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समाचार पत्रों के चयनित अंश
Newspapers Clippings

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

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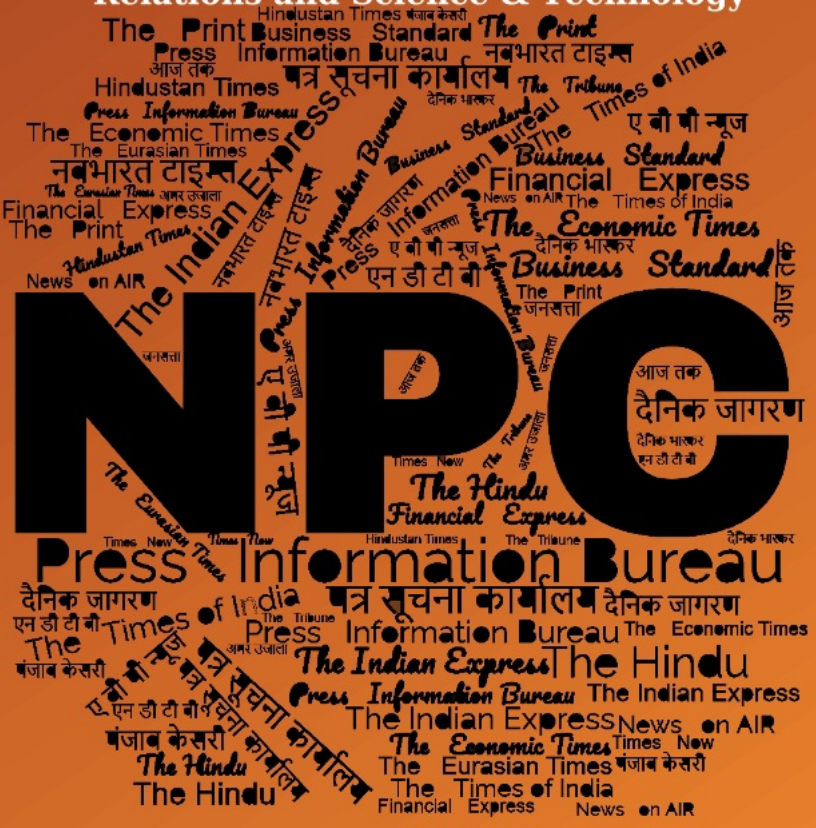

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THE ECONOMIC TIMES

Tue, 26 Nov 2024

Russia fulfilling all contractual obligations on S400 missile defence system: Deputy FM

Military-technical cooperation with Russia will play an important role in modernizing and re-equipping the Indian armed forces, Russia's Deputy Foreign Minister, Andrey Rudenko, has recently said.

"In general, India is our time-tested, reliable partner, we sincerely value our friendship and seek to exclusively strengthen it in the future. Russian-Indian military-technical cooperation has a long history, it is based on deep mutual trust and is not subject to foreign policy considerations. The Indian leadership views it as an important factor in ensuring the required level of combat readiness of the national armed forces, solving the problems of their modernization and re-equipment," Rudenko told state-run news agency TASS.

Asked about the supply of Russian S-400 anti-aircraft missile systems to India, the deputy minister stressed that Moscow "strictly fulfills its contractual obligations."

"All issues that arise are resolved in close cooperation with Indian customers. Bilateral cooperation between Moscow and New Delhi in this area, including joint production of modern weapons, is developing in the interests of maintaining security and stability in the region and the world as a whole. It has never been directed against other states," the Russian Deputy Foreign Ministry noted.

https://economictimes.indiatimes.com/news/defence/russia-fulfilling-all-contractual-obligations-on-s-400-missile-defence-system-deputy-fm/articleshow/115677006.cms

THE ECONOMIC TIMES

Mon, 25 Nov 2024

Army's Kharga Corps demonstrates combat readiness with integrated field firing exercise

The Kharga Corps of the Indian Army successfully conducted a two-day integrated field firing exercise, 'Kharga Shakti', at the Mahajan Field Firing Ranges beginning Sunday. This comprehensive exercise was aimed at testing and validating the effectiveness of combined arms operations in a simulated battlefield environment, an official statement said.

Lieutenant General Rajesh Pushkar, General Officer Commanding (GOC), Kharga Corps reviewed the 'Kharga Shakti' exercise. The firing range is in Rajasthan. He witnessed the showcase of coordinated manoeuvres and integrated firing of various military assets, including attack helicopters, artillery guns, armoured and mechanised platforms, and infantry weapons.

The troops demonstrated their combat readiness through live firing drills, tactical movements and air support missions, incorporating cutting-edge technology such as swarm drones, loiter munition systems, quadcopters and logistic drones.

Lt Gen Pushkar also interacted with the troops and highlighted the Armed Forces' commitment to maintain a high state of readiness and operational excellence.

He commended the soldiers for exhibiting exceptional professional competence and expressed confidence in the Kharga Corps' ability to remain a decisive force for future operations on the western front. The 'Kharga Shakti' exercise demonstrates the Indian Army's focus on modern warfare techniques and its commitment to ensure the highest standards of combat readiness, he added.

https://economictimes.indiatimes.com/news/defence/armys-kharga-corps-demonstrates-combat-readiness-with-integrated-field-firing-exercise/articleshow/115662806.cms

THE NEW INDIAN EXPRESS

Mon, 25 Nov 2024

24 naval ships and 40 aircraft to participate in Indian Navy's Op Demo in Puri, Odisha

The Indian Navy's 'Operational Demonstration' will take place at Blue Flag Beach in Puri on the occasion of Navy Day--December 4--to recognise the achievements and role of the Indian Navy in safeguarding the country. At least 24 warships and 40 aircraft including helicopters and fighter jets

will demonstrate the Navy's maritime capabilities and operational strength through aerial maneuvers and other exercises.

