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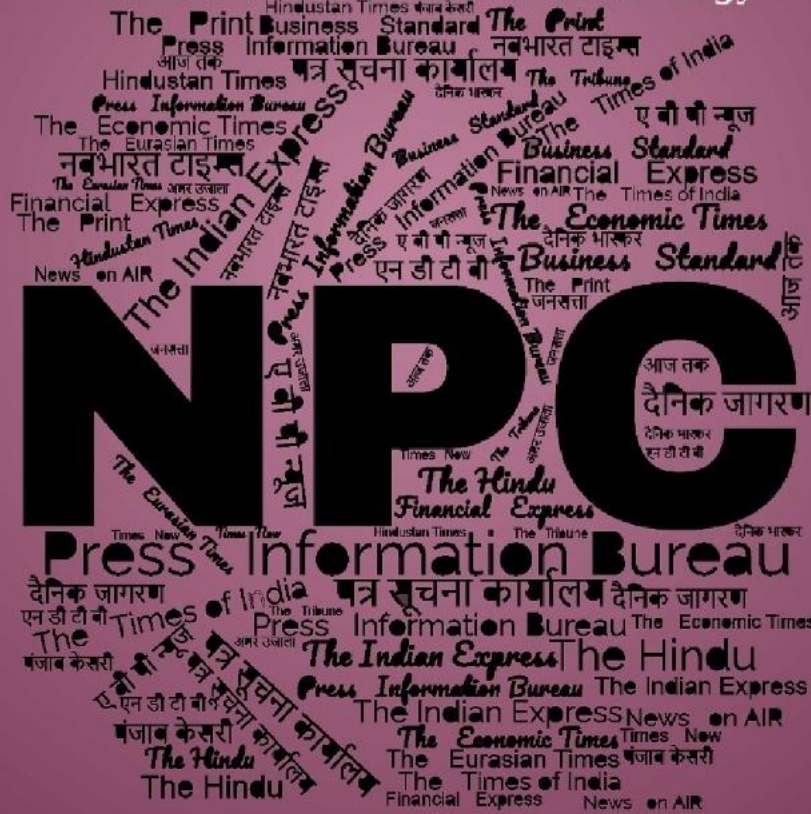
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Defence News

Army Brass seeks boost in defence self-reliance

Source: Hindustan Times, Dt. 18 Apr 2026

HT Correspondent

letters@hindustantimes.com

NEW DELHI: The army leadership has called for urgently boosting the country's capabilities to produce weapons and systems to enhance self-reliance in the defence manufacturing sector and build long-term strategic resilience, given how supply chain disruptions triggered by ongoing global conflicts could hit military preparedness.

The biannual Army Commanders' Conference also focused on operational capability requirements, including the employment of unmanned aerial systems (UAS) and counter-UAS technologies based on lessons learnt from Operation Sindoor and the changing global conflict dynamic, the defence ministry said on Friday.

Defence minister Rajnath Singh recently asked the military brass to draw "operational and technological" lessons from the ongoing US-Israel war with Iran to bolster India's defence preparedness. This came during a wide-ranging review of the West Asia crisis, which has disrupted global supply chains, sparked a surge in oil and gas prices, and rattled the global economy.

The army brass "discussed a

BIANNUAL ARMY COMMANDERS' CONFERENCE ALSO FOCUSED ON OPERATIONAL CAPABILITY REQUIREMENTS

wide array of issues pertaining to modernisation, technology infusion in combat operations, doctrinal and training requirements besides networking and data centrality to enhance operational readiness and address emerging security challenges," the ministry said in a statement.

The four-day conference, chaired by army chief General Upendra Dwivedi, concluded on Thursday. The speakers alluded to the "need for hard power for guaranteed protection of India's strategic and security interests," in the context of lessons emerging from ongoing conflicts.

Addressing the army brass on Tuesday, cabinet secretary TV Somanathan emphasised the need for sovereign artificial intelligence models and resilient supply chains to safeguard national interests, amid evolving geopolitical challenges triggered by global conflicts.

