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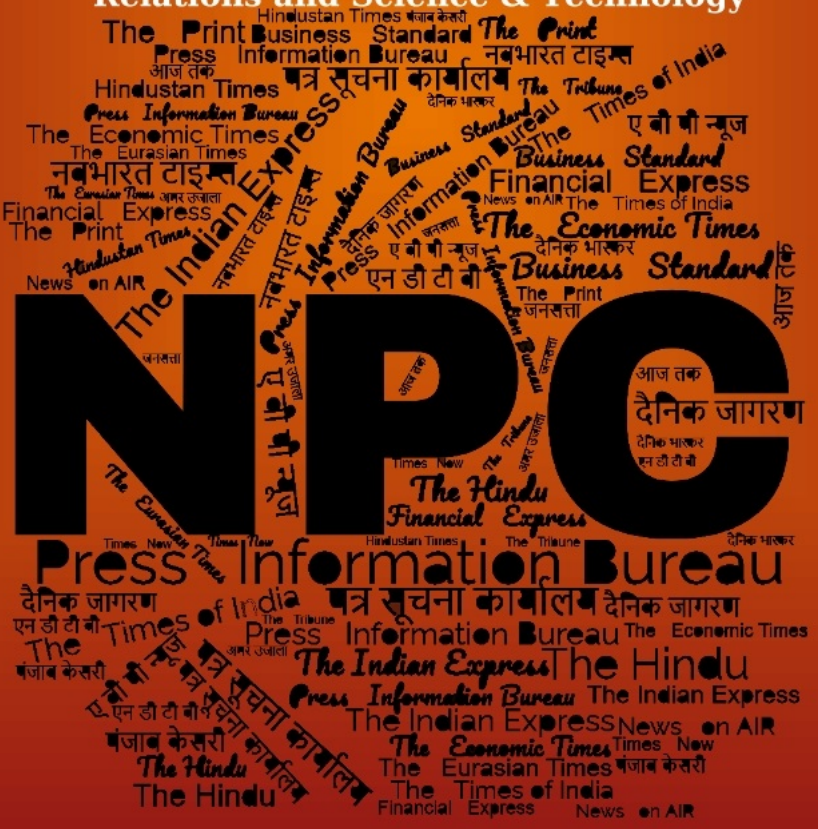
समाचार पत्रों से चयनित अंश
Newspapers Clippings

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

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



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DSL – Defence Scientific Information & Documentation Centre

DRDO News

'भारत की आर्थिक समृद्धि इसकी समुद्री सुरक्षा से जुड़ी है', DRDO के कार्यक्रम में बोले राजनाथ सिंह

Source: Bharat24Live, Dt. 17 Jan 2025,
URL: https://bharat24live.com/indias-economic-prosperity-is-linked-to-its-maritime-security-rajnath-singh-said-in-drdo-program

रक्षा मंत्री राजनाथ सिंह ने नौसेना नागरिक वर्ष के स्मरणोत्सव के दौरान एक सभा को संबोधित किया, जिसमें भारत के हितों की सुरक्षा में समुद्री सुरक्षा और साइबर सुरक्षा के महत्व पर जोर दिया गया.

डीआरडीओ में आयोजित कार्यक्रम में नौसैनिकों के योगदान को मान्यता दी गई और भारत की रक्षा और सुरक्षा रणनीतियों में उनकी महत्वपूर्ण भूमिका पर जोर दिया गया.

सामुद्रिक सुरक्षा के लिए साइबर सुरक्षा महत्वपूर्ण

तेजी से जटिल होते वैश्विक माहौल में राष्ट्रीय सुरक्षा के समक्ष बढ़ती चुनौतियों पर प्रकाश डालते हुए रक्षा मंत्री ने कहा, "सामुद्रिक सुरक्षा के लिए साइबर सुरक्षा भी उतनी ही महत्वपूर्ण है."

उन्होंने आगे जोर देकर कहा, "भारत की आर्थिक समृद्धि इस देश की समुद्री सुरक्षा से जुड़ी हुई है. इसे प्राप्त करने के लिए, हमारे क्षेत्रीय जल की रक्षा की जानी चाहिए, नेविगेशन की स्वतंत्रता सुनिश्चित की जानी चाहिए, और हमारे समुद्री मार्गों, जो हमारे समुद्री राजमार्ग हैं, को सुरक्षित रखा जाना चाहिए."

समय के साथ सेनाओं की जटिलताएँ बढ़ रही हैं

बदलते सुरक्षा परिदृश्य पर विचार करते हुए, सिंह ने टिप्पणी की, "समय के साथ हमारी सेनाओं की जटिलताएँ बढ़ती जा रही हैं. लेकिन ऐसा क्यों हो रहा है? ऐसा इसलिए हो रहा है क्योंकि दुनिया भर में रक्षा–सुरक्षा माहौल तेजी से तनावपूर्ण होता जा रहा है. यदि हम रक्षा और सुरक्षा के दृष्टिकोण से पूरे दशक का आकलन करें, तो लगभग आधा दशक बीत जाने के बाद, हम कह सकते हैं कि यह एक अस्थिर दशक रहा है. हम दुनिया भर के विभिन्न क्षेत्रों में कई संघर्ष और युद्ध देख रहे हैं."

उन्होंने कहा, "हमारे सशस्त्र बल आज एक बड़े जनादेश और अधिक जटिल संरचना के साथ आगे बढ़ रहे हैं. इसमें हमारे नागरिक सहयोगी हमारी सेनाओं को महत्वपूर्ण प्रशासनिक और तकनीकी सहायता प्रदान करते हैं. भारतीय नौसेना अगर आज इनोवेशन के क्षेत्र में इतनी आगे बढ़ रही है तो इसका कारण यह है कि अनुसंधान और विकास का काम सभी मिलकर कर रहे हैं. इसी तरह और भी कई काम हैं जिनमें आपकी अहम भूमिका अहम रहती है."

नौसैनिक नागरिकों की भूमिका पर प्रकाश डाला

राजनाथ सिंह ने योजना और परामर्शी दृष्टिकोण के महत्व पर जोर दिया, विशेष रूप से इस प्रक्रिया में नौसैनिक नागरिकों की महत्वपूर्ण भूमिका पर प्रकाश डाला.

उन्होंने कहा, "इस सब में योजना बनाना बहुत महत्वपूर्ण है. इस योजना प्रक्रिया में एक परामर्शी दृष्टिकोण भी होना चाहिए, जिसमें हम सभी हितधारकों से परामर्श करें. मेरा मानना है कि इस योजना प्रक्रिया में, हमारे नौसेना नागरिकों की बहुत महत्वपूर्ण भूमिका है."

हमें अपनी क्रिटिकल कैपेबिलिटी बढ़ानी होगी

रक्षा मंत्री ने भारत की रक्षात्मक और आक्रामक क्षमताओं को मजबूत करने की आवश्यकता पर भी जोर दिया. उन्होंने कहा, "हमें अपनी क्रिटिकल कैपेबिलिटी बढ़ानी होगी और आने वाले समय में हमें अपनी आक्रामक और रक्षात्मक दोनों प्रतिक्रियाओं को मजबूत करने पर ध्यान केंद्रित करना होगा."

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Defence News

Defence Strategic: National/International

Rajnath calls for increasing India's offensive, defensive capabilities

Source: Hindustan Times, Dt. 18 Jan 2025,
URL: https://www.hindustantimes.com/india-news/rajnath-calls-for-increasing-india-s-offensive-defensive-capabilities-101737140043811.html

Defence minister Rajnath Singh on Friday called for ramping up India's "offensive and defensive responses" in light of the turmoil in the rules-based international order, highlighting the growing complexities faced by the country's military on account of the "tense geopolitical security scenario".

He underlined the need to boost the critical capabilities of the armed forces at the earliest to address new challenges.

"If we assess the entire decade from a defence and security perspective, we can say it has been volatile. We are witnessing conflicts and wars in different regions across the world. We need planning, resourcing and budgeting for our security," Singh said at an event to recognise the contribution of naval civilians.