The Op Demo will highlight the Navy's diverse abilities and promote maritime awareness amongst the public in Odisha. President Droupadi Murmu will attend the event, which will be organised between 4 pm and 6.30 pm and conclude with a spectacular laser show.

The Ministry of Defence said the Op Demo will be held against the backdrop of the pristine Blue Flag Beach and it will symbolise the connection between the Indian Navy and the maritime legacy of Odisha. The Indian Navy is working closely with the Odisha Government and local authorities to ensure the smooth execution of the event.

Arrangements will be made to accommodate local spectators and tourists in a bid to offer everyone a chance to witness the demonstration from the beach, it said.

Sources said the Indian Navy has invited about 7,500 guests to attend the event and sitting arrangements will be made for them. While addressing the mediapersons on Monday, DGP YB Khurania informed the full-dress rehearsals for the Op Demo will be held on December 2 and 3.

"At least 40 sectors will be set up at the Blue Flag beach for the visitors where they can witness the capabilities of the Indian Navy's naval ships and aircraft," said Khurania.

Odisha Police have made tight security arrangements and about 80 platoons of police force along with 300 officers will be deployed in Puri to ensure the event passes off smoothly. The entire town will be under CCTV surveillance to maintain law and order. Police will also keep a close watch on the vehicular movement between Bhubaneswar and Puri on December 4 to make certain there are no traffic snarls on the highway.

https://www.newindianexpress.com/business/2024/Nov/26/rbi-governor-shaktikanta-das-hospitalised-in-chennai-condition-stable

Business Standard

Mon, 25 Nov 2024

Coast Guard to conduct 'SAREX 24' in Kochi from Nov 27-30 under NMSAR Board

The Indian Cast Guard will conduct National Maritime Search and Rescue Exercises & Workshop (SAREX-24) under the aegis of NMSAR Board at Kochi from November 27 to 30, according to an official press statement.

This workshop will be conducted with imperatives to validate the National M-SAR construct through 'all-inclusive' and 'collaborative' approach.

The release added, taking cognizance of the vast 4.6 Million Sq Kms of Indian Search and Rescue Region (ISRR) bestowed to India, Indian Cast Guard has been a proponent of cooperative

engagements not only with the resource agencies but also with littorals and friendly foreign countries.

Response operation to large scale contingencies at sea, termed as 'Mass Rescue Operation' (MRO) will be the essence of 11th edition of SAREX-24.

The theme of the exercise will be "Enhancing Search and Rescue capabilities through Regional collaboration" to signify ICG's commitment and resolute to provide succor during large scale contingencies regardless of location, Nationality or circumstances in the ISRR and beyond.

The two-day event will be inaugurated by Rajesh Kumar Singh, IAS, Defence Secretary in presence of Director General S Paramesh, PTM, TM, Director General, Indian Coast Guard who is also the National Maritime Search and Rescue Coordinating Authority.

On the first day of the event, on November 28, various programmes including Table Top exercise, Workshop, Seminars etc involving participation of senior officials from the government agencies, ministries and armed forces, various stake holders and Ffreign delegates will be conducted.

On second day of the event, the Sea exercise involving two large scale contingencies will be carried out off Kochi coast with participation of ships and aircraft of Indian Coast Guard, Navy, Indian Air Force, Passenger Vessel and Tug from Cochin Port Authority and boats from the Customs.

The first contingency will simulate distress onboard a passenger vessel having 500 passengers onboard, whereas, the second scenario will depict ditching of civil aircraft with 200 passengers. The response matrix in the sea exercise will involve various methodology to evacuate distressed passengers wherein the advent of new-age technology using satellite aided distress beacons, Drones to deploy a life buoy, air droppable life rafts, operation of remote controlled life buoy etc will be demonstrated, the release added.

The exercise is designed not only to evaluate efficiency of operations and coordination with national stakeholders but also to aptly focus on cooperative engagements with the littorals and Friendly Foreign Countries (FFCs).

https://www.business-standard.com/external-affairs-defence-security/news/coast-guard-to-conduct-sarex-24-in-kochi-from-nov-27-30-under-nmsar-board-124112500591_1.html

Business Standard

Mon, 25 Nov 2024

China outpaces India in nuclear aircraft carrier race with new breakthrough

China appears to be advancing its plans for a nuclear-powered aircraft carrier, a South China Morning Post report from Sunday indicated, citing reports of a prototype nuclear reactor sparking renewed attention on Beijing's aspirations to project naval power globally.

What about India's aircraft carrier plans?

Unlike conventional carriers, nuclear-powered ones can operate for extended periods without refuelling, providing them with greater range and the capacity to carry more fuel and weapons for their aircraft.

What do we know about China's prototype nuclear reactor?

On November 11, the Associated Press reported that a prototype reactor for a large surface warship had been constructed at a mountain site near Leshan in Sichuan province. Research, conducted by the Middlebury Institute of International Studies in California and provided to the news agency, suggested that China's 701 Institute, which oversees aircraft carrier development, had acquired reactor equipment "intended for installation on a large surface warship".