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Army Commanders' Conference concludes in New Delhi

Source: Press Information Bureau, Dt. 17 Apr 2026

The biannual Army Commanders' Conference (ACC) which commenced on 13 April 26, culminated on 16 April 26. The conference chaired by Chief of the Army Staff (COAS), was attended by apex military leadership and was addressed by senior functionaries in the government including the Cabinet Secretary, Chief of the Defence Staff, Defence Secretary and Chairman NSAB besides Chief of the Naval Staff. Aligned with the vision of evolving into a 'Future Ready Force', the Indian Army has designated the year 2026 as the year of "Networking and Data Centricity".

The conference discussed a wide array of issues pertaining to modernisation, technology infusion in combat operations, doctrinal and training requirements besides networking and data centricity to enhance operational readiness and address emerging security challenges. Based on the lessons learnt from Operation Sindoor, and in keeping with the current operational dynamics globally, senior army leadership also focussed on operational capability requirements including employment of Unmanned Aerial Systems (UAS) and Counter Unmanned Aerial Systems (C-UAS).

The distinguished speakers highlighted the evolving geopolitical landscape and emerging global, regional and internal security dynamics. With specific reference to lessons emerging from global conflicts, the speakers alluded to the need for Hard Power for Guaranteed Protection of India's strategic and security interests while emphasising on inter ministerial coordination, enhanced synergy between civil and military institutions and a whole of nation approach for a coordinated national response to complex security challenges. It emerged during the discussions that there is an urgent need to accelerate indigenous production capabilities, for strengthening self-reliance in defence and ensuring long-term strategic resilience in view of current supply chain crisis.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=2252846®=3&lang=1>

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ड्रोन और मिसाइल भविष्य के हथियार, इसी में हो निवेश: डॉ. लेले

Source: Dainik Jagran, Dt. 19 Apr 2026

साक्षात्कार

रुमनी घोष • जागरण

नई दिल्ली: अमेरिका, इजरायल और ईरान के बीच युद्ध की लपटें जैसे-जैसे धीमी पड़ रही हैं, उससे सबक पर चर्चा होने लगी है। सामरिक विशेषज्ञ मंथन कर रहे हैं कि भविष्य की तैयारी क्या हो? मनोहर परिकर रक्षा अध्ययन और विश्लेषण संस्थान (एमपी-आइडीएसए) के उप महानिदेशक व ग्रुप कैप्टन (सेवानिवृत्त) डा. अजेय लेले का कहना है कि पश्चिम एशिया संकट ने साबित कर दिया है कि कोई किसी



डा. अजेय लेले • जागरण का दोस्त नहीं है। भारत समझना होगा कि ड्रोन और मिसाइल ही भविष्य के हथियार हैं, लिहाजा इसी में निवेश की जरूरत है।

सामरिक विशेषज्ञ डा. अजेय लेले ने पश्चिम एशिया संकट पर दैनिक जागरण से विस्तार से बातचीत की। उन्होंने कहा कि किसी भी युद्ध का विश्लेषण सैन्य, कूटनीतिक और आर्थिक दृष्टिकोण से किया जाता है।

सैन्य क्षमता के मामले में अमेरिका, इजरायल और ईरान तीनों ही युद्ध के मैदान में अच्छी तैयारी के साथ उतरे हैं। अमेरिका-इजरायल के लक्ष्यों की सटीकता उल्लेखनीय है, जबकि ईरान की युद्ध नीति में शिवाजी के गुरिल्ला युद्ध और कुरुक्षेत्र के चक्रव्यूह की झलक देखने को मिलती है। इस संघर्ष में न तो कोई हारा है और न ही जीता है, लेकिन कूटनीतिक मोर्चे पर अमेरिका हारता हुआ नजर आ रहा है। डा. लेले का मानना है कि अमेरिका को एक बड़ा झटका लगा है, क्योंकि बिना कुछ कहे दुनिया के अन्य देशों ने ट्रंप को अहसास दिला दिया है कि बेबुनियाद और गैरजरूरी युद्ध छेड़ने पर कोई भी