The military must be equipped and ready to face challenges in a time of change, he said, adding that the civilian workforce was an integral part of the armed forces and will play a crucial role in planning.

"In the broader perspective of national service, every responsible civilian is a soldier without uniform and every soldier is a civilian in uniform," the minister said.

In his speech, Singh touched upon India's strategic location and its geopolitical situation in the vast Indian Ocean Region (IOR) and reiterated the government's resolve to bolster the navy's capabilities, referring to the recent rare simultaneous commissioning of three locally built combat platforms, two warships and a submarine.

On January 15, Surat, a destroyer; Nilgiri, a frigate; and Vaghsheer, the sixth and final Kalvari-class submarine — all built at the Mumbai-based Mazagon Dock Shipbuilders Limited (MDL) — were commissioned into the navy, with the development highlighting India's shipbuilding prowess and steps being taken to bolster its posture in the IOR, where China is seeking to boost its influence.

Prime Minister Narendra Modi had said at the time that it was a significant step towards empowering the Indian Navy of the 21st century.

"India's economic prosperity is linked to its maritime security. It is necessary to protect our territorial waters, ensure freedom of navigation, and keep sea routes, which are our maritime highways, safe. In recent years, major naval powers have reduced their presence in the IOR, while the Indian Navy has increased it," Singh said.

He cautioned against the possibility of increased threats in the Gulf of Aden, the Red Sea and the waters near east African countries. "In view of this, the Indian Navy is working towards increasing its presence further," he added.

Singh described cyber security as a critical aspect of maritime security, warning that ignoring threats in this domain could prove to be "detrimental and fatal".

He urged the civilian workforce in the armed forces to stay abreast of the latest technological advancements and upgrade their skills to help realise the government's vision of India becoming a developed country by 2047 when it celebrates 100 years of independence.

"Our goal is to work with the 'whole-of-government' approach. It should not be linked only to the level of a department or organisation. If people work together, then no matter which organisation they are associated with, they will work for the larger goal of the country."

Navy chief Admiral Dinesh Tripathi acknowledged the critical role that civilians play in service, supporting various facets of operations including technical assistance, administrative management and logistics support. Their support is essential to the navy's combat readiness and operational success, he added.

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Indian Naval Ship Mumbai To Participate In Multi-National Exercise La Perouse

Source: Press Information Bureau, Dt. 18 Jan 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2093998

The indigenously designed and built guided missile destroyer INS Mumbai is participating in the fourth edition of the Multinational Exercise *LA PEROUSE*. This edition will witness participation of personnel/ surface and sub-surface assets from various maritime partners including Royal Australian Navy, French Navy, Royal Navy, United States Navy, Indonesian Navy, Royal Malaysian Navy, Republic of Singapore Navy and Royal Canadian Navy.

The exercise aims to develop common Maritime Situational Awareness by enhancing the cooperation in the field of maritime surveillance, maritime interdiction operations and air operations along with the conduct of progressive training and information sharing. The exercise provides an opportunity for like-minded navies to develop closer links in planning, coordination and information sharing for enhanced tactical interoperability. The exercise will witness complex and advanced multi-domain exercises including surface warfare, anti-air warfare, air-defence, cross deck landings and tactical manoeuvres, as also the constabulary missions such as VBSS (Visit, Board, Search and Seizure) operations.

Participation of Indian Navy in the exercise showcases the high levels of synergy, coordination and interoperability between the like-minded navies and their commitment to a rules-based international order in the maritime domain.

This visit is in consonance with India's vision of *SAGAR* (Security and Growth for All in the Region) to enhance maritime cooperation and collaboration for safer and secure Indo-Pacific Region.

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Russia and Iran sign a partnership treaty to deepen their ties in the face of Western sanctions

Source: The Hindu, Dt. 17 Jan 2025,
URL: https://www.thehindu.com/news/international/russia-and-iran-sign-a-partnership-treaty-to-deepen-their-ties-in-the-face-of-western-sanctions/article69110378.ece

Russian President Vladimir Putin and Iranian President Masoud Pezeshkian attend a ceremony to sign an agreement of comprehensive strategic partnership between the two countries, at the Kremlin in Moscow, Russia January 17, 2025.

Russian President Vladimir Putin and his Iranian counterpart, Masoud Pezeshkian, signed a broad cooperation pact Friday as their countries deepened their partnership in the face of stinging Western sanctions.

Russian and Iranian officials say the “comprehensive strategic partnership treaty” covers all areas -– from trade and military cooperation to science, education and culture.

Putin praised the deal as a “real breakthrough, creating conditions for the stable and sustainable development of Russia, Iran and the entire region.”

He said the amount of trade and economic cooperation was still insufficient, voicing hope the new treaty will help clear bureaucratic hurdles and expand ties. The Russian leader added that the countries are trying to resolve technical obstacles to advance planned projects to ship Russian natural gas to Iran and build transport corridors to Iranian ports in the Gulf.

Pezeshkian said the projects are feasible, adding that experts were working to resolve the remaining obstacles.

“We witness a new chapter of strategic relations,” the Iranian president said, adding that the countries were set to expand trade ties and also boost the "level of security cooperation.”

His visit came ahead of Monday's inauguration of President-elect Donald Trump, who has pledged to broker peace in Ukraine and take a tougher stance on Iran, which is grappling with growing economic problems and other challenges, including military setbacks in its sphere of influence across the Middle East.

Kremlin spokesman Dmitry Peskov dismissed any link with Trump’s inauguration, saying the signing had been planned long ago.

The signing of the treaty with Iran follows last year's pact with North Korea -- countries once identified by former President George W. Bush, along with Iraq, as “the Axis of Evil.”

Welcoming Pezeshkian as they sat down for talks, Putin said the new treaty will “give an additional impulse to practically all areas of our cooperation.”

Pezeshkian, who met Putin for the third time since coming to power in July, said the documents form a “solid foundation for our forward movement.”

“We do consider our relations with you as vital, sensitive and strategic, and we are on this path strongly,” he said.

The Iranian president emphasized that countries in the region should resolve their own problems themselves, adding in an apparent reference to the U.S. that the presence of outside forces will only exacerbate tensions and destabilize the situation.

“They come from another side of the world to make chaos in the region," he said. "These ties will defuse their plot, definitely.”

Russia’s ties with Iran have grown closer after Putin sent troops into Ukraine in February 2022. Ukraine and the West have accused Tehran of providing Moscow with hundreds of drones for use to attack Ukraine, which Moscow and Tehran have denied.

Pezeshkian spoke in support of prospective Russia-Ukraine peace talks, saying that “war is not a solution” and urging the West to “avoid imposing excessive demands” and acknowledge others’ “security concerns.”

Last year, Iran joined the BRICS bloc of developing economies and Pezeshkian attended its summit, which was hosted by Russia in Kazan.

Russia and Iran, which had troubled relations in the past, developed cordial ties after the collapse of the Soviet Union in 1991, with Moscow emerging as a key trade partner and supplier of weapons and technologies for Tehran, which has faced bruising international sanctions.

Russia built Iran's first nuclear plant that was launched in 2013 and is building two more nuclear reactors there.

Russia was part of the 2015 deal between Iran and six nuclear powers offering sanctions relief for Tehran in exchange for curbing its atomic program, and the Kremlin offered political support to Iran when the U.S. unilaterally withdrew from the agreement during Trump's first term.

Russia and Iran also pooled their efforts to shore up Bashar Assad's government during Syria's civil war, but failed to prevent his downfall last month after a lightning offensive by the opposition. Assad and his family fled to Russia.His ouster dealt another blow to Tehran's self-described "Axis of Resistance" across the region, which had already been pummeled by Israel's offensives against two militant groups backed by Iran -– Hamas in Gaza and Hezbollah in Lebanon. Israel also attacked Iran directly on two occasions.

