. And, even then, the satellites were brought closer very slowly. With all the knowledge gathered during the first docking, the second became easier. It was quicker, without the satellites needing to stop and go as many times as the first time,” the scientist said.

During the initial attempt, the SpaDeX satellites were brought progressively closer, halting at designated checkpoints – 5 km, 1.5 km, 500 m, 225 m, 15 m, and 3 m – before finally docking. In the second attempt, post-separation, the process was smoother and faster, with fewer halts en route to redocking.

<https://indianexpress.com/article/india/isro-readies-spandex-2-mission-to-dock-satellites-in-elliptical-orbit-10080630/>

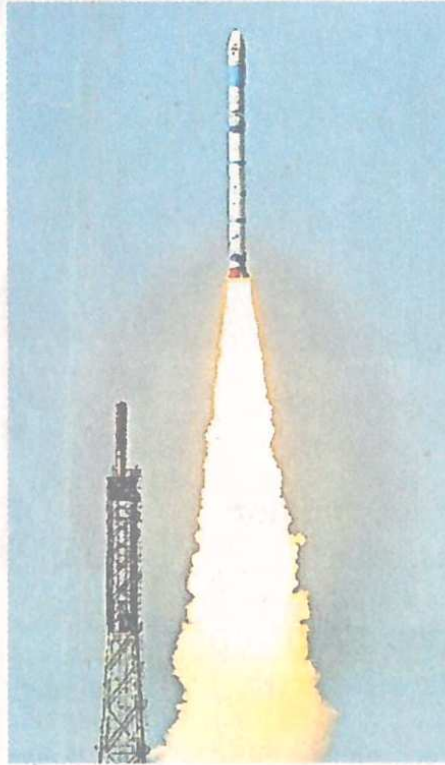
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## अब हिंदुस्तान एयरोनॉटिकल लिमिटेड में बनेंगे इसरो का एसएसएलवी रॉकेट

Source: Dainik Jagran, Dt. 21 Jun 2025

नई दिल्ली, प्रेटर : रक्षा क्षेत्र की सरकारी कंपनी हिंदुस्तान एयरोनॉटिक्स लि. (एचएएल) में अब इसरो का एसएसएलवी रॉकेट भी बनेगा। एचएएल ने इसरो के छोटे उपग्रह प्रक्षेपण यान (एसएसएलवी) की प्रौद्योगिकी हस्तांतरण के लिए 511 करोड़ की सर्वाधिक बोली लगाई है। यह 'मेक इन इंडिया' के लिए बड़ी उपलब्धि है। एचएएल को शुक्रवार को एसएसएलवी की प्रौद्योगिकी हस्तांतरण के लिए बोली का विजेता घोषित किया गया। लड़ाकू विमान बनाने वाली इस कंपनी का मुकाबला दो कंसोर्टियमों से था - एक का नेतृत्व अल्फा डिजाइन टेक्नोलाजीज द्वारा किया जा रहा था, जिसे अदाणी समूह का समर्थन था और दूसरा हैदराबाद स्थित भारत डायनेमिक्स लि. के नेतृत्व में था। इसरो के एसएसएलवी रॉकेट से 500 किग्रा तक के उपग्रहों को पृथ्वी की निचली कक्षा में स्थापित किया जाएगा।

पहली बार भारतीय कंपनी को इसरो से मिलेगी रॉकेट बनाने की पूरी



### नौ कंपनियों ने प्रौद्योगिकी हस्तांतरण में दिखाई थी रुचि

इन- स्पेस के अध्यक्ष गोयनका ने बताया कि नौ कंपनियों ने एसएसएलवी की प्रौद्योगिकी हस्तांतरण में रुचि दिखाई थी, जिनमें से तीन को अस्वीकार कर दिया। शेष छह में से तीन ने आवेदन नहीं करने का फैसला किया। गोयनका ने कहा कि इसरो अगले दो वर्षों में एचएएल को दो प्रोटोटाइप रॉकेट बनाने में मदद करेगा। उसके बाद, कंपनी द्वारा मांग के आधार पर हर वर्ष छह से 10 एसएसएलवी उत्पादन करने की उम्मीद है।

तकनीक : पहली बार ऐसा हो रहा है कि किसी भारतीय कंपनी को इसरो से रॉकेट बनाने की पूरी तकनीक मिलेगी। एचएएल ने 511 करोड़ रुपये की बोली लगाई, जिसके तहत प्रौद्योगिकी हस्तांतरण की प्रक्रिया पूरी होने के बाद एसएसएलवी को