This conclusion was drawn from publicly accessible documents, including an environmental impact report identifying the project as "national defence-related", and satellite imagery captured between 2020 and 2023 that showed the development of reactor-related facilities. Currently, the United States (US) operates 11 nuclear-powered carriers, while France has one, the Charles de Gaulle.

China's ambitions for a nuclear-powered aircraft carrier have long been speculated upon, with many seeing it as a critical step towards equipping the People's Liberation Army (PLA) Navy with blue-water capabilities. The *Associated Press* report may be the clearest indication yet that Beijing is pursuing this goal.

What about India's aircraft carrier plans?

This comes as India continues to counter Beijing's growing military presence in the Indian Ocean, a concern expected to persist despite the recent thaw in relations following the October Line of Actual Control (LAC) patrolling agreement.

In May, Defence Minister Rajnath Singh announced that India would soon begin constructing its third aircraft carrier. Singh made these remarks in reference to the pending Indian Navy proposal to construct another indigenous aircraft carrier of the same size as the INS Vikrant, which weighs 45,000 tonnes and was commissioned in September 2022.

Currently, the Indian Navy operates two 45,000-tonne aircraft carriers: the INS Vikramaditya and the INS Vikrant. Both are conventionally powered and utilise ski-jump ramps to assist with aircraft take-offs. The INS Vikrant, India's first indigenous carrier, was constructed by Cochin Shipyard Ltd, while the INS Vikramaditya was acquired from Russia and has been operational since 2014.

These carriers can each accommodate 25-30 fixed-wing aircraft along with 10 helicopters. Given that the proposed third aircraft carrier will match the size of the INS Vikrant, it is expected to have a similar air wing capacity.

India had earlier considered building a 65,000-tonne third carrier, the Indigenous Aircraft Carrier-2 (IAC-2), with a projected air wing of 54 fighters. Discussions had also included the possibility of equipping the ship with nuclear propulsion and electromagnetic catapults. However, the current plans strongly suggest that India’s third carrier will be conventionally powered.

What are the capabilities of nuclear-powered carriers?

If realised, a nuclear-powered carrier would enable the PLA Navy to carry out "smooth deepwater aircraft operations", Yoon Suk-joon, a senior fellow at the Korea Institute for Military Affairs and an expert on Chinese naval systems, told the South China Morning Post.

Yoon noted that nuclear propulsion not only allows sufficient operating speed unaffected by sea conditions and ample power supply, but also ensures the safety of aircraft take-off and landing systems. This, he added, would provide the Chinese navy with the confidence to keep its carriers operational in open seas.

He explained that nuclear power could enable speeds of up to 30 knots, or 55 kilometres per hour (km/h), enhancing the efficiency of advanced aircraft launch systems. Collin Koh, a senior fellow at the S Rajaratnam School of International Studies in Singapore, reportedly highlighted the potential for such carriers to undertake "global voyages" without frequent refuelling. "We are not just looking at the Chinese operating the carrier just within the region," Koh observed.

He speculated that such a reactor would likely be intended exclusively for use on carriers, emphasising the "long-term Chinese ambition" it represents. While such vessels could play a critical role in flashpoints like the South China Sea and Taiwan Strait, Koh noted their likely deployment on a broader scale, starting with the Indian Ocean. He also pointed out that China's first overseas military base in Djibouti on the Horn of Africa is large enough to host an aircraft carrier.

What do we know about China's rapid naval modernisation?

The PLA Navy, already the largest in the world, aims to operate six carriers by 2035 as part of its aggressive modernisation drive. Its newest and third carrier, the Fujian, is undergoing sea trials and is the first non-US carrier to feature an advanced electromagnetic catapult launch system, which allows for higher-frequency aircraft launches.

According to Koh, China's carrier programme is evolving rapidly, with the Fujian's successor – referred to as the Type 004 – expected to be of a similar or larger size. Should the reactor project prove successful, future Chinese carriers "will all be nuclear-powered", he reportedly added. In March, Yuan Huazhi, political commissar for the PLA Navy, confirmed that work on a fourth carrier was in progress, with an announcement on whether it would feature nuclear propulsion expected "soon".

What are the strategic implications?

Alex Bristow, senior analyst at the Australian Strategic Policy Institute, told the South China Morning Post that nuclear-powered carriers would solidify the PLA Navy's status as a "first-tier" rival to the US Navy.

While noting that an aircraft carrier's chances of survival in a major US-China conflict were "debatable", Bristow said that they could still play an important role in other scenarios, enabling Beijing to signal strength and exert force, particularly against weaker adversaries.

https://www.business-standard.com/external-affairs-defence-security/news/china-outpaces-india-in-nuclear-aircraft-carrier-race-with-new-breakthrough-124112500654_1.html

THE WEEK

Mon, 25 Nov 2024

Indian Army sets up radio station in Ladakh's Hanle

Northern Army Commander, Lieutenant General M.V. Suchindra Kumar on Monday inaugurated a community radio station set up by the force in Hanle village in Ladakh.

Taking to X, the Northern Command wrote, "Lt Gen M.V. Suchindra Kumar, Army Commander, Northern Command, along with the GOC, Fire & Fury Corps, inaugurated the community radio station at Hanle, Ladakh."

Hanle comprises six hamlets: Bhok, Dhado, Punguk, Khuldo, Naga, and a Tibetan refugee settlement.

The Indian Army operates community radio stations in remote regions of Jammu and Kashmir and Ladakh, the tweet said.