Tehran increasingly needs Moscow's assistance as it faces economic woes and stinging setbacks across its sphere of influence in the Middle East. The troubles could deepen after Trump returns to the White House with his policy of "maximum pressure" on Iran.In particular, Iran wants sophisticated Russian weapons like long-range air defense systems and fighter jets to help fend off possible attacks by Israel.

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Army pushes for desi Pinaka rockets, to ink Rs 10,200 crore deals within this fiscal

Source: The Times of India, Dt. 20 Jan 2025,
URL: https://timesofindia.indiatimes.com/india/army-pushes-for-desi-pinaka-rockets-to-ink-rs-10200-crore-deals-within-this-fiscal/articleshow/117381351.cms

The Army is now putting its full weight behind the indigenous Pinaka multi-launch artillery rocket systems, with orders worth Rs 10,200 crore for its ammunition to be cleared soon, even as India is also exporting the systems to other countries.

Army chief General Upendra Dwivedi said two Pinaka contracts — Rs 5,700 crore for high-explosive pre-fragmented ammunition and Rs 4,500 crore for area denial munitions — are all set to be inked before the current fiscal ends on March 31. These orders will cater for the 10 Pinaka regiments already ordered by the over 11-lakh strong Army, which also has three Russian-origin Smerch and five Grad rocket regiments.

While the force has inducted four Pinaka regiments, with some of the launchers also deployed in high-altitude areas along the northern borders with China, the other six are in the process of being

inducted to add “more punch and lethality” to its arsenal. “The Pinaka is one of the best rocket systems in the world. Its regiments have been high-altitude enabled,” a senior officer said.

The high-explosive pre-fragmented ammunition has a strike range of 45 km, while the aerial denial munitions can be launched to a distance of 37 km. The latter have the capability to saturate a target area with multiple bomblets, including anti-tank and anti-personnel minelets.

DRDO has developed a variety of ammunition for the Pinaka, including rockets with 45-km extended range and 75-km guided extended range. With the plan underway to further enhance the range first to 120 km and then to 300 km, Gen Dwivedi said, “As soon as we get longer ranges, we might drop plans for other alternate long-range weapons we are looking at and concentrate on it (Pinaka).”

The six new Pinaka regiments, under contracts inked with defence PSU Bharat Earth Movers Ltd and private sector companies Tata Advanced Systems and Larsen & Toubro, comprise 114 launchers with automated gun aiming and positioning systems and 45 command posts, along with 330 vehicles. “They are equipped with electronically and mechanically improved weapon systems capable of firing a variety of ammunition over longer ranges,” another officer said.

India is also stepping-up plans to export the Pinaka system, along with other products like BrahMos supersonic cruise missiles and Akash air defence missile systems, to ‘friendly’ countries.

The former Soviet republic of Armenia, for instance, is importing both Pinaka and Akash systems, as earlier reported by TOI. Some Asean, African and European countries have also shown interest in acquiring the Pinaka systems. Another major deal to be inked within this fiscal for the Army’s Regiment of Artillery will be the Rs 8,500 crore one for 307 indigenous advanced towed artillery gun systems, which is touted to have a strike range of 48 km.

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Eyes on defence deals as Donald Trump pads up

Source: The Economic Times, Dt. 20 Jan 2025,
URL: https://economictimes.indiatimes.com/news/defence/eyes-on-defence-deals-as-donald-trump-pads-up/articleshow/117378353.cms

With Donald Trump set to take over as the US President, all eyes will be on the defence relationship with India. Some high-value Indo-US deals have reached a critical point and major acquisitions are in the pipeline.

During his last term as the US President, India and the US had pledged to deepen defence and security cooperation by collaborating on co-development and production of advanced military systems. While some success has been made on this front, no major co-production project has yet taken off.

One of the first challenges will be to ensure that a deal for technology transfer and production of fighter jet engines in India takes off despite some last-minute speed bumps. India and the US have agreed on the production of GE414 engines locally, with 80% technology transfer.

However, in recent weeks it has emerged that the price may be a challenge as the US side has vastly increased its offer price from the estimated value. When the deal was signed last year, the estimated price was billed at around $1 billion for the first set of 99 engines to be made in India.

It is feared that fresh estimates shared with the Indian side recently could push this up to $1.5 billion. Given that India requires much more than 99 of these engines - estimates are in excess of 200 - there might be room for negotiations, but there is an urgency to close and sign the deal within the next three months.

Another Indian acquisition that will be keenly followed by the US is of new fighter jets, which are urgently needed by the Air Force. A special committee within the defence ministry is reviewing the requirement, but the Air Force has a projected urgent need for 114 medium-role fighter aircraft.

This deal would involve local production and significant technology transfer and by conservative estimates would be valued at over $20 billion, staggered over a 10-year period. US companies Boeing and Lockheed Martin are keen to offer solutions for the requirements and have already tied up with local partners in anticipation of the upcoming tender.

Another major co-production project underway where the US has significant interest is the requirement of medium transport aircraft for the Air Force. Estimated to cost over $5 billion, the deal would involve production of over 80 military transport aircraft in India with deep technology transfer. Lockheed Martin is a contender for the contract, which will see a challenge from Brazil and Europe.

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Seven Indian firms join India-US space, defence collaboration programme

Source: The Economic Times, Dt. 17 Jan 2025,
URL: https://economictimes.indiatimes.com/news/defence/seven-indian-firms-join-india-us-space-defence-collaboration-programme/articleshow/117333493.cms

Seven Indian private companies have been chosen for a first-of-its-kind India-U.S. space and defence collaboration programme, unlocking a lucrative and strategic market for Indian firms, said three sources with knowledge of the matter.

Under the programme, the companies - which the sources said included space imaging company KaleidEO and rocket makers EtherealX and Aadyah Space - will work with the U.S. Defense Innovation Unit, the Department of Defense and other government agencies on satellite observation and emerging space and defence technologies.

In return, they get access to the world's biggest defence and space market, mentorship and paid clientele as they also work with U.S. defence industry leaders such as Northrop Grumman, RTX, and Lockheed Martin, two of the sources said.

That could give them an edge against the competition as they compete for U.S. business in their niches worth about $1.5 billion annually, the first source said.

The sources spoke on condition of anonymity because a public announcement had not yet been made.

The government bodies did not immediately respond to emails seeking comment. The development and details of the programme have not been made public before, and Reuters was unable to verify the names of all the selected companies.

Lockheed and Northrop declined to comment, while RTX, formerly known as Raytheon, did not immediately respond to an email seeking comment. The Indian firms did not immediately respond to requests for comment.

The India-U.S. Defense Acceleration Ecosystem was launched in 2023 to create an innovation bridge between the two nations. The initiative comes as India pushes to expand its defence and space private industries while reducing its reliance on Russia, its traditional partner.

Indian investor IndusBridge Ventures and U.S.-based FedTech, which established a launchpad in September 2024 under the broader government initiative, selected the seven successful Indian companies and talks are underway about specific projects, the first source said.

Access to the U.S. defence and space market, the largest globally, could be transformative for Indian private players, generating annual revenues between $500 million and $1 billion, the source added.

The second source said the main objective was for companies domiciled in India to be able to work with the U.S. Department of Defence and private industry leaders, as well to gain a foothold into the U.S. commercial space launch market.

Indian National Security Advisor Ajit Doval this month met with his U.S. counterpart Jake Sullivan in New Delhi to discuss space technology collaboration and the "deepening cooperation between the U.S. Defense Innovation Unit and India’s Innovations for Defense Excellence to accelerate the adoption of cutting-edge commercial technologies for military solutions," among other topics.

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Indian, Indonesian navies work to keep IOR safe

Source: The Economic Times, Dt. 18 Jan 2025,
URL: https://economictimes.indiatimes.com/news/defence/indian-indonesian-navies-work-to-keep-ior-safe/articleshow/117341400.cms

India and its biggest maritime neighbour, Indonesia, have stepped up naval cooperation to stabilise and safeguard mutual interests in the Indian Ocean Region as part of their shared Indo-Pacific vision, from port calls by Indian Navy ships at Indonesian ports to training of Indonesian military in India and increasing joint exercises. Defence cooperation will get a leg up with President Prabowo Subianto's visit to India next week, said officials.