केवल एचएएल में बनाया जाएगा। यह प्रक्रिया अगले दो वर्षों में पूरी होने की उम्मीद है। अंतरिक्ष क्षेत्र की स्टार्ट-अप स्कार्फूट एयरोस्पेस और अग्निकुल कासमास के बाद एचएएल रॉकेट बनाने वाली तीसरी कंपनी होगी।

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## HAL wins ISRO bid to build small sat launch vehicles after tech transfer

Source: The Indian Express, Dt. 21 Jun 2025

In a big boost to open up the rapidly-growing space sector to private players, fighter jet maker Hindustan Aeronautics Limited (HAL) has won a bid to commercialise the SSLV — the smallest rocket developed by ISRO — with the technology transfer set to take place over the next two years. The cost-effective vehicle, capable of carrying up to 500 kg payload to low-Earth orbit, can be assembled quickly for commercially launching small and nano satellites, most of which were being sent outside the country for launch by foreign companies so far.

During the technology transfer phase, HAL will have to make at least two SSLVs end-to-end while observing the procedure ISRO followed for the three developmental flights. In August 2027, the company can start manufacturing and offering commercial launches on its own. It will also be

allowed to make changes to the design of the launch vehicle as well as suppliers it sources the components from.

During the technology transfer phase, HAL will have to make at least two SSLVs end-to-end while following ISRO's procedure for the three development flights of the vehicle. In August 2027, the company can start manufacturing and offering commercial launches on its own. It will also be allowed to make changes to the design of the launch vehicle as well as suppliers it sources the components from.

There are certain restrictions in place, however, like 51% ownership to remain with an Indian company. Of the three companies that submitted their commercial bid after a thorough technical evaluation, HAL won with a bid of ₹511 crore. After the two-year period, HAL will aim for six to 12 launch vehicles a year. HAL is also part of the consortium that won the bid to privately manufacture India's workhorse rocket PSLV, whose first launch is expected to happen this year.

CMD of NewSpace India Limited, the commercial arm of the space department, Radhakrishnan Durairaj said, "This is different from the PSLV model, where we were the buyers. Here, the company will manufacture, launch, and look for its own market. And, there is a lot of potential considering that world over, satellites are being miniaturised and several constellations are coming up."

He added that it was a two-step selection process and of the 9 companies that applied, 6 were selected in the first stage. Then three of the six companies submitted their techno-commercial bids — Alpha Design Technologies, Bharat Dynamics Ltd, and HAL — which were evaluated by an expert committee headed by former Principal Scientific Advisor K Vijayraghavan.

NSIL will undertake 15 SSLV launches to keep the small satellite market in India as well as bring in demand from other countries. Radhakrishnan said that the first of these 15 launches will happen in the fourth quarter of next year, followed by one launch a month. "The customers for these missions have already been designated," he said.

Dr Pawan Goenka, Chairman of IN-SPACE, said, "Before these, we will also have two other launches of SSLV primarily for the Indian private sector's small payloads. IN-SPACE has already sought the interest of the companies through an announcement opportunity. We have fairly high demand. The first of these launches is planned for October this year and the second for February next year."

He said that the second SSLV flights will also have the SMiLE (SSLV Module in LEO Experiment) — a technology demonstrator platform similar to POEM on PSLV where experiments are placed on the last stage of the rocket. "While the HAL roll-out will happen after two years, we will complete these launches before that. So, there is no conflict," said Radhakrishnan.

"We want India to become the global hub for small satellite launches with the three vehicles, a new spaceport for launches of these small vehicles at Kulasekharapatnam, and a launch vehicle manufacturing cluster at Tamil Nadu are geared towards this. Hopefully, global players will find it attractive to come to India for their launches because of the cost, easy scheduling with a choice of three vehicles, and our infrastructure," said Dr Goenka.