उनका साथ नहीं देगा। डा. लेले ने बताया कि जब ईरान ने होर्मुज का रास्ता रोका, तो अमेरिका ने तय किया कि ईरान की नौसेना को सबसे पहले खत्म किया जाए। अमेरिका ने अपने एकमात्र माइंस स्वीपर को रिटायर कर दिया था। अब केवल यूके के पास यह उपकरण है, जिसने युद्ध क्षेत्र में भेजने से मना कर दिया। यही कारण है कि अमेरिका धमकी देने के बावजूद पूरी क्षमता से होर्मुज पर कब्जा नहीं कर पा रहा है।



पूरा साक्षात्कार पढ़ने के लिए स्कैन करें।

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सेना ने घोषित किया 2026 को 'नेटवर्किंग-डेटा सेंट्रिसिटी' साल

Source: *Dainik Jagran, Dt. 18 Apr 2026*

नई दिल्ली, प्रेटर : भारतीय सेना के शीर्ष कमांडरों ने चीन और पाकिस्तान के साथ सीमाओं पर भारत की सुरक्षा चुनौतियों की व्यापक समीक्षा की और आपरेशन सिंदूर से प्राप्त सबक के आधार पर अपनी युद्धक क्षमता को और मजबूत करने के तरीकों की खोज की। रक्षा मंत्रालय ने कहा, एक दिन बाद जब कमांडरों ने नई दिल्ली में अपने चार दिवसीय विचार-विमर्श को समाप्त किया, 'फ्यूचर रेडी फोर्स' में विकसित होने के अपने दृष्टिकोण के अनुरूप सेना ने वर्ष 2026 को 'नेटवर्किंग और डाटा सेंट्रिसिटी' का वर्ष घोषित किया।

द्विवार्षिक सेना कमांडरों के सम्मेलन ने बल की संचालनात्मक क्षमता की आवश्यकताओं पर भी ध्यान केंद्रित किया, जिसमें कमांडरों ने स्वदेशी सैन्य हार्डवेयर के उत्पादन की क्षमताओं को तेज करने पर जोर दिया।

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Raksha Mantri to undertake 3-day visit to Germany

Source: *Press Information Bureau, Dt. 19 Apr 2026*

Raksha Mantri Shri Rajnath Singh will undertake an official visit to Germany from April 21 to 23, 2026 to further strengthen the strategic defence partnership between the two countries. During the visit, Raksha Mantri is scheduled to hold bilateral talks with his German counterpart Mr Boris Pistorius and other senior leaders of the government.

Discussions will focus on enhancing defence industrial collaboration, strengthening military-to-military engagements, and exploring opportunities in emerging domains such as cyber security, artificial intelligence, and drones. A Defence Industrial Cooperation Roadmap and Implementing Arrangement for Cooperation in UN Peacekeeping Operations Training are likely to be signed in the presence of both Defence Ministers.

The visit will provide an opportunity to review the ongoing defence cooperation initiatives and identify new avenues for collaboration between the defence industries of both countries. Shri Rajnath Singh is also expected to interact with key representatives of the German defence industry, with a view to promoting joint development and co-production under the Make-in-India initiative. This visit of Raksha Mantri comes after a gap of seven years. The last visit by an Indian Defence Minister to Germany was by Smt Nirmala Sitharaman in February 2019. Mr Boris Pistorius had visited India in June 2023 and held extensive talks with Shri Rajnath Singh.

India and Germany share a strong & multifaceted strategic partnership, anchored in democratic values, rule of law, and a shared commitment to a rule-based international order. Defence and

security cooperation has emerged as an important pillar of this partnership in recent years. The objective of the visit is to further deepen bilateral ties and contribute to regional & global peace, stability, and prosperity.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=2253493®=3&lang=1>

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India, Germany likely to ink pact on defence cooperation

Source: The Tribune, Dt. 20 Apr 2026

Defence Minister Rajnath Singh will be in Germany on a 3-day visit from April 21-23. The two countries are likely to ink a 'defence industrial cooperation roadmap'. Besides, they will look to enhance military-to-military engagements and explore opportunities in emerging domains. The defence industrial cooperation roadmap is to be signed at a time when the two countries are on the verge of announcing a deal to co-produce next generation conventional submarines in India.