The Army has already set up several community radio stations across the Union Territories of Jammu and Kashmir and Ladakh. These include Drass, Karu, Leh and Baramulla in Ladakh and Pir Panjal region in J-K. Managed by local RJs, these stations offer entertainment and regional content based on local interests to the residents.

"In the remotest and coldest region, locals will tune into the community radio station established by the Dhruva Command," an officer said.

Hanle, located at an altitude of 4,300 metres, is home to the Major Atmospheric Cherenkov Experiment (MACE) observatory, the world's highest-imaging Cherenkov telescope.

https://www.theweek.in/news/defence/2024/11/25/indian-army-sets-up-radio-station-in-ladakhs-hanle.html

THE WEEK

Mon, 25 Nov 2024

LCA Tejas updates: Integration testing of India-made actuators begins

In what comes as another major leap for self-reliance in defence sector, the integration testing of indigenous actuators of Light Combat Aircraft (LCA) Tejas has begun at the national Iron Bird facility of HAL's Aircraft Research and Design Centre (ARDC) in Bengaluru.

According to leading defence and aerospace journalist Anantha Krishnan M, the time and frequency domain to test the integrity of the digital flight control computer (DFCC) with the flight control system (FCS) actuators, and the flight control software version of DFCC under test will be

certified by Centre for Military Airworthiness & Certification (CEMILAC), a regulatory body under DRDO.

Integration testing of actuators involves verifying that different actuator systems work together as intended within a larger system. The process is important for ensuring that the actuators communicate effectively with other components of the aircraft, perform reliably under various conditions, and meet the specified operational requirements.

According to the report, the integration testing will lead to developmental flight testing of the DFCC along with a pair of elevon actuators on a Limited Series Production (LSP) version of the LCA-Tejas.

Although currently the primary actuators are manufactured by M/s Moog Inc, USA, indigenisation efforts are underway with Vikram Sarabhai Space Centre (VSSC) in Kerala's Thiruvananthapuram.

"Initially there was a plan to fit in all 13 indigenous actuators (6 slat actuators, 2 airbrake actuators, 4 elevon actuators and 1 rudder actuator) on to the first LCA Mk.1A aircraft. But somehow the developmental testing, type certification and production flight of primary actuators had taken the backseat though these actuators outperform the Moog actuators on various parameters and the cost of these actuators is almost one fourth as compared to the imported ones," an HAL official told the senior journalist.

https://www.theweek.in/news/defence/2024/11/25/lca-tejas-updates-integration-testing-of-india-made-actuators-begins.html

THE WEEK

Mon, 25 Nov 2024

Is Oreshnik the end of missile defence as we know it? Expert claims no defense systems in the world can counter Russia's missile

The Oreshnik, Russia's new intermediate-range ballistic missile, cannot be intercepted by any of the existing missile defense systems in the world, a leading missile technology expert claimed.

According to media reports, Theodore Postol, a US missile technology expert and retired MIT Professor Emeritus of Science, Technology, and National Security Policy, rubbished the claims that defense systems like Aegis Ballistic Missile Defense System, Aegis Ashore, THAAD, Patriot, or Iron Dome can counter Oreshnik, which means hazel tree in Russian.

He seemed to echo the claims of Russian President Vladimir Putin, who in a TV address, had claimed that "there are currently no ways of counteracting this weapon". Putin had made the statement after Russia fired the intermediate-range ballistic missile in response to Kyiv's use of the US and British longer-range missiles capable of striking deeper into Russian territory.

Classified as a hypersonic missile, capable of traveling at speeds exceeding Mach 5 and has the ability to maneuver mid-flight, Oreshnik, which can carry multiple independently guided warheads, has a reported range of 2,500-3,000km.

According to Postol who claims that Oreshnik is a very advanced system that uses very advanced technology, "There is nothing available that can engage that system and offer any meaningful defense against it."

He dismissed claims that Oreshnik system represents previous outdated developments in Russia, and said people who make such claims have no idea what they are talking about. "My guess is these statements are all being made by political people who don't know one rocket from another," news agency TASS quoted him as saying.

According to him, missile defense systems like Aegis, THAAD, Patriot, and Iron Dome are "are fundamentally flawed in their concept" and so they "can't even defend against a standard ballistic missile, let alone something as sophisticated as this Oreshnik system."

https://www.theweek.in/news/defence/2024/11/25/is-oreshnik-the-end-of-missile-defence-as-we-know-it-expert-claims-no-defense-systems-in-the-world-can-counter-russias-missile.html

THE WEEK

Mon, 25 Nov 2024

In an 'Atma Nirbhar Bharat' milestone, Indian Army gets revolutionary tech to extend tank engine life and cut fuel use

In what has been hailed as a significant step towards Atma Nirbhar Bharat, system solution oriented R& D enterprise Aartech Solonics Ltd announced that it has developed the Adaptive Alternate Power Module (AAPM), an indigenous innovation for Armored Fighting Vehicles (AFVs) and guns, including the K9 Vajra. This is designed to provide regulated DC power to tanks and guns based on the desired load, eliminating the need to switch on the main engine.

Aartech Solonics, in collaboration with Manmeet Singh Soni of Sudarshan Chakra Corps (EME) and IIT Mumbai, on Monday, announced the development of the AAPM.

According to a company statement, this breakthrough technology extends engine life, reduces fuel consumption, and enhances operational efficiency in extreme conditions.