<https://indianexpress.com/article/india/hal-bid-manufacture-small-satellite-launch-vehicles-10078575/>

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## सुरक्षा जांच के कारण शुभांशु का अंतरिक्ष मिशन पांचवां बार स्थगित हुआ

Source: Jansatta, Dt. 21 Jun 2025

जनसत्ता ब्यूरो  
नई दिल्ली, 20 जून।

अमेरिकी अंतरिक्ष एजेंसी नासा ने भारतीय अंतरिक्ष यात्री शुभांशु शुक्ला और तीन अन्य को अंतरराष्ट्रीय अंतरिक्ष स्टेशन (आइएसएस) ले जाने वाले एक्सओम-4 मिशन के लिए रविवार को निर्धारित प्रक्षेपण स्थगित करते हुए कहा कि हाल में रूसी खंड में मरम्मत कार्यों के बाद कक्षीय प्रयोगशाला के संचालन का आकलन करने के लिए उसे अतिरिक्त समय की आवश्यकता है। स्पेसएक्स के फाल्कन-9 राकेट के बूस्टर में रिसाव, प्रक्षेपण पथ में खराब मौसम और ज्वेज्दा सर्विस माड्यूल के सबसे पीछे वाले भाग में रिसाव के कारण चार बार टाले जाने के बाद एक्सओम-4 मिशन के तहत प्रक्षेपण 22 जून को करने का लक्ष्य रखा गया था।

‘एक्सओम स्पेस’ ने एक बयान में कहा, ‘नासा (नेशनल एरोनाटिक्स एंड स्पेस एडमिनिस्ट्रेशन) ने रविवार यानी 22 जून की निर्धारित तारीख पर प्रक्षेपण नहीं करने का निर्णय लिया है तथा प्रक्षेपण की नई तारीख आगामी दिनों में तय की जाएगी।’ इस मिशन के

तहत प्रक्षेपण मूलतः 29 मई को होना था लेकिन फाल्कन-9 राकेट के बूस्टर में तरल आक्सीजन के रिसाव और अंतरराष्ट्रीय अंतरिक्ष स्टेशन के पुराने रूसी माड्यूल में भी रिसाव होने का पता चलने के बाद पहले इसे आठ जून, फिर 10 जून और फिर 11 जून के लिए टाल दिया गया। अंतरिक्ष एजेंसी ने कहा कि उसे कक्षीय प्रयोगशाला के ‘ज्वेज्दा सर्विस माड्यूल’ के सबसे पिछले हिस्से में हाल में किए गए मरम्मत कार्य के बाद अंतरराष्ट्रीय अंतरिक्ष स्टेशन के संचालन का आकलन जारी रखने के लिए अतिरिक्त समय की आवश्यकता है।

‘एक्सओम स्पेस’ के बयान में कहा गया है कि अंतरिक्ष स्टेशन की परस्पर जुड़ी और एक दूसरे पर निर्भर प्रणालियों के कारण नासा यह सुनिश्चित करना चाहता है कि स्टेशन अतिरिक्त चालक दल के सदस्यों के लिए तैयार है और एजेंसी डेटा की समीक्षा करने के लिए आवश्यक समय ले रही है। इस 14 दिन के मिशन के तहत अंतरिक्ष यात्रियों को फ्लोरिडा स्थित नासा के कैनेडी स्पेस सेंटर से स्पेसएक्स कंपनी के फाल्कन 9 राकेट से आइएसएस भेजा जाना है।

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## NASA puts off June 22 launch of Axiom-4 mission to International Space Station

Source: The Hindu, Dt. 21 Jun 2025

Axiom-4 astronauts, commander Peggy Whitson of U.S., pilot Shubhanshu Shukla of India, mission specialist Slawosz Uznanski-Wisniewski of Poland and mission specialist Tibor Kapu of Hungary, are pictured on the countdown video clock, as the SpaceX Falcon 9 rocket stands at Launch Complex 39-A after a delay of its mission to the International Space Station, in Cape Canaveral, Florida, U.S.

Axiom-4 astronauts, commander Peggy Whitson of U.S., pilot Shubhanshu Shukla of India, mission specialist Slawosz Uznanski-Wisniewski of Poland and mission specialist Tibor Kapu of Hungary, are pictured on the countdown video clock, as the SpaceX Falcon 9 rocket stands at

Launch Complex 39-A after a delay of its mission to the International Space Station, in Cape Canaveral, Florida, U.S. | Photo Credit: REUTERS

NASA has put off Sunday's (June 22, 2025) launch of the Axiom-4 mission carrying Indian astronaut Shubhanshu Shukla and three others to the International Space Station and a new date will be announced in the coming days.

"NASA has made the decision to stand down from a launch on Sunday, June 22, and will target a new launch date in the coming days," Axiom Space said in a statement.

The space agency needs additional time to continue evaluating International Space Station operations after recent repair work in the aft (back) most segment of the orbital laboratory's Zvezda service module, it said.