A collaborative approach to defence development is poised to strengthen collective maritime security, they said.

"The idea is to strengthen the existing security architecture in the Indo-Pacific which is anchored in ASEAN-led mechanisms and establish an open, inclusive and transparent cooperation, with the aim of delivering peace, security and prosperity to all associated with the region," said one of the officials, who did not wish to be identified. "Enhancing information sharing related to maritime security in the Indo-Pacific region is the key goal of New Delhi and Jakarta."

At the end of 2024, military exercise Garuda Shakti and naval exercise Samudra Shakti were organised to strengthen institutional bilateral mechanisms between the two countries. Several Indian Navy ships made port calls in Indonesia last year in a display of growing trust.

Bilateral cooperation between India and Indonesia is aimed at addressing the emerging maritime security issues facing the Indo-Pacific region including the smuggling of people, arms, drugs and money; illegal, unreported and unregulated fishing; and the movement of terrorists, said the officials.

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Indian Army's 'Sambhav' smart phone used during China border talks for secure communication

Source: The Economic Times, Dt. 17 Jan 2025,
URL: https://economictimes.indiatimes.com/news/defence/indian-armys-sambhav-smart-phone-used-during-china-border-talks-for-secure-communication/articleshow/117337949.cms

During the last round of talks held with China in October, the Indian Army used the Sambhav smartphones which have now been given in large numbers to the officers in the force.

Army chief Gen Upendra Dwivedi in his annual press conference had stated that the Sambhav phone was used for secure communication.Around 30,000 of these Sambhav phones have been given to officers for secure communication and have been provided with their own applications which can be used for sharing critical information as well, defence sources told ANI.

The project was launched last year.The handsets used for the project have applications like M-Sigma which is seen as an equivalent of the popular WhatsApp application for messaging and sharing documents, pictures and videos.

The Army is also hoping that the internal smartphones which can be used on Airtel and Jio mobile networks, will help in curbing the leakage of important documents in public.

A number of Indian Army officials had been using WhatsApp and other similar applications for sharing information and documents and almost all of them were getting leaked in the public domain.

The phones also have the numbers of all important functionaries and the officials don't need to save the numbers, the sources said.The Indian Army has indigenously developed the "end-to-end secure mobile ecosystem" to provide secure communication with instant connectivity.The

SAMBHAV (Secure Army Mobile Bharat Version) -- functions on contemporary 5G technology and is fully encrypted.

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Presenting blueprint on integrated theatre commands, creating them priority: CDS Gen Chauhan

Source: The Economic Times, Dt. 19 Jan 2025,
URL: https://economictimes.indiatimes.com/news/defence/presenting-blueprint-on-integrated-theatre-commands-creating-them-priority-cds-gen-chauhan/articleshow/117376064.cms

Presenting a blueprint to the government on integrated theatre commands and creating them will now be a key priority, Chief of Defence Staff Gen Anil Chauhan said on Sunday, days after Defence Minister Rajnath Singh declared 2025 as the 'year of defence reforms'. Gen Chauhan also said that making a joint planning and operation room to help enable the three services to conduct integrated operations will be another focus area for the military under organisational and structural reforms.

In a podcast, the CDS said joint doctrines are being prepared on subjects like multi domain operations, airborne and heliborne operations, network centric warfare, joint communications, conventional missile force, space, joint staff work, joint logistic architecture, etc.

Work is underway on a 'Vision 2047' roadmap for the armed forces and it will be released in middle of this year, he said.

The defence ministry's aim on theatre commands assumes significance as it virtually indicated a resolve to unveil the ambitious reform measure in 2025.

Under the theaterisation model, the government seeks to integrate the capabilities of the Army, Air Force and Navy and optimally utilise their resources for wars and operations.

As per the theaterisation plan, each of the theatre commands will have units of the Army, the Navy and the Air Force and all of them will work as a single entity looking after security challenges in a specified geographical territory.

At present, the Army, Navy and the Air Force have separate commands.Outlining modernisation of the armed forces, Gen Chauhan said an Integrated Capability Development Plan (ICDP) will be brought out and it will be slightly different from the previous Long-Term Integrated Perspective Plan.

He said the global geopolitics in a big flux at present and rising uncertainty is driving nations to review their national security strategies and also increase defence budgets.

On ensuring jointness among the three services, he said the focus is on enhancing efficiency in planning and conduct of operations, capability development, training, communication, logistics, maintenance support, human resource development, administration and legal matters.Eight

verticals were selected to bring about integration amongst the three services and work on 196 activities under these verticals is already underway, he said.

The prime objectives of jointness are to develop capability that will take into account the changing nature of warfare in the future and to create integrated structures that can carry out multi domain operations.

To be able to operate across the spectrum of conflict will be another priority, he said.Gen Chauhan also noted that work is underway on a future technology capability roadmap that will feature specific policies in areas such as space, artificial intelligence, manned-unmanned teaming, and lethal autonomous systems.

On organisational and structural reforms, he said presenting the blueprint for integrated theatre commands to the government and creating them will be a major priority.

On the challenges facing the military, he said to correctly understand the future and how the future wars will be fought and to be able to win the future conflicts will be among them.

It is important to undergo the process of learning and unlearning and relearning, he said, adding it will be something like being creative, then exploiting it, using it and then destroying it.

To have all the desired capabilities together in future would be the biggest challenge, he said.

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Chinese Submarines In A 'Chokehold': India Beefs Up Infra In Carnicobar To Challenge China's Forays In IOR

Source: The EurAsian Times, Dt. 18 Jan 2025,
URL: https://www.eurasiantimes.com/india-beefing-up-infrastructure-in-carnicobar/

In anticipation, India is building its military capability in the Andaman and Nicobar Islands that sit on the mouth of Malacca Strait, where the Chinese submarines have to surface to enter the IOR.

The latest satellite photos indicate significant capability augmentation at the strategically located Car Nicobar air base. India is increasing its operational capacity by increasing the length and width of the runway.

The longer taxi track can serve as a secondary runway, "facilitating smoother and more efficient operations."

Located at the confluence of the Indian and Pacific Oceans, the Andaman and Nicobar Islands are said to be one of the world's most strategically located island chains.

The Indian government is developing the islands' military assets as part of a 10-year infrastructure development. So far, Indian Air Force (IAF) fighter jets Jaguar Maritime Strike Aircraft and Sukhoi Su-30MKI are deployed at Carnicobar for some duration.

Capability enhancement would pave the way for a fighter squadron to be stationed on the island permanently. The IAF C-130J Super Hercules transport aircraft can also operate from the island following the capability enhancement.

Car Nicobar is located in the Andaman and Nicobar Islands, in the Bay of Bengal, at roughly 9 degrees north of the equator. The Island is 15 km long and 12 km wide, with a 51 km coastline.

Car Nicobar is 270 km south of Port Blair. Normally, a ship is available twice a week to Port Blair. Indian Air Force (IAF) operates charter services between Port Blair's Veer Savarkar International Airport, Campbell Bay, and Car Nicobar Air Force Base.

The 914-metre (3,000 ft) bitumen runway on the island was built by the Japanese during their occupation of these islands between 1942 and 1945.

After 1945, it was used by the British Royal Air Force as a refueling base for regular flights between RAF Negombo (now Colombo International Airport) in Sri Lanka (then Ceylon) and RAF Changi in Singapore and vice versa. The runway was extended to 2,717 meters (8,914 ft) by the IAF in 1967.

Before the Tsunami wreaked havoc on the islands, Carnicobar was serviced by Russian An-32, Port Blair had a runway used by civil airlines, and the southernmost point, Campbell Bay, was serviced by helicopters. Now, India has four runways in the archipelago, making it possible for the Indian forces to operate independently from all regions of the island chain.