AAPM, jointly developed and tested by Aartech Solonics and the Indian Army, and validated by IIT Mumbai, supplies power without running the main engine, preserving up to 20 per cent of engine life typically consumed during gun-firing operations. It operates seamlessly from +60C to -30C, making it ideal for both the scorching deserts and the freezing Himalayan heights.

https://www.theweek.in/news/defence/2024/11/25/in-an-atma-nirbhar-bharat-milestone-indian-army-gets-revolutionary-tech-to-extend-tank-engine-life-and-cut-fuel-use.html

Mon, 25 Nov 2024

चीनी वैज्ञानिकों का दावा, Death Star से प्रेरित होकर बनाया बीम वेपन... जानिए क्या चीज है ये

China ने दावा किया है कि उन्होंने स्टार वॉर्स (Star Wars) मूवी के डेथ स्टार (Death Star) से प्रेरित होकर बीम वेपन (Beam Weapon) बनाया है. अब जिन्होंने स्टार वार्स फिल्म नहीं देखी उन्हें कैसे पता चलेगा कि ये किस तरह का हथियार है? आइए आपको बताते हैं... फिल्म में दिखाया गया है कि कैसे आठ अलग-अलग लेजर बीम यानी किरणों को जोड़कर एक किरण बनाई जाती है. फिर इस किरण से दुश्मन की ओर हमला किया जाता है. इस सुपर पावरफुल किरण से पूरा का पूरा प्लैनेट तबाह हो जाता है. इस किरण को फेंकने वाला डेथ स्टार पूरे के पूरे अल्डेरान को खत्म कर देता है. तबाह कर देता है.

चीनी वैज्ञानिकों का दावा है कि उन्होंने ऐसा हथियार बनाया है जो कई हाई-पावर इलेक्ट्रोमैग्निक किरणों को जोड़कर एक नए तरह की माइक्रोवेव किरण बना सकते हैं. इससे दुश्मन की ओर टारगेट कर सकते हैं. माइक्रोवेव को छोड़ने के लिए मशीने हैं. जिन्हें अलग-अलग तरह की गाड़ियों पर तैनात किया गया है.

अलग-अलग गाड़ियों पर सवार माइक्रोवेव इमिटर

ये गाड़ियां अलग-अलग लोकेशन से ताकतवर माइक्रोवेव किरणें छोड़ती हैं. फिर इन किरणों को बेहद अधिक सटीकता और सिंक्रोनाइजेशन के साथ जोड़ा जाता है. फिर उसे दुश्मन की ओर फेंक दिया जाता है. इस तकनीक को मैनेज करना बेहद मुश्किल है क्योंकि माइक्रोवेव किरणों को नियंत्रित करके दुश्मन की ओर फेंकना आसान वैज्ञानिक प्रक्रिया नहीं है. यह सेकेंड के करोड़वें हिस्से में होने वाला काम है.

सटीकता का ही सारा गेम है, नहीं तो हथियार बेकार

चीन की बीडोऊ सैटेलाइटर नेविगेशन सिस्टम वैज्ञानिकों को 0.4 इंच यानी एक सेंटीमीटर की सटीक पोजिशनिंग देता है. लेकिन नए हथियार के लिए यह काफी नहीं है. इस समस्या से उबरने के लिए चीन ने लेजर-रेंजिंग ऑक्सिलरी पोजिशनिंग डिवाइसेस का इस्तेमाल किया. ताकि मिलिमीटर के स्तर पर पोजशिनिंग मिल सके.

फाइबर ऑप्टिक्स की मदद से जोड़ रहे हैं हथियार के हिस्से

फायरिंग सेकेंड के 170 वें ट्रिलियंथ हिस्से में होना चाहिए. यानी 170 लाख करोड़वें हिस्से में. इतनी सटीकता इंसानी दिमाग के हिसाब से बहुत ज्यादा है. लेकिन चीन ने दावा किया है कि उसने ऐसा कर लिया है. क्योंकि घर में मौजूद साधारण सा कंप्यूटर कोई भी सिंगल प्रोसेसिंग साइकल एक सेकेंड के 330 लाख करोड़ हिस्से में कर देता है. इस समस्या से बचने के लिए चीन के वैज्ञानिकों ने फाइबर ऑप्टिक्स की मदद ली.

लैब में तैयार किया होगा हथियार, जंग में उतारना मुश्किल

माइक्रोवेव किरणें ज्यादा दूरी के लिए सफल नहीं हो सकती हैं. क्योंकि इन्हें धूल और नमी छितरा देती हैं. इन्हें एक सीधी रेखा में कहीं पहुंचाने के लिए इनकी ताकत बढ़ानी होती है. लेकिन ऐसा करने के लिए बहुत ही ज्यादा

ताकतवर लॉजिस्टिक सपोर्ट चाहिए. बड़े और सटीक यंत्र चाहिए. हो सकता है चीन ने एक नियंत्रित माहौल में ऐसा हथियार बना लिया हो, लेकिन इसे जंग के मैदान में उतारना आसान नहीं होगा.

https://www.aajtak.in/science/story/china-made-death-star-inspired-beam-weapon-dskc-2105999-2024-11-25

The EurAsian Times

Tue, 26 Nov 2024

Russian Tu-160 M Strategic Bombers For Indian Air Force! A Game-Changer Or White Elephant For India?

Russia has reportedly offered India the opportunity to procure the Tu-160M strategic bombers, known as the "White Swan," which could substantially boost the IAF's aerial capabilities. Earlier, as EurAsian Times reported, former Chief of Air Force, Air Chief Marshal Arup Raha, revealed that India was very closely looking to include the Tupolev Tu-160. Russia has extensively used these strategic bombers in the war against Ukraine.