The plan involves German company ThyssenKrupp Marine Systems tying up with Mazagon Dock Shipbuilders Limited (MDL) to build six such vessels for around \$8 billion. In June last year, TKMS and MDL signed a memorandum of understanding (MoU) to collaborate on making these stealth submarines that have a specific technology called air-independent propulsion (AIP) allowing the vessel to remain submerged under water for a longer period of time.

The Ministry of Defence said the visit would provide an opportunity to review the ongoing defence cooperation initiatives and identify new avenues for collaboration between the defence industries of both countries. Rajnath Singh is also expected to interact with key representatives of the German defence industry, with a view to promoting joint development and co-production under the Make-in-India initiative. TKMS is a global market leader for non-nuclear submarines based on air independent propulsion (AIP) technology, which helps a submarine to stay under water for longer periods. India had sought operational AIP technology, which would allow a submarine to remain under water for up to six days.

The TKMS-MDL pact aims to utilise the latest technology from Germany and the manufacturing abilities of MDL for making submarines. MDL, headquartered in Mumbai, is a public sector company owned by the Ministry of Defence. As per the pact, TKMS will contribute to the engineering and sign of the submarines as well as provide consultancy support to this joint project. MDL will take the responsibility for constructing and delivering the submarines. The construction of the submarines will take place in India and is expected to have significant local content.

The Ministry of Defence said Rajnath Singh's visit would further strengthen strategic defence partnership between the two countries. During the visit, Singh is scheduled to hold bilateral talks with his German counterpart Boris Pistorius and other senior leaders of the government. Discussions will focus on enhancing defence industrial collaboration, strengthening military-to-military engagements, and exploring opportunities in emerging domains such as cyber security, artificial intelligence, and drones.

<https://www.tribuneindia.com/news/top-headlines/india-germany-likely-to-ink-pact-on-defence-cooperation/amp>

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Pact allowing India, Russia to station 3,000 troops, 5 warships, 10 aircraft in each other's territory operational: Report

Source: The Times of India, Dt. 19 Apr 2026

India and Russia can now station 3,000 troops and a limited number of naval ships and aircraft in each other's territory as part of an agreement that was signed between New Delhi and Moscow in Feb 2025 and that has been in force since Jan 12 this year, Russia's official legal information portal published on Friday. The law ratifying the agreement was passed by Russia in Dec 2025.

The Indo-Russian Reciprocal Exchange of Logistics Agreement (RELOS) will allow 'five warships, ten aircraft and three thousand troops to be simultaneously stationed in the territory of the partner country for a period of five years, and if both parties agree, it can be extended for another five years,' first deputy chairman of International Affairs Committee Vyacheslav Nikonov recently confirmed to State Duma in Moscow after Russian Parliament ratified it.

The operationalisation of the pact strengthens long-term military cooperation, particularly for servicing India's Russian-origin military equipment and enabling longer deployments. The pact also covers joint military exercises, training and humanitarian missions. The RELOS agreement, which carries deep significance amid the West Asia conflict and Ukraine war, not only regulates deployment of military personnel and equipment but also governs logistics.

The exchange of logistics includes a range of specific services provided by the receiving country. For warships, this entails port and repair services, as well as delivery of water, food, technical resources and other supplies. In the case of military aircraft, it involves air traffic control, aeronautical data, the processing of flight requests, use of military navigation systems and aircraft parking and security. Aviation fuel, lubricants and special fluids, along with restoration of failed equipment, are offered on a reimbursable basis.

The pact allows reciprocal access to military facilities, including airbases and ports, to support ships, aircraft and personnel. It provides India access to Russian naval and air bases, including in the Arctic, and allows Russia broader access to Indian facilities. The agreement specifically covers "deployment of military formations", allowing for joint training, disaster relief and joint operations. The agreement is designed to boost defence cooperation in Indo-Pacific and Arctic regions, enhancing interoperability between the armed forces of the two nations.