Because of the space station's interconnected and interdependent systems, NASA wants to ensure the station is ready for additional crew members, and the agency is taking the time necessary to review data, the Axiom Space statement said.

<https://www.thehindu.com/sci-tech/science/nasa-puts-off-june-22-launch-of-axiom-4-mission-to-international-space-station/article69715973.ece>

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## AI dream is missing innovation, R&D spend

Source: Hindustan Times, Dt. 21 Jun 2025

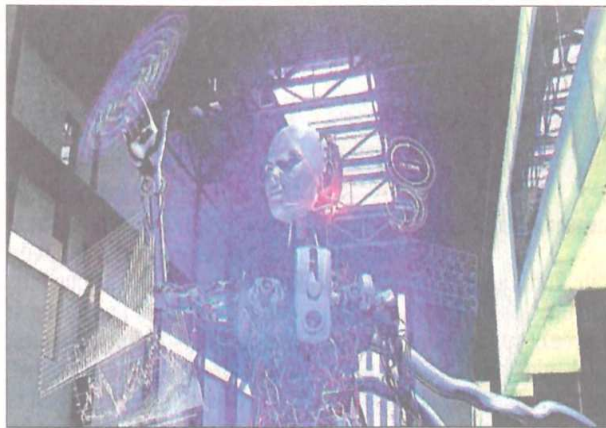
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**NEW DELHI:** India's mushrooming artificial intelligence-focused startups are attracting a lot of buzz, but a lack of innovation and groundbreaking research means the country is way behind the US and China in the tussle for AI supremacy.

This is a result of what the industry calls 'secondary' innovation—technologies that cannot be patented worldwide to influence global economics in the long run. Spending on foundational engineering, research and development (ER&D) work in AI is minuscule, at least five executives involved in AI-related work told *Mint*.

In November, the World Intellectual Property Organization (Wipo's) annual report said that India was the sixth region in the world in terms of overall patent applications—behind China, the US, Japan, Korea and



Executives leading global ventures agree that India is behind the curve in AI at the moment. ISTOCKPHOTO

the European Union. However, the gap was stark—China filed 1.7 million patents through 2024, almost 3x more than the US, with 600,000 patents. India filed only 90,000 patents—5% of what China did.

The gap is even more evident in generative AI, the core battlefield in global technology right now. Last year, China filed over

38,000 patents in generative AI with Wipo, the global patent authority, ahead of the US with around 6,500 patents. India ranked sixth here too with 1,350 patents in generative AI—3.5% of China's advancements and around a fifth of the US.

Ashwini Vaishnav, Union minister for electronics and IT, promised last month that

"India's first foundational AI model is still on track to be released by the end of this year". Yet, the patent filings suggest a US-China war for AI supremacy threatens to leave India out of the league of nations that would influence global innovation and economy over the next decades.

Founders argue that much of this is due to the lack of large early-stage funds. US-based Essential AI, founded by Ashish Vaswani, former Google Brain engineer who co-invented the transformer model that backs generative AI, emerged from stealth in December 2023 with a \$56.5-million series-A funding round.

Others to have raised large capital in the US over the past three years include Adept AI's \$65-million Series A round in April 2022 and Cursor's \$60-million Series A in August.

Each of these ventures is investing in building foundational technologies would be

patented and licensed to run AI applications and services around the world.

Executives leading global ventures agree that India is behind the curve in AI at the moment. "There is certainly a mindset difference between India and the US in terms of how ventures approach AI engineering in the two nations. In the end, being able to hold patents is what will give geographies access to geopolitical soft power over the years to come—and India should definitely focus on this field," Pranav Mistry, founder and chief executive of Two.ai and former global chief of Samsung's advanced research division told *Mint* earlier this month.

But the lack of funds is also a key reality. In India, apart from Sarvam's \$41-million Series A funding round in December 2023, there have been no large early-stage investments in AI-focused startups.

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## Quantum challenge: On IIT-DRDO demonstration of quantum key-distribution scheme

*Source: The Hindu, Dt. 21 Jun 2025*

Scientists from IIT-Delhi and the DRDO recently demonstrated a key advance in quantum cybersecurity that stands to revolutionise how the world will communicate in the future. The world's secrets are currently stored and communicated via channels that are protected by difficult mathematical problems. Over the years, an increasing amount of computing power available to certain actors has forced these problems to become difficult and nigh-uncrackable. The imminence of quantum computing requires this paradigm to change because quantum computers can (at least on paper) solve problems currently out of reach of the most powerful conventional supercomputers.