As India considers this 'reported' offer, questions arise regarding its practicality, implications for regional security, strategic deterrence, and the broader Indo-Russian defense relationship.

Background And Features

The Tupolev Tu-160, developed initially in the Soviet Union during the late 1970s, is the world's most oversized and fastest supersonic bomber. The modernized variant, the Tu-160M, incorporates significant upgrades over its predecessor. Equipped with advanced avionics, enhanced navigation systems, and state-of-the-art NK-32-02 engines, the Tu-160M is designed to improve operational efficiency and extend mission capabilities.

Each aircraft can carry up to 12 long-range cruise or nuclear missiles, enabling precision strikes far from home bases. With a remarkable range of 12,000 km without refueling and variable-sweep wings allowing flexible mission adaptation, the Tu-160M maintains supremacy as a long-distance strategic bomber. The model's design allows for high-speed, low-altitude flight and quick acceleration, granting it a unique operational profile suitable for conventional and strategic missions.

Geopolitical Aspects

The offer of the Tu-160M aligns with Russia's goal of deepening defense ties with India amid shifting global alliances. India and Russia have historically shared a strong defense partnership, which has marked extensive arms sales and technology transfers. This relationship has weathered challenges posed by India's increasing engagements with Western powers, notably the US, for defense technology.

Accepting Russia's offer could reaffirm this bilateral relationship, counterbalancing Western influence while ensuring India maintains diverse sources for its defense procurement. This diversification reduces reliance on any single country and allows India to navigate its complex strategic environment more flexibly. Additionally, the offer comes as Russia seeks to assert its position in global arms markets amid sanctions and the fallout from geopolitical conflicts. By selling advanced military equipment like the Tu-160M, Moscow reinforces its image as a provider of cutting-edge technology to key partners.

Multi-Role Fighters Vis-a-Vis Strategic Bomber

Historically, the Indian Air Force has favored multirole fighters over a dedicated strategic bomber. The potential acquisition of the Tu-160M would significantly shift India's defense posture. This addition would enhance India's capability to project power across the Indo-Pacific region and serve as a formidable deterrent amid evolving regional threats. Presently, India relies on fighters like the Sukhoi Su-30MKI and Dassault Rafale for long-range strikes. While versatile, these aircraft do not match the range and payload of the Tu-160M, which can carry nuclear-capable Kh-101 and Kh-102 cruise missiles.

Capability Enhancement

The Indo-Pacific is witnessing an intensification of geopolitical rivalries, particularly with the rise of China's military capabilities and assertive stance in territorial disputes. For India, a strategic bomber like the Tu-160M could provide enhanced reach, allowing it to strike deep into adversarial territories or support extended deterrence strategies. This would complement India's existing nuclear triad, comprising land-based missiles, submarines, and fighter-borne atomic weapons.

Regional Balance: Strategic bombers could alter the military balance regionally, compelling neighboring states to recalibrate their security strategies. For instance, though formidable, China's fleet of H-6 bombers lacks the same speed and range as the Tu-160M. Thus, India's acquisition could establish a new tier of deterrence, countering strategic depth advantages that adversaries maintain.

Cost Factor: Despite the potential benefits, the Tu-160M's high price tag poses significant budgetary implications. The need for specialized training, new infrastructure, and extensive maintenance compounds high acquisition costs. Given its size and operational demands, the IAF would have to consider adapting airbases and logistical support systems to operate and sustain such an aircraft.

Doctrinal Challenges: The bomber's survivability in contested airspace that India is likely to face is another issue for consideration. Furthermore, integrating the strategic bomber into IAF operations would require significant investments in pilot training programs and mission planning resources to optimize its use. Training specialized crews and adopting new operational doctrines may also present a challenge, as India's air force has historically not fielded heavy bombers.

Place in Priority List: Currently, the Tupolev Tu-160 may not occupy a high priority in the Indian Air Force's defense acquisition plans. India focuses primarily on enhancing its missile defense, air superiority fighters, and long-range strike capabilities through multi-role aircraft and cruise missiles. While a potent strategic asset, the Tu-160 may not align with India's current needs due to

the high cost of acquisition and maintenance and the presence of alternative means of strategic deterrence. However, its role in a long-term strategic vision could be revisited if future developments necessitate it.

The potential acquisition of the Tu-160M bomber presents India with a pivotal opportunity to enhance its strategic capabilities and solidify its position as a regional power. While the benefits of range, payload, and deterrence are substantial, India must consider the broader implications, including costs, logistics, and geopolitical messaging. If India integrates the Tu-160M into its air force, it will signify a significant milestone in its defense modernization. This decision would reinforce its strategic deterrence and strengthen Indo-Russian ties at a time when global power dynamics are in flux.

However, acquiring such a platform involves more than financial investment. India must weigh the strategic benefits against operational challenges, including the bomber's relevance in modern warfare, which increasingly favors multi-domain and network-centric approaches over traditional heavy bombardment. Ultimately, the choice will reflect India's long-term vision for its role in the regional and global security landscape.

https://www.eurasiantimes.com/russian-tu-160-m-strategic-bombers-for-indian/

THE ECONOMIC TIMES

Mon, 25 Nov 2024

Satellite images suggest North Korea expanding missile plant, researchers say

North Korea is expanding a key weapons manufacturing complex that assembles a type of short-range missile used by Russia in Ukraine, researchers at a U.S.-based think tank have concluded, based on satellite images.