The island runways are being extended to let the Indian Navy's P-8I operate from there to boost its anti-submarine capabilities in the region. India is the second biggest P-8I maritime patrol aircraft operator after the US military.

INS Baaz naval station was inaugurated on July 31, 2012. It is a full-fledged "forward operating base" of the Indian Navy. It overlooks the six-degree Channel, one of the most crucial shipping lanes in the world, a vital choke point. It will soon become India's eye over the Malacca Strait and the Bay of Bengal. There is a 1,050m (3,445 ft) asphalt runway. There are plans to extend the runway to 10,000 feet in the future.

The INS Utkrosh in Port Blair has a runway big enough for the P-8Is to operate. That station is currently home to a squadron of short-range Dornier-228 maritime patrol aircraft.

In 2019, India established the Kohassa Naval Air station on the northern end of the Andaman Islands, near a suspected Chinese intelligence outpost on Myanmar's Coco Island. Plans are afoot to extend the runway as well to accommodate P-8Is.

Apart from relocating warships and anti-ship missile batteries on the islands, the Indian Army has been test-firing its BrahMos anti-ship missiles from the islands, the latest one being done on January 15, 2025.

The northernmost point of the 572 islands is only 22 nautical miles away from Myanmar, and its southernmost point is a mere 90 nautical miles from Indonesia. The islands control the Bay of Bengal, the Six Degree, and the Ten Degree channels, which over 60,000 commercial vessels use.

India's Defense Minister Rajnath Singh said on January 15 that international power rivalry is playing out in the IOR and that a strong naval presence in the key trade route was the country's biggest priority.

"A large part of the world's trade and commerce passes through the Indian Ocean region. Due to geo-strategic reasons, the region is also becoming a part of international power rivalry," Defense Minister Singh said during the induction of one submarine and two navy ships in the city of Mumbai.

Chokehold On Chinese Trade Route

The 572-item Island chain is emerging as an essential part of India's strategy to balance China's burgeoning dominance in the Indo-Pacific.

Over the past decade, the presence of the Chinese Navy's surface ships and submarines in the Indian Ocean has become ubiquitous. In 1962, when India and China fought their first war, a Chinese submarine was sighted in the IOR, after which the Indian government sanctioned a 150-sailor garrison on the islands.

The biggest advantage of the island chain, which is located over 1200 kilometers away from mainland India, is that it controls important choke points like the Malacca Strait, one of the busiest shipping lanes in the world. Hence, India is on a quest to strengthen its position in the archipelago and maintain a stable Indo-Pacific.

The Malacca Straits connects the South China Sea and the IOR. The Islands will be converted into a shipping hub and tourist destination under a US $9 billion project.

The project scale can be gauged by the promotional video released by the Ministry of Ports, Shipping, and Waterways. In March 2021, NITI Aayog unveiled a Rs 72,000 crore plan called 'Holistic Development of Great Nicobar Island at Andaman and Nicobar Islands.'

It includes the construction of an international transshipment terminal, an international airport, a power plant, and a township. The project will be implemented by the Andaman and Nicobar Islands Integrated Development Corporation (ANIIDCO), a government undertaking.

Talking about the strategic importance of the isles, former Indian Navy chief Admiral Arun Prakash wrote that the military assets stationed here need to be beefed up as "the frequent transits of PLA Navy (PLAN) warships, submarines, and research/intelligence-gathering vessels in these waters portend a sustained Chinese naval presence, including nuclear attack submarines."

"This would require the IN (Indian Navy) to maintain a substantial anti-submarine warfare capability in the A&N," the former Indian Navy chief contended.

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Science & Technology News

Science and Technology Minister Dr. Jitendra Singh dedicates India's 1st of its kind CSIR Innovation complex in Mumbai

Source: Press Information Bureau, Dt. 17 Jan 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2093898

Science and Technology Minister Dr. Jitendra Singh dedicated India's 1st of its kind CSIR Innovation complex through virtual mode in Mumbai today.

Union Minister of State (Independent Charge) for Science and Technology, Minister of State (I/C) for Earth Sciences, Minister of State in the Prime Minister's Office, Department of Atomic Energy, Department of Space, and Personnel, Public Grievances and Pensions, Dr. Jitendra Singh credited Prime Minister Shri Narendra Modi for his vision enabling India to emerge as a global hub for start-ups and innovation. He said the inauguration of this complex is another landmark step.

Dr. Singh shared pride that we have third-largest start-up ecosystem in the world, with over 100 unicorns that stand as testaments to India's entrepreneurial spirit.

He said "This remarkable growth is a reflection of the transformative initiatives and policies introduced by our government to empower the youth and drive economic self-reliance."

The science and technology Minister lauded CSIR and said that it has been playing a significant role in the scientific and technological progress of the country by addressing national needs through its innovative research, industrial and societal partnerships, entrepreneurship, capacity building, and policy formulation.

In order to boost innovation, industry collaboration and employment generation the 6 memorandum of association signed between CSIR and 6 prestigious institutes such as IIT Bombay, icreate, NRDC . Strengthen startups 50 technology transfer took place from CSIR institutes to startups, Msme's and institutions.

Dr. Singh remarked that CSIR-IC Mumbai is a state-of-the-art innovation-cum-incubation facility with high-end scientific infrastructure and expertise, designed to foster critical translational unmet needs (lab-to-regulator and regulator-to-industry domains) for start-ups, MSMEs and CSIR labs and to catalyze faster tech-transfer.

He highlighted that the Ready-to-move world-class incubation labs and IP/ business development support to innovative start-ups, companies partnering with CSIR labs, MSMEs, deep-tech companies from India and abroad, public-funded research institutions, and CSIR labs will further strengthen our innovation capacity.

He expressed his confidence that the IC-Mumbai will be used to strengthen the business development and tech-transfer activities of CSIR labs, leveraging the unique opportunities offered by Mumbai. This will serve as a hub for the other incubators operating within the CSIR Labs.

The IC Mumbai, spread over nine floors, is equipped with 24 “ready-to-move” incubation labs and furnished office/ networking spaces for innovative start-ups, MSMEs and industry and CSIR labs.

He underscores that facilities like these embody the spirit of collaboration, innovation, and inclusivity that define our approach to nation-building.

Dr. N Kalaiselvi shared that not just in India but CSIR is collaborating internationally with 4 countries namely Germany, Norway, Switzerland etc.

She called it shaping of decadal dream into reality. Crediting her predecessors. She also remarked the Purple revolution as novel one reflecting dedication towards indigenous technologies.

Dr. Kalaiselvi informed that every year 10-15 technologies are developed by CSIR which are globally appreciated. She informed that currently 5 national highways are using steel slag technology developed by CSIR.

Referring to India's indigenization process she recalled the development of India's indigenous Paracetamol. Another development is the zero liquid discharge plant which is 1st of its kind in India. She emphasized on ‘Aatmanirbhar’ and ‘self reliance’ to be the way forward for making India Viksit Bharat @2047.

Dr. V.K. Paul , member NITI Aayog recalled the untiring efforts of CSIR team during pandemic. He termed them as Covid warriors. He categorically mentioned CSIR for developing CRISPR diagnostic test - Being 1st in the World. Development of Oxygen concentrators and sending it to every remote corner of the country.

Dr.V.K Saraswat, member, NITI Aayog adviced to take innovation to industry rather than calling industry to innovation. He said we develop everything in a cost-effective manner and we should leverage this to our advantage.

Dr. Ram Vishwakarma who has a lion shre in bringing this complex into reality informed that complex houses 24 labs of 500 sq. ft. each. 24 office-spaces for startups along with 6 conference rooms and lounges.