<https://timesofindia.indiatimes.com/defence/pact-allowing-india-russia-to-station-3000-troops-5-warships-10-aircraft-in-each-others-territory-operational-report/articleshow/130361423.cms>

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Operation Sindoor effect: IAF eyes new tech to counter enemy drones at close range

Source: The Tribune, Dt. 20 Apr 2026

As part of the post-Operation Sindoor revamp, the Indian Air Force (IAF) is exploring an advanced drone interception system to counter enemy drone threats at close range. The IAF's South Western Command at Gandhinagar has asked for specific drones and is looking at the Indian

industry to give solutions. A request for information (RFI) – the first step of the tendering process has been issued. It seeks “Indigenous solutions capable of detecting, tracking and neutralising targets”. The system is envisaged to be designed as a small drone interceptor with launch and forget characteristics. The system needs to be designed to autonomously track and intercept hostile drones.

After being launched towards a detected target, the designed system is expected to use on-board sensors, optional datalink and automated guidance to pursue and neutralise the target without any manual control from ground-based controllers. The RFI has been issued by the Regional Aerospace Innovation Division, Gandhinagar (RAID-GN), South Western Air Command, Gandhinagar. The IAF is seeking three types of systems to form a layered system that allows targeting and neutralisation. The first is a man-portable system that can detect and track drones at an altitude of 1,000 metres at a distance of 5 km. The second category of interceptor needs to have a ‘minimum neutralisation’ altitude of 5,000 meters at a distance of 10 Km. It can be a vehicle launched with the ability to fire a salvo of intercepting missiles.

The third category of drones needs to have an ability to neutralise targets at an altitude of 7,000 metres and at a distance of 25 Km, with launch capability and also to function as a command and control centre. Besides this, separately, the government is set to bolster the IAF’s elite Special Forces with a new compact unmanned aerial vehicle (UAV) system, capable of operating at altitudes up to 16,400 feet. Designed for high-altitude surveillance and operational support, the UAV will function in extreme climatic conditions.

The Ministry of Defence (MoD) has issued an RFI to procure the 'micro UAV' system, emphasising its advanced range, endurance, and day-night operational capabilities. The system is a lightweight, man-portable platform, marking an upgrade to the current technology used by the IAF's Garud Special Forces, and aligns with India's initiative to promote indigenous defence production. The UAV needs to have autonomous vertical take-off and landing capabilities, secure communication, and multi-operational modes.

<https://www.tribuneindia.com/news/defence/operation-sindoor-effect-iaf-eyes-new-tech-to-counter-enemy-drones-at-close-range/>

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India Highlights Maritime Security Leadership at World Border Security Congress 2026 in Vienna

Source: Press Information Bureau, Dt. 17 Apr 2026

India showcased its leadership in maritime security and reinforced its commitment to international cooperation during its participation in the World Border Security Congress 2026 held in Vienna, Austria from April 14-16, 2026.

A three-member Indian delegation, led by Additional Director General Anand Prakash Badola, represented the country at the international forum. The delegation presented India’s best practices in safeguarding its maritime boundaries, reflecting the nation’s focus on building robust and resilient maritime governance.



Established in 2012, the World Border Security Congress is a premier international platform that brings together senior government officials, security experts, and industry leaders to deliberate on emerging challenges, technological innovations, and best practices in border management, while fostering international cooperation.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=2253095®=3&lang=1>

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Culmination of First Edition of Naval Commanders' Conference 2026

Source: Press Information Bureau, Dt. 17 Apr 2026

The first edition of the biannual Naval Commanders' conference 2026 was conducted from 14-17 Apr 2026 at Nausena Bhawan, New Delhi. The four-day, apex-level conference served as a vital forum for a comprehensive review of the Navy's operational and materiel preparedness, infrastructure, logistics, and human resource initiatives, along with an assessment of the prevailing operational environment amidst the ongoing conflict in West Asia.