The facility, known as the February 11 plant, is part of the Ryongsong Machine Complex in Hamhung, North Korea's second-largest city, on the country's east coast.

Sam Lair, a research associate at the James Martin Center for Nonproliferation Studies (CNS), located at the Middlebury Institute of International Studies at Monterey, said the plant was the only one known to produce the Hwasong-11 class of solid-fuel ballistic missiles.

Ukrainian officials say these munitions - known as the KN-23 in the West - have been used by Russian forces in their assault on Ukraine.

The expansion of the complex has not been previously reported. Both Moscow and Pyongyang have denied that North Korea has transferred weapons for Russia to use against Ukraine, which it invaded in February 2022. Russia and North Korea signed a mutual defense treaty at a summit in June and have pledged to boost their military ties.

North Korea's mission to the United Nations did not respond to a request for comment for this story. The satellite images, taken in early October by the commercial satellite firm Planet Labs, show what appears to be an additional assembly building under construction as well as a new housing facility, likely intended for workers, according to the analysis by researchers at CNS.

It also appears that Pyongyang is improving the entrances for some of the underground facilities at the complex. A disused bridge crane that was in front of a tunnel entrance, blocking easy access, was removed, suggesting they might be placing an emphasis on that part of the facility, Lair said.

"We see this as a suggestion that they're massively increasing, or they're trying to significantly increase, the throughput of this factory," Lair said.

The new assembly building is about 60 to 70 percent the size of the previous building used to assemble missiles. In 2023, state media published images, which Reuters has reviewed, showing North Korean leader Kim Jong Un walking through new buildings at the complex in Hamhung, where workers were assembling tail kits and nose cones for what appeared to be the KN-23, according to analysts.

In the past, publicly released videos from North Korean state media show that the complex has produced everything from tank wheels to the casings for rocket motors, Lair said.

Low-fly missiles

The KN-23 was first tested in May 2019, and is designed to evade missile defenses by flying on a lower, "depressed" trajectory, experts have told Reuters, making them potentially useful for Russia as it seeks ways to penetrate Ukraine's air defenses.

Russia has fired thousands of missiles since the invasion. Leaning on North Korea for additional supplies could ease the strain on its own production facilities, Lair said. North Korea's state news agency KCNA has reported that construction is underway at the Ryongsong Machine Complex.

This month, KCNA said the facility "is pushing ahead with the projects for attaining the goal for modernization planned for this year."

The work includes rebuilding production facilities as well as assembling and installing equipment at machine workshops and a steel casting workshop, it said.

Researchers at SI Analytics, a South Korean satellite imagery firm that uses AI technology to scour images, also confirmed the new construction at the February 11 plant, saying in a report on Monday that some of the construction near the loading area would likely be used to conceal the future operations of the factory from satellites.

"Considering the presence of numerous construction materials, vehicles, and open-top freight cars loaded with materials around the site, the construction appears to be progressing rapidly," the firm said.

The report said the facility was used to produce ballistic missiles, without naming the KN-23. Michael Duitsman, also a research associate at CNS, said it was possible that the new construction revealed in the satellite images could be a storage facility, but he believed it was more likely a new assembly building.

North Korean missiles account for a fraction of Russia's strikes during its war on Ukraine, but their alleged use has caused alarm in Seoul and Washington because it suggests an end of nearly two-decade consensus among U.N. Security Council permanent members on preventing Pyongyang from expanding its ballistic missile programs.

SI Analytics said on Monday it had also identified new construction at the nearby February 8 Vinalon Complex, which is believed to produce fuel for ballistic missiles. The construction may be aimed at boosting production of solid propellants or UDMH, an important liquid rocket engine fuel, the report said. Joseph Dempsey, a military analyst with London's International Institute for Strategic Studies, said that North Korea's expansion of short-range ballistic missile facilities would likely be motivated mainly by a desire to boost the country's own arsenal.

He said it was unclear to what extent Pyongyang may have expanded production capacity to meet the demands of its new cooperation with Moscow. More than 10,000 North Korean troops have been deployed to the Russian region of Kursk, where Ukraine launched a major cross-border incursion in August, according to Washington, Kyiv and Seoul.

The troops will fight as part of Russia's airborne unit and marines, with some already participating in battles in the Ukraine war, a South Korean lawmaker who sits on the parliamentary intelligence committee said on Wednesday.

Russia has not denied the involvement of North Korean troops in the war, which it has been waging in Ukraine since launching a full-scale invasion in February 2022.

https://economictimes.indiatimes.com/news/defence/satellite-images-suggest-north-korea-expanding-missile-plant-researchers-say/articleshow/115658439.cms

The EurAsian Times

Tue, 26 Nov 2024

“Invisibility Cloak” For Chinese Fighters? Scientists Claim Developing New Material To Defeat Anti-Stealth Radars

China has developed a new material that it claims could render its aircraft virtually “invisible” to anti-stealth radar systems. According to claims from Chinese media, the material, created by the National University of Defense Technology, is designed to absorb electromagnetic waves and convert them into heat, a process that may significantly reduce the aircraft’s radar visibility.

The new material is said to be able to absorb electromagnetic waves with wavelengths ranging from 2.3 feet to 0.6 feet, which covers the key frequencies of most anti-stealth radars, specifically the P-band and L-band. Chinese researchers said that laboratory tests have shown the material’s ability to effectively absorb low-frequency electromagnetic waves from various angles, with a thickness no greater than two sheets of printing paper—an achievement considered impossible until now.