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Quantum Advantage Unveiled: From Theory to Real-World Demonstration

Source: Press Information Bureau, Dt. 17 Jan 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2093766

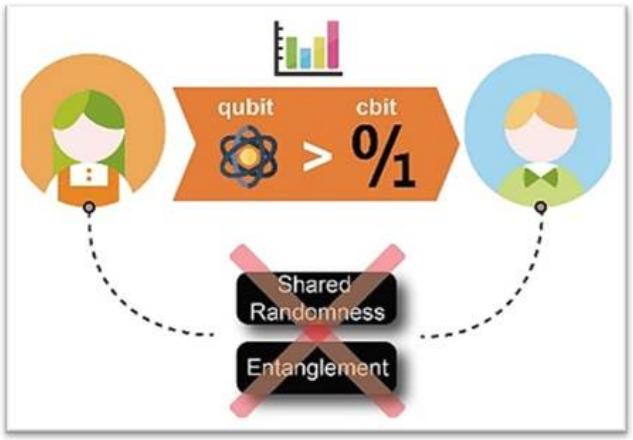
A new study on how a quantum system can outperform its classical counterpart reshapes our understanding of what is possible with quantum systems and hints at a future where quantum technologies might solve problems classical computers cannot, even when resources are scarce.

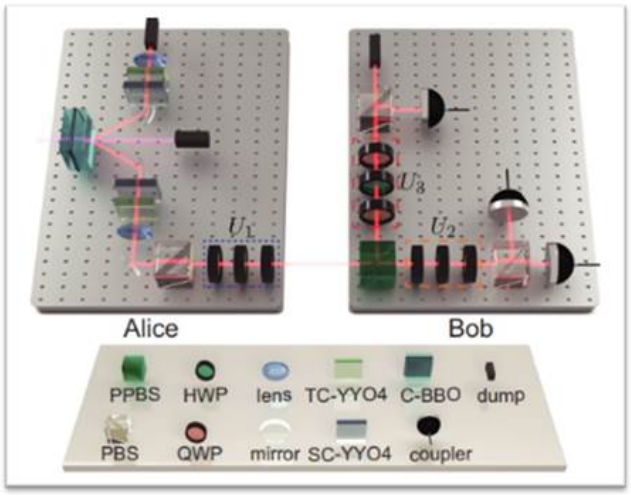
In the race to build the ultimate computer, quantum systems are often hailed as the future, capable of outclassing their classical counterparts in ways that could revolutionize technology. But proving this quantum advantage has been no small feat. Experiments are notoriously tricky, and fundamental limitations often seem to dash our hopes.

Recently, researchers from the S. N. Bose National Center for Basic Sciences, an autonomous institute of the Department of Science and Technology, working alongside the teams from the Henan Key Laboratory of Quantum Information and Cryptography, Laboratoire d'Information Quantique, University libre de Bruxelles, and ICFO-the Barcelona Institute of Science and Technology, have made a breakthrough.

They've shown that even the simplest quantum system—a single qubit—can outperform its classical counterpart, the bit, in a communication task where no extra help, like shared randomness, is allowed. The theoretical study conducted by Professor Manik Banik and his team at the S. N. Bose Centre, published in the journal Quantum, alongside their collaborative experiment, featured as an Editors' Suggestion in Physical Review Letters, provides a rare and compelling demonstration of quantum advantage in a real-world scenario.

Here's why this is so exciting: Classical communication typically relies on shared resources, like pre-agreed random numbers, to function efficiently. Without these shared correlations, communication tasks can become much more difficult. A qubit, however, doesn't seem to need this help.





The researchers showed that, under the same conditions, a qubit could achieve more than a classical bit—a result that challenges long-held assumptions in the field. To demonstrate this, the team developed a photonic quantum processor, and a new tool called a variational triangular polarimeter. This device allowed them to measure light polarization with extreme precision, using a technique called Positive Operator-Valued Measurements (POVM). These measurements are key to understanding the behaviour of quantum systems under realistic conditions, including noise.

The study is more than just an academic milestone—it's a step closer to a future where quantum technologies transform how we process and communicate information making the horizon between quantum and classical a bit more interesting.

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Raman Research Institute faculty honored with the Gates-Cambridge Impact Prize 2025

Source: Press Information Bureau, Dt. 19 Jan 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2094287

Professor Urbasi Sinha, faculty in the Light and Matter Physics theme at the Raman Research Institute (RRI), was honored with the Gates-Cambridge Impact Prize 2025 by the Bill & Melinda Gates Foundation at Cambridge, UK.

Prof. Sinha is among the eight winners of Gates-Cambridge's Impact Prize to celebrate its 25th anniversary. She says: "I have seen how the scholarship has evolved over the 25 years and am thrilled to celebrate its anniversary and to be recognised for my work over a similar time span. It is very humbling, but also makes me believe in the impact I can have in the next 25 years." The nomination for her Gates-Cambridge Impact Prize said: "Professor Sinha's vision and dedication are paving the way for a future where quantum computing serves as a catalyst for solving humanity's most pressing issues, embodying the true spirit of science in service of global progress."

Prof. Sinha is a researcher in both quantum fundamentals and technologies, and she heads the Quantum Information and Computing (QuIC) lab at RRI an autonomous institute of Department of Science and Technology. Her lab was one of the first in India to manufacture and establish the usage of heralded and entangled photon sources towards various applications in the following areas: quantum communication, quantum computing, quantum optics and quantum fundamentals and information processing. Professor Sinha has leadership roles in the recently announced 'National Quantum Mission'. This initiative encourages research and development in quantum technologies with an aim of making India globally competitive in quantum innovation.

She was awarded the prestigious Rashtriya Vigyan Yuva Puraskar by the Government of India. She is also a recipient of the Canada Excellence Research Chair (CERC) in Photonic Quantum Science and Technologies, University of Calgary, Canada. She has played a leading role in the creation of the Open Quantum Institute (OQI), first of its kind multi-stakeholder institution, launched at CERN in March 2024.

Prof. Sinha is an affiliate member, Institute for Quantum Computing, Waterloo, Canada, and the Centre for Quantum Information and Quantum Computing at the University of Toronto.

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Kick-off meeting of Quantum Sensing Hub at IIT Bombay strategizes way forward

Source: Press Information Bureau, Dt. 19 Jan 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2094287

The Quantum Sensing and Metrology Hub, Qmet Tech Foundation, established by IIT Bombay under the National Quantum Mission (NQM) brought together some of the best in the field to define a shared vision, set milestones, and discuss collaborative frameworks.

Focused on Quantum Sensing and Metrology, Qmet, a Section 8 (not-for-profit) company serves as a leadership hub for translational research, managing funds, and promoting interdisciplinary collaboration among member institutions. The kick-off meeting consolidated strategies for a way forward.

“The establishment of Qmet Tech Foundation marks a significant milestone in India’s journey towards quantum excellence. By uniting some of the country’s brightest minds, we aim to create groundbreaking advancements in Quantum Sensing and Metrology that will not only benefit India but also contribute to the global quantum ecosystem. Indian scientists are making significant advancements in the field and it is now time to escalate the research to benefits that can make India stand out internationally” said Prof. Abhay Karandikar, Secretary, DST while inaugurating the kick off meeting.

Dean (R&D), Prof. Sachin Patwardhan and Dean (Strategy) Prof. K. P. Kaliappan of IIT Bombay were also present on the occasion.

Prof Kasturi Saha, Project Director of Qmet Tech Foundations pointed out, “Qmet aims to lead globally in quantum sensing, metrology, and imaging by advancing technology, workforce training, and innovation. It seeks to bridge research and applications, fostering international collaborations, driving transformative solutions in healthcare, national security, and scientific discovery.”

Kiran Shesh, CEO, Qmet Tech Foundation explained, “The Qmet Hub structure is intricate, comprising 16 institutes and 40 researchers located across India. The kick-off meeting is designed to create a shared sense of purpose and inspire enthusiasm to achieve the common goal through collaboration, cooperation, and effective communication.”

Qmet, one of the four thematic hubs created under NQM being implemented by the Department of Science and Technology (DST), Government of India aims to bridge fundamental research and practical applications in Quantum Sensing and Metrology—one of the four focus areas under NQM.

Some of the technologies they would work with include Portable Magnetometer, Quantum Diamond Microscope generated in the lab of Prof Kasturi Saha. These and many more will help positioning India as a global leader in this domain.