The conference commenced with an inaugural address by the Chief of the Naval Staff. Emphasising the evolving geostrategic environment, the CNS highlighted increasing complexities in maritime security, where concurrent conflicts, a weakening rules-based order, and increased threats posed by non-state actors are converging to create a highly contested operational space for the Indian Navy.

The Chief of the Naval Staff underscored the need to maintain continued focus on combat readiness and to adopt emerging technologies in order to build a future-ready force. He also reiterated the Indian Navy's obligations in the Indian Ocean Region within the emerging geo-strategic landscape, and stressed the importance of a cohesive and credible approach through proactive engagements with Friendly Foreign Countries in both multilateral and bilateral exercises.



The Chief of the Defence Staff (CDS) and the Union Home Secretary also interacted with the Naval Commanders during the conference. The CDS highlighted changing geo-political order and urged the Navy to prepare for the rapidly evolving nature of warfare, including its economic and technological dimensions. The Home Secy alluded to the need for continued collaborative efforts between the Navy and para military in maintaining robust Coastal security architecture, and towards combating transnational illegal activities.

During the conference, the Indian Navy Maritime Security Strategy (INMSS -2026) was released by the Chief of the Naval Staff, along with other key naval publications. Building upon Defence Forces Vision 2047 and Indian Navy Vision 2047, the INMSS outlines the Navy's security strategy in the maritime domain for furtherance of national interests in the coming decade in the evolving security environment. The strategy is anchored in a realistic assessment of the evolving geo political landscape disruptive technologies, reforms in higher defence organisation, and the changing character of warfare.

On the sidelines of the conference, the Chief of the Naval Staff also hosted Sagar Manthan. The forum facilitated a discussion between the Navy's top leadership and subject matter experts on 'Reforming Defence R&D and Capability Development through Greater Industry Participation'.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=2253155®=3&lang=1>

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Indian Ocean Ship Sagar departs Phuket, Thailand

Source: Press Information Bureau, Dt. 19 Apr 2026

Indian Ocean Ship (IOS) SAGAR - INS Sunayna departed Phuket, Thailand on 17 Apr 2026 on completion of a high-tempo three-day Operational Turnaround (OTR), marking the successful culmination of her second port call during the ongoing deployment.

During the visit to Phuket, IOS SAGAR undertook a series of professional, strategic and cultural engagements with the Royal Thai Navy (RTN), significantly strengthening bilateral naval

cooperation. Commander Siddharth Chaudhary, Commanding Officer, INS Sunayna called on Rear Admiral Sathaporn Wajarat, Chief of Staff of the Third Naval Area Command, RTN, reaffirming shared commitment towards maritime cooperation.

Professional and interpersonal ties were enhanced through a friendly football match and a joint Yoga session, participated by crew from IOS Sagar and RTN. A formal deck reception hosted onboard was attended by senior naval dignitaries, facilitating a platform for sharing insights on the IOS Sagar mission and discussions on maritime cooperation and regional security. The ship was opened to visitors, promoting people-to-people connect.



During a Passage Exercise (PASSEX) with HTMS Klongyai, operational interoperability was demonstrated, which included communication drills and formation manoeuvres, highlighting seamless coordination and “plug-and-play” capability between the two navies. The visit underscores the strong and enduring maritime partnership between India and Thailand, aligned with the MAHASAGAR vision of Mutual and Holistic Advancement for Security and Growth Across Regions.

IOS SAGAR has now proceeded to Jakarta, Indonesia, for the next port of call, continuing her mission to strengthen maritime cooperation in the Southeast Indian Ocean Region.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=2253510®=3&lang=1>

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Indian Army conducts Jal Rahat: Flood relief joint exercise

Source: The Pioneer, Dt. 19 Apr 2026

The Red Horns Division of Gajraj Corps on behalf of the Indian Army, conducted a Joint Flood Relief Exercise, Exercise Jal Rahat at IIT, Guwahati, demonstrating inter agency coordination and disaster preparedness by flood relief columns of Army, NDRF, SDRF & SSB. The exercise showcased modalities of conduct of flood relief operations, role of various agencies, use of high-end technology and innovative means for conduct of rescue operations during floods.