Anti-stealth radars typically emit long-wavelength electromagnetic signals, which are difficult for current stealth aircraft coatings to absorb effectively due to their thinness. The report said that the new material could mark a breakthrough in overcoming this limitation, potentially offering stealth aircraft enhanced protection against radar detection.

The material is also described as lightweight, flexible, and easy to mass-produce, making it an attractive option for covering a range of military platforms. Chinese scientists believe this cost-effective material could evolve the production of stealth technologies for aircraft and other defense equipment.

This new material is based on metamaterials—structures engineered to interact with electromagnetic waves in unconventional ways. Metamaterials are known for their ability to absorb a wide range of frequencies and manipulate light and other waves at a microscopic level. Researchers used an unidentified metal to create a circuit within the material. When hit by low-frequency electromagnetic waves, the circuit creates currents that are converted into heat and dissipated into the surrounding air.

This technique reportedly allows the technology to provide ultra-wideband stealth effects without relying on heavy and costly magnetic components. While these claims are groundbreaking, independent verification is still required to assess the material's real-world effectiveness. Nonetheless, the announcement reflects China's continued push to refine its stealth capabilities and maintain a competitive edge in military aviation.

Stealth Technology And Metamaterials

Metamaterials have long fascinated scientific research and have captured the public's imagination since 2006. That year, John Pendry, a physicist at Imperial College London, introduced the concept of creating a "Harry Potter-style" invisibility cloak using specially engineered materials. Pendry's research revealed how metamaterials could bend light so that objects effectively disappear from view. This idea sparked widespread interest and laid the foundation for further exploration of these materials' potential applications.

Building on Pendry's research, David Smith, a professor of electrical and computer engineering at Duke University, co-authored the study and later developed the first working version of an invisibility cloak. Smith's cloak did not render objects invisible to visible light, but it succeeded in making them invisible to microwaves—a crucial leap forward in the study of metamaterials. Over the years, metamaterials have started to transition from laboratory experiments to real-world applications. Their ability to control electromagnetic waves has made them particularly useful in improving the performance of satellite antennas and sensors. Although these uses may not generate the same media buzz as the idea of an invisibility shield, they signal that metamaterials are moving beyond theoretical research and into everyday technologies. China, in particular, has become a leader in the field of metamaterials. The country currently holds the largest number of patents in the area, with universities and research agencies working diligently to refine these materials for use in military and civilian applications.

This includes the potential use of metamaterials to enhance aircraft stealth capabilities. In fact, Beijing has made headlines before with its metamaterial efforts. In 2021, EurAsian

Times reported that China had successfully tested metamaterial coatings on aircraft at a major military production base in Shenyang, Liaoning province, with claims that the technology could render aircraft invisible to anti-stealth radar systems.

Such developments align with China's broader strategy to enhance the capabilities of its stealth aircraft, including the J-20 and the newer J-35, which are expected to play a major role in potential conflicts, especially in scenarios involving the US. Meanwhile, in 2017, Lockheed Martin, the manufacturer of the US military's F-22 and F-35 stealth fighters, also partnered with a Canadian firm specializing in lightweight metamaterials for solar-energy applications.

While metamaterials hold great promise, experts caution that they are not yet a revolutionary breakthrough. Some skepticism remains, particularly regarding the metamaterials being developed by Chinese researchers. The research community is engaged in ongoing debate about the effectiveness of these materials. A researcher from the Chinese Academy of Sciences noted that there is no clear consensus on what defines a metamaterial, and many believe the products still have significant room for improvement.

Metamaterials are expected to continue evolving in the coming years, with applications in both the military and commercial sectors. However, their role in the development of stealth technology remains an area of intense competition and scrutiny as countries around the world race to refine and deploy these cutting-edge materials.

https://www.eurasiantimes.com/style-invisibility-china/

Science & Technology News

Press Information Bureau
Government of India

Ministry of Education

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Cabinet approves One Nation One Subscription (ONOS)

The Prime Minister in his address to the Nation from the ramparts of the Red Fort on 15th August, 2022, had pointed out the importance of Research and Development in our country in the Amrit Kaal. He had given the clarion call of "Jai Anusandhan" on the occasion.

The NEP 2020 has also identified research as a corequisite for outstanding education and development in our country.

The establishment of Anusandhan National Research Foundation by the Government of India was a step in this direction.

In response to the vision of making India Atmanirbhar and Viksitbharat@2047, the Union Cabinet approves One Nation One Subscription scheme to provide country-wide access to international high impact scholarly research articles and journal publications to students, faculty and researchers of all Higher Education Institutions managed by the central government and state governments and Research & Development Institutions of the central government.

The initiative will open a goldmine of knowledge available in top quality scholarly journals to nearly 1.8 crore students, faculty, researchers and scientists of all disciplines, including those in tier 2 and tier 3 cities, thereby encouraging core as well as interdisciplinary research in the country
A total of 30 major international journal publishers have been included in One Nation One Subscription. All of the nearly 13,000 e-journals published by these publishers will now be accessible to more than 6,300 government Higher Education Institutions and central government R&D institutions

Access to journals will be provided through a national subscription coordinated by the Information and Library Network (INFLIBNET), an autonomous inter-university centre of the University Grants Commission (UGC) through an entirely digital process

A total of almost ₹ 6,000 crore has been allocated for One Nation One Subscription for 3 calendar years, 2025, 2026 and 2027 as a new Central Sector Scheme

One Nation One Subscription is a timely step towards establishing India in the global research ecosystem by bringing ease of doing research to the doorstep