Quantum cybersecurity is one prong of this change, promising to protect communication channels irrespective of the computing power available to malicious actors. The IIT-Delhi and DRDO team successfully demonstrated a quantum key-distribution scheme through one kilometre of free space on the institute's campus. Such a technology allows two individuals (or stations) located a kilometre apart to securely access messages they send each other.

If an eavesdropper tries to intercept any message, instantaneous changes in the keys the individuals use to decrypt the messages will reveal the channel has been compromised, and in a way that the eavesdropper cannot prevent. If scaled up to include satellites, the technology could allow stations anywhere in India to exchange information through a quantum network without fear of being compromised.

Herein lies the rub. Quantum communications is one of the four themes of the National Quantum Mission, approved in 2023 with an outlay of ₹6,003 crore until 2031. Many of the same problems assailing fundamental research in India have already beset research under the Mission, however. A small fraction of the outlay has been disbursed thus far even as venture capital flow into startups remains trivial.

Scientists have complained that just-in-time funding, absence of single-window clearances, and documentation requirements have increased the duration of projects. There are persistent foreign hardware and software dependencies: materials required for specific use-cases, such as cryostats and sensors, need to be fabricated abroad while most quantum software stacks are currently implemented by multinational companies. Government pay does not match global offers and lack of timely access to resources has forced researchers to accept short-term contracts and rent equipment.

In fact, India's commitment, itself down from the ₹8,000 crore announced in 2020, is dwarfed by those of the U.S. and China, which are five- and 20-times higher, respectively. If the demonstration at IIT-Delhi is to scale, the government cannot simply 'clip on' scientific talent and technological and economic opportunity to existing infrastructure. Administrative reform is essential.

<https://www.thehindu.com/opinion/editorial/quantum-challenge-on-iit-drdo-demonstration-of-quantum-key-distribution-scheme/article69717803.ece>

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## India could achieve quantum communication using satellite by 2030, says IIT-Delhi Professor

*Source: The Hindu, Dt. 23 Jun 2025*

India could be technologically capable of “quantum communication” using satellites in the “next half a decade” Professor Bhaskar Kanseri of the Indian Institute of Technology (IIT)-Delhi, whose team recently reported an instance of quantum key distribution one kilometre apart — the farthest such transmission in India, without any connecting cables — told The Hindu in an interview.

This, however, would require large teams of well-funded multidisciplinary experts and the involvement of start-ups which are specifically geared towards such ends, Prof. Kanseri said.

Safe quantum communication requires enabling a sender and receiver to get “quantum keys”, which are made of streams of photons — the carriers of light. Quantum Key Distribution (QKD) employs principles of quantum mechanics: the incompletely understood principles underlying the behaviour of atomic and sub-atomic particles, including photons.

While there are a couple of approaches in using QKD, one of them — said to be the most secure but technically harder to implement — uses quantum entanglement. Pairs of photons are naturally ‘entangled’, in a way that a change in one instantaneously reflects in the other. Applying this to encryption means that even the mere attempt by a potential hacker into a QKD-secured transmission of information becomes apparent to those communicating, thus allowing preventive measures.

While generating such secure keys can be done through physical networks, including fibre optic cables, the goal is to be able to do it in ‘free-space’ or without such intervening wires. This is because the cost of such transmissions using cables rapidly rises once the sender and receiver are hundreds of kilometres apart. Thus the ideal step would be to involve satellites, which can act as an intermediary between any two points even if they are thousands of kilometres apart.

However, using fibre optic cables provides a stable channel for quantum communication which free-space channels do not. Atmospheric disturbances such as turbulence, air flow, pollution, etc., particularly in a city such as the Delhi National Capital Region, made it more “challenging” to demonstrate free-space quantum communication. “The photon beam of quantum channel diverges and wanders due to these disturbances and results in more errors. Owing to these reasons, the error rates are generally higher than the fibre ones. However, with better beam control and optimisation, there is a scope to reduce these errors,” Prof. Kanseri said.

China had demonstrated satellite-based quantum communication nearly one decade ago, as they had a head start in quantum communication activities since the early 2000s, he surmised. “I strongly believe that India, which started quite recently (in the 2020s), will achieve it in next half-a-decade or so, as under the National Quantum Mission (NQM), a strong focus is to develop satellite-based long distance quantum communication,” Prof. Kanseri, who is currently in the U.S., said in an email.