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ISRO carries out demo of restarting Vikas liquid engine

Source: The Economic Times, Dt. 18 Jan 2025,
URL: https://economictimes.indiatimes.com/news/science/isro-carries-out-demo-of-restarting-vikas-liquid-engine/articleshow/117346283.cms

The Indian Space Research Organisation has successfully carried out a demonstration of restarting its Vikas liquid engine at a test facility at Propulsion Complex in Mahendragiri, the space agency said on Saturday. The space agency said the Vikas engine is the workhorse that powers the liquid stages of its launch vehicles.

This test on January 17 marks a milestone in the development of technologies for recovery of stages, leading to reusability in future launch vehicles, according to an ISRO statement.

A series of tests are being carried out to validate the restarting of the engine under different conditions.

"In this test, the engine was fired for 60 seconds after which it was shut-off for a period of 120 seconds followed by restart and firing for seven seconds duration. All engine parameters during the test were normal and as expected," the ISRO said.

Previously, a shorter duration restart was carried out successfully in December 2024 with a shut-off time of 42 seconds and firing duration of seven seconds each.

Further tests are planned in coming days to optimise the performance of the engine under restart conditions, the statement read.

Also, ISRO Chairperson V Narayanan flagged off the core liquid stage (L110) of ISRO's LVM3 launch vehicle on Friday to the launch complex at Sriharikota.The stage was designed and developed by Liquid Propulsion Systems Centre (LPSC) during the development of the LVM3 launch vehicle and is powered by twin Vikas engines with a propellant loading of 110 tonnes, the ISRO said.

"This stage is the tenth L110 liquid stage integrated at ISRO Propulsion Complex, Mahendragiri and is earmarked for the LVM3 mission under a commercial agreement between NewSpace India Limited (NSIL) and AST SpaceMobile & Science, LLC to launch their BlueBird Block 2 satellite," the agency said in a statement.

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Isro preps for more docking trials with same SpaDeX sats to perfect precision in space

Source: The Times of India, Dt. 20 Jan 2025,
URL: https://timesofindia.indiatimes.com/science/isro-preps-for-more-docking-trials-with-same-spadex-sats-to-perfect-precision-in-space/articleshow/117378839.cms

The Indian Space Research Organisation (Isro) is preparing for additional docking attempts with its recently (Jan 16) linked satellites, focusing on achieving greater precision in its automated docking capabilities.

M Sankaran, director of the UR Rao Satellite Centre (URSC), which spearheaded the Space Docking Experiment (SpaDeX) told TOI exclusively that the space agency is conducting detailed assessments of the docking accuracy before proceeding with the next phase of experiments.

“We have to gain more information about how accurately we have achieved this docking and how much more accuracy we can achieve,” Sankaran said, emphasising that the actual act of docking is just one aspect of the mission.“How accurately we are docking is important. We will make an assessment of how accurately we have docked and how much we can improve,” he said.

Small separations

Isro, which launched the SpaDeX mission on Dec 30, with two 220kg satellites put in space as separate units, had achieved a peak a inter-satellite distance of 12.8km before initiating a series of mamanoeuvres that eventually culminated in the Jan 16 docking.

Isro employed a petal-based docking system, aligned with international standards including the International Docking System Standard (IDSS).On whether the fuel remaining on the satellites were sufficient to carry out more docking attempts, Sankaran said that for the upcoming trials, Isro plans to separate the satellites by shorter distances, potentially not exceeding 100 metres, unlike the initial approach.

“Fuel consumption won’t be a constraint for these experiments, as the focus will be on perfecting the final approach and docking mechanism rather than long-range maneuvers,” Sankaran said.

Sensors & Sat Capture

The success of these operations relies on a sophisticated array of five different types of sensors, each activated at specific ranges. These sensors, which were evaluated at each step in the run-up to Isro’s first successful attempt on Jan 16, are crucial to both the rendezvous and the eventual docking.

The Proximity and Docking Sensor (PDS) becomes operational from 20 meters, while other sensors work at varying distances – some at long range, others at 200 meters, and some specifically for close proximity operations.

The final phase of docking involves specialised mechanism entry sensors that detect when one satellite’s petals enter the other satellite's mechanism.

"...After it enters, we have to trigger mechanisms to grab the satellite. Once it is entered, it should get trapped there. It should not go out," Sankaran explained.Currently, Isro's team is analysing data from the successful docking and running simulations to prepare for the next attempt. While the exact timeline for satellite separation remains under review, Sankaran indicated it would take "a few days" as they carefully evaluate their options.

Mastery & future missions

"If we can do what we want to do immediately, we will do those things and then turn on the payload later. If that is going to take time, then we will turn on the payload and go ahead with the other observations. When we are ready, we will do the docking experiment again," he added.

As reported by TOI, the successful docking achieved by Isro was the first step towards mastering the technology, which will have to be done multiple times in different configurations, before Isro could confidently use it for future missions like Chandrayaan-4 and India's own space station.

And, the planned additional trials will help Isro decide how future docking experiments are designed. For Chandrayaan-4, which requires docking to bring back samples, Isro will be operating spacecraft of different sizes, while docking for the space station would have different challenges.

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Indian cryptography research gears up to face the quantum challenge

Source: The Hindu, Dt. 20 Jan 2025,
URL: https://www.thehindu.com/sci-tech/science/indian-cryptography-research-gears-up-to-face-the-quantum-challenge/article69115334.ece

Fundamental research in cryptography that's used worldwide to facilitate internet banking, e-commerce services, and secure messaging systems is now taking root in India as well.

The principal goal of those developing or using cryptographic systems is to improve system security. Cryptography — from the English roots of "hidden writing — is the name for techniques that secure information by converting plain text into ciphertext. It is concerned with the creation and use of encrypted messages that only the sender and the receiver can understand and which a malicious actor who interferes with the communication can't.

Sending secret messages isn't new. Archaeologists have unearthed clay tablets made by the ancient Mesopotamians in which they wrote down cryptic formulae to make ceramic glazes. In the first century BC, the Roman dictator Julius Caesar used the eponymous Caesar cipher to relay messages of strategic value to his generals.

More recently, many Polish codebreakers fled their country after Adolf Hitler invaded it in 1939 to work with reputed British mathematicians, including the father of modern computing Alan Turing, to crack Germany's famed Enigma cryptosystem. Turing's work in particular established much of the foundational theory for modern algorithmic computing.

Scientists have devised many sophisticated methods to prevent adversaries from cracking secret codes and gaining unauthorised access to sensitive information. These methods achieve their goals by using algorithms and protocols to protect some data's confidentiality, integrity, authenticatability, and non-repudiation.

'Hard' problems

Cryptographic algorithms convert messages in ways that make it very difficult, very expensive or both to decode them. A common way to achieve this has been to place some sensitive information behind the answer to a very difficult problem. An agent can access the information by solving the problem, so the harder the problem, the more inaccessible the information.

"Hence the search for harder and harder problems — for instance, even those that quantum computers may find hard to solve," R. Ramanujam of the Institute of Mathematical Sciences, Chennai, said.

As computational techniques evolve, particularly with advancements in quantum computing, the interplay between complexity and cryptography will continue to be a crucial area of research and development, he added.

Modern cryptographic systems are built on problems that demand far too many resources to be solved.

"As they say in the crypto community, if your cryptosystem is broken, either a spy is dead or a million dollars is missing," Ayan Mukherjee, an assistant professor at the Indian Institute of Science Education and Research (IISER), Pune, said. "Such is the seriousness of the effect of a broken cryptosystem. Thus, oftentimes, people use the old and the trusted to secure their communications."

This is also why, he added, "The field of cryptography is very slow-moving."

"There is a close connection between complexity theory and cryptography, hence many [researchers] work on these connections, clarifying notions and building finer techniques," Ramanujam said.

Areas where Indian researchers are working extensively include communication complexity (the amount of communication required to complete a computational task), proof complexity (the computational resources required to prove or disprove statements), and algebraic coding theory (using algebra to encode and decode data).