Exercise JAL RAHAT was conceptualised and designed with an aim to enhance response capability in the event of severe flooding. A specialist team from Indian Army, supported by other State Agencies, depicted rescue missions incorporating and simulating actual scenarios, employment of drones for surveillance and logistic outreach of stranded villagers and evacuation of drowning individuals.

Apart from this specialist teams of Army, NDRF & SDRF showcased their skills in deep water rescue operations. It effectively exercised all stakeholders in conduct of relief operations in an effectively synchronised manner, showcasing inter agency synergy and interoperability at challenging times of natural calamities.



The exercise was witnessed by General Officer Commanding, Gajraj Corps, senior officials from Army, State Administration, SSB, CAPFs and disaster relief organisations and approximately 800 audience to include flood relief columns of Indian Army, cadets from NCC and NSS and students from various schools and colleges of Guwahati. The operational readiness state of flood relief columns was overseen by Lt Gen Neeraj Shukla, AVSM, SM**, General Officer Commanding of Gajraj Corps.

He also addressed the august gathering and exhorted all ranks of Army, SSB, NDRF, SDRF and NCC Cadets for adopting whole of society approach for Nation Building by following the mantra of four 'P' – “Predict, Prepare, Protect and Provide, thus leading to, further strengthening the interoperability and inter agency synergy to achieve the aim of “Janbhagidari Se Aapda Prabandhan”.

The events conducted during the exercise instilled a sense of assurance and faith among the spectators towards Army and other agencies for ensuring their safety in case of any crisis situation or natural calamity. Moving forward from here, the participating agencies in coordination with Indian Army have committed towards conduct of regular joint training sessions, updation of SOPs, and disaster relief plans and investing towards capacity building for effective emergency response mechanism. Further strengthening the motto of Exercise Jal Rahat, “Sanghatit Shakti Se Jan Aapda Suraksha”

<https://dailypioneer.com/news/slug-lite/indian-army-conducts-jal-rahath-flood-relief-joint-exercise?year=2026>

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Science & Technology News

ISRO plans G20 satellite launch 2027

Source: The Pioneer, Dt. 19 Apr 2026

ISRO Chairman V Narayanan said on Saturday that the G20 satellite, designed to study climate, air pollution and monitor weather, is expected to be launched in 2027. Addressing scientists from DRDO, ISRO, and the Aeronautical Society of India at the Engineering Staff College of India, Dr Narayanan also said India is the first country to succeed in placing 104 satellites, more than 100 satellites using a single rocket without any collision.

"Right now we are also working on a G20 satellite for G-20 countries, India is taking the lead role, and we are going to have the launch by the 2027 timeframe," he said. The ISRO chief further said a lot of commercial missions were carried out, including 433 satellites of 34 countries launched, and the heaviest satellite lifted from India was again a commercial satellite.

Narayanan said ISRO is working towards sending a human to the moon by 2040. "If we make it happen by 2040, we will be on par with any other space-faring nation in terms of launcher technology, satellite technology, application area, and human space flight program. And we are working towards the Viksit Bhrat-2024," he said. According to him, ISRO is in the process of making a 2.2 m diameter with 100 mm thickness titanium vessel for Samudrayaan, a project for the Deep Ocean Mission.