As an academic institute, IIT-Delhi’s experiments in quantum communication so far were “proof of concept (POC) nature” conducted with a small team of four to five students, explained Prof Kanseri. “Satellite based quantum communication would be one of the biggest projects and require not only adequate funds but also a large, dedicated team of multidisciplinary skilled experts for developing several types of enabling technologies. Quantum startups, mentored by researchers

working in quantum technologies, if funded adequately, can contribute immensely in translation of technologies from lab to market, and in prototyping quantum technologies in a focussed and faster manner. In addition, indigenous development of needed equipment and components is also required," Prof. Kanseri said.

In 2017 and 2020, researchers at the University of Science and Technology of China, during multiple instances, generated quantum keys involving a satellite (500 km above the ground) and ground stations 1,000 and 1,700-km apart.

Since 2005, there have been ground demonstrations in Europe, Canada, and the United States of free-space (without cables) QKD greater than 100 km, suggesting that India still has much to cover regarding QKD-entanglement communication.

In January 27, 2022, scientists from the Department of Space (DOS), namely, Space Applications Centre (SAC) and Physical Research Laboratory (PRL), both in Ahmedabad, jointly demonstrated quantum entanglement based real time Quantum Key Distribution (QKD) over a 300-metre atmospheric channel. In 2021, a team of scientists led by Urbasi Sinha demonstrated perhaps the first instances of such free-space communication in Bangalore over building separated by 50 metres.

Quantum key distributions over much greater distances have been achieved over optical fibre networks. Prof. Kanseri's team demonstrated an intercity quantum-communication link between Vindhyachal and Prayagraj in 2022, using commercial grade underground dark optical fibre. In 2024, the team successfully distributed quantum keys using entanglement over a 100 km spool of telecom-grade optical fibre in another project supported by the Defence Research and Development Organisation.

<https://www.thehindu.com/sci-tech/science/with-money-and-manpower-india-could-achieve-quantum-satellite-communication-by-2030-says-expert/article69724357.ece>

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## **IIT Delhi researchers develop compact, energy efficient computing device using 2D material tech**

*Source: The Times of India, Dt. 21 Jun 2025*

A team of researchers at IIT Delhi developed a compact, energy-efficient computing device using 2D materials technology.

2D materials technology involves the use of materials that are just one or a few atoms thick, offering unique electrical, thermal, and mechanical properties. Unlike conventional computers that rely on traditional semiconductor materials and bulky designs, often resulting in high power consumption, this innovation promises to make future computers significantly smaller, faster, and more power-efficient.

The team, which includes Dr Manoj Kumar and Kritika Bhattacharya and is led by Dr Samaresh Das, head of centre for applied research in electronics at IIT Delhi, named the device MOD-PC (Multifunctional Optoelectronic Device for Processing Circuits).

Optoelectronic signal processing means handling signals that involve both light (optical) and electricity (electronic). In regular computers, most signals are processed electronically (using

electrical currents). However, optoelectronic devices can process signals using both light and electricity. This allows for much faster data transmission, lower energy loss, and the ability to handle huge amounts of data quickly.

The new computing cell, called MOD-PC, is built using light-sensitive tungsten diselenide (WSe<sub>2</sub>), a 2D material that holds great promise for creating next-generation, deeply scaled computing chips.

Kumar, the lead author of the study, explained that the computing unit draws inspiration from the visual cortex of the human brain. This allows it to learn from optical light signals, mimic synaptic plasticity, and store data for long-term use. The device can also perform digital, analogue, and mixed-signal operations within a single unit, helping to overcome the traditional memory and power limitations faced by conventional computing systems, he added.

Bhattacharya, a senior research fellow at IIT Delhi, led the fabrication and implementation of the MOD-PC chips. She shared that producing semiconductor chips from WSe<sub>2</sub>, which measure only a few nanometres in thickness and size, was challenging. However, with persistent efforts and advanced fabrication techniques, the team successfully achieved this breakthrough.

Speaking about its real-world impact, Das, principal investigator of the project, said that the development of the MOD-PC device could transform neuro-vision computing hardware, with significant applications in artificial intelligence and neuro-robotics.

<https://timesofindia.indiatimes.com/city/delhi/iit-delhi-researchers-develop-compact-energy-efficient-computing-device-using-2d-materials-tech/articleshow/121977307.cms>

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