Post-quantum cryptography: securing data in the age of quantum Computers

Locks and keysThe goal is to make sure an adversary, especially one with enormous computational resources, can't crack the code. At the heart of any cryptosystem is the key: a secret value an algorithm uses to encrypt or decrypt data.

The Caesar cipher is a simple example. It works by mapping the existing alphabet to one where the starting letter is offset by some number of letters. This number is the key. For example, if the key is 14, the encrypted alphabet begins with the letter O (the 14th letter) rather than A. Thus the words FIGHT FOR ROME become TWUVH TCF FCAS.

When the sender encrypts data with a key, only someone who knows the key can decrypt the message and read it. More sophisticated systems use two keys — one each for the sender and the receiver — and map them in a separate secret way.

A famous example is public-key cryptography, which is used to secure information over the internet. The receiver uses a single algorithm to generate two keys called the public key and the private key, and shares the public key with the sender. Any message the sender encrypts with the public key can be decrypted by the private key.

Researchers prefer the algorithms that generate keys to be one-way functions, a name in mathematics for functions that are simple to use but hard to crack. In cryptography, this means they can be used to easily encrypt messages but can't be cracked without knowing the key. As Ramanujam put it, the challenge is like protecting a house with a strong alarm system that the house's residents can still use without training.

Some one-way functions are very difficult to crack and thus very secure — but which also take a long time to decrypt messages. This is one of the principal reasons mining for bitcoins has become a very energy-intensive process. The bitcoin system uses a one-way function that has required more computational resources to decrypt messages as the size of its blockchain has increased.

This is why some cryptography researchers in India and abroad are working on simplifying the decryption side in particular. Researchers are also considering whether shorter proofs (of the hard problems) can be used to verify the integrity of data in artificial intelligence and large language models.

Cryptography isn't just a mathematical or academic curiosity but is of considerable practical interest, Yael Kalai, whose work on proofs won her the 2022 Turing Award, told the 11th Heidelberg Laureate Forum in September (the author was in the audience). "In today's world, the biggest problem we have to solve is trustworthiness," she said.

Since researchers have solved the problem of authentication and security in communications, she added, the current problem is computation. "People are computing things for us. How do we know that they are computing correctly? How do we certify the huge and often crazy computations people are coming up with? That is a huge new research problem now."

Possibility of disruption

Two research areas that could disrupt current cryptographic systems with significant economic and social consequences are homomorphic encryption and quantum information technologies, per a recent paper by the Organisation of Economically Developed Countries (OECD).

Homomorphic encryption is a cryptographic method that allows certain calculations to be performed on encrypted data without the need to decrypt it first and without accessing the secret key. The result of such computations remains in encrypted form and can be revealed later, when necessary. According to the paper, this technique could surmount the problem of processing encrypted data without decrypting it first, which increases risk.

Second, a mature quantum computer could easily break some encryption methods widely used today. Some researchers are thus working on algorithms that can resist attacks powered by a

quantum computer, an enterprise called quantum resistant cryptography (QRC). In fact marrying cryptography with quantum physics paves the way for encryption technologies based on the laws of quantum physics, which can be more convoluted than mathematical concepts alone.

Researchers worldwide have been working on QRC since 2006, including in publicly funded research projects in the European Union and Japan. In India, Mukherjee's group at IISER Pune, and those at the Indian Institute of Science (IISc) and the Raman Research Institute (RRI), both in Bengaluru; the Centre for Development of Telematics, New Delhi; and at Pondicherry University are working on it as well.

'A huge deal'Cryptography research in India is taking off in other aspects, too, catching up with that in the European Union, the U.S., and China. The National Quantum Mission the Cabinet approved in 2023 includes a research hub for quantum communication. The mission is to enable satellite-based secure quantum communications between ground stations over 2,000 km, long-distance secure quantum communications with other countries, inter-city quantum key distribution over 2,000 km, and multi-node quantum networks, among other outcomes.The Indian Space Research Organisation is also planning to launch a satellite with ultra-secure quantum communication capabilities.

In July, a team of Indian scientists from RRI, IISc, IISER Thiruvananthapuram, and the Bose Institute in Kolkata published a paper describing a way to generate true random numbers that are crucial to making secure private keys and nearly unhackable passwords. "This new method offers the enhanced protection we all need in our daily lives, by using truly random numbers to generate keys that will be used to encrypt the passwords," the Department of Science & Technology said in a statement.

Apart from the Ministry of Science & Technology, major government funders for cryptography research in the country include the Ministry of Electronics and Information Technology and the Department of Telecommunications."The present status of quantum cryptography is to build quantum-secure cryptosystems," Mukherjee said. "It's based on the idea that, in the near future, we will have quantum computers. When that happens the current cryptosystems will fail. This is a huge deal."

The consequences will also affect India's cryptography policy. According to a recent study commissioned by the Thales Group, the volume of sensitive data in the cloud could surge from 51% of all organisational data to 68% by 2027. As more data enters and lives in the cloud, "encryption techniques for data at rest, in motion, and in use are becoming more pervasive, evolving into a standard practice for protecting cloud-resident sensitive information against emerging cyber threats," the report said.

There is widespread data loss as well: the report said almost three-fourths of all organisations have faced multiple data breaches in the past year, foremost due to inadequate encryption. Some 71% initiated formal cryptographic programmes and 81% have dedicated encryption teams.T.V. Padma is a science journalist in New Delhi.

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India to have space station by 2035: Minister

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During his visit to the Meteorological Centre, Shimla, here today, Jitendra Singh, Minister of State for Science and Technology and Earth Sciences, said that India will have its own space station by 2035. The minister said that the space station would give a big boost to the country's capabilities in the missions requiring deployment of satellites and preparedness for emergencies.

The minister further said that the country's weather forecasting was at par with the rest of the countries and the department was high up on the priority list of Prime Minister Narendra Modi.

The minister reviewed the entire forecast system and equipment at the Shimla Meteorological Centre. "We apprised him of our entire forecasting system and about the 48 Automatic Weather Stations (AWS) that would be set up in the state in the near future," said Kuldeep Srivastava, Director, Meteorological Centre, Shimla. The state government has already signed an MoU with India Meteorological Department for setting up these AWS.

The automatic weather stations will provide real-time data to improve forecasting and preparedness to handle natural disasters. It will also help in sectors like agriculture and horticulture. At present, there are 22 automatic weather stations in the state.

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Dr Jitendra Singh, Minister of State for Earth Sciences, today accused the Congress of misusing the Constitution for furthering its own interests and trying to project the BJP as anti-constitutional.

While kicking off the BJP's 'Samvidhan Parv' – which is aimed at making people aware of what the BJP has done to protect the Constitution under Prime Minister Narendra Modi here today – the minister said that the BJP would take the programme to the district and the block level to highlight

how it was actually the Congress that had dishonoured the Constitution and insulted DR Ambedkar.

“The Congress used Article 356 of the Constitution 88 times to dislodge the elected government and to further its own interest. Prime Minister Narendra Modi has made amendments for empowering poor and weaker section of society,” Singh said while addressing a press conference here today.

“The amendment brought after Indira Gandhi’s election was challenged, the move to increase the tenure of Parliament and Assemblies to six year, the Shah Bano incident… the Congress did it all to protect its own interests. On the other hand, Prime Minister Narendra Modi ensured 33 per cent reservation for women in Parliament and Vidhan Sabha, empowerment youth and weaker sections, etc,” the minister said.

When asked if Home Minister Amit Shah had disrespected Ambedkar with his comments in Parliament, the minister replied in the negative and instead blamed the Congress for showing disrespect to Ambedkar. “The Modi government has built memorials of Ambedkar at five places in India and London. The Modi government established the Dr Ambedkar International Centre in Delhi. And it was the NDA government that conferred Bharat Ratna on Ambedkar. And yet, the Congress says the BJP does not respect Ambedkar,” he said.

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