<https://dailypioneer.com/news/isro-plans-g20-satellite-launch-2027>

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Simultaneous oscillations in solar filaments provides new clues to their properties

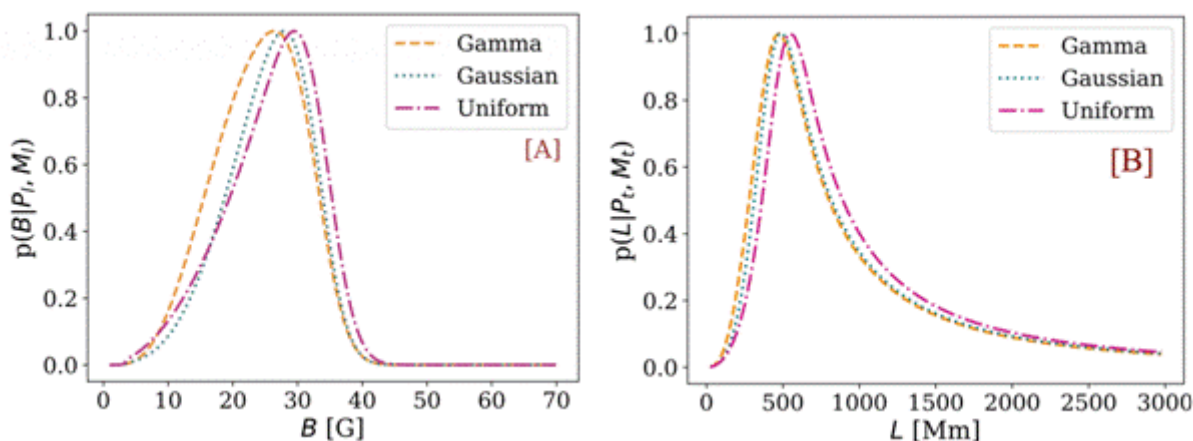
Source: Press Information Bureau, Dt. 17 Apr 2026

A new study by astronomers has unveiled a powerful method to estimate the hidden physical properties of solar filaments by analysing their oscillations, offering deeper insights into the Sun's magnetic structure. Solar filaments, which are gigantic clouds of cool plasma suspended in the Sun's atmosphere, are held in place by magnetic fields. Understanding their properties, such as magnetic field strength, size, and internal structure is crucial for studying solar eruptions and space weather, which can impact satellites, communication systems and power grids on Earth.

However, directly measuring these properties remains extremely challenging. Scientists instead rely on a technique that interprets oscillations in solar filaments called prominence seismology to infer their internal conditions, similar to how earthquakes are used to study Earth's interior. Researchers from the Aryabhata Research Institute of Observational Sciences (ARIES), along with collaborators from the Indian Institute of Technology, Delhi, Institute de Astrofísica de Canarias, Spain have taken this approach a step further.

The team consisting of Upasna Baweja, Vaibhav Pant, Iñigo Arregui, M. Saleem Khan studied rare cases where solar filaments exhibit simultaneous longitudinal and transverse oscillations. These

dual oscillations offer a unique opportunity to tightly constrain the filament's physical parameters. Using advanced statistical methods called Bayesian analysis, the team combined observational data with theoretical models to estimate key properties of these filaments.



Marginal probability distributions obtained from Bayesian analysis of solar filament oscillations.

Panel [A] shows the probability distribution of the magnetic field strength, while the panel [B] shows the probability distribution of length of the flux tube. The curves correspond to different prior assumptions, uniform (dash–dotted), Gaussian (dotted), and gamma (dashed), illustrating the influence of prior knowledge on the inferred physical parameters.

Their analysis revealed that the probable range of magnetic field holding the filaments can be robustly inferred even with limited knowledge of plasma density. Besides, magnetic flux tubes that support filaments can be very long about 100 to 1000 megameters showing that quiescent prominences cover large areas of the Sun's atmosphere and that the twist in magnetic field lines is generally low, typically less than three turns, suggesting relatively stable magnetic configurations.

To achieve this, the study first estimated the magnetic field strength from observed longitudinal oscillations and then used this information to determine the length and structure of the supporting flux tubes from transverse oscillations. This combined approach significantly improved the accuracy of the inferred parameters.

This work published in the journal *Astrophysics* can significantly advance the understanding of solar magnetic fields and properties of the magnetic features present in the solar atmosphere. Such insights are crucial for improving models of solar eruptions and enhancing our ability to predict space weather events.

Publication link: <https://arxiv.org/abs/2601.01730>

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=2253011®=3&lang=1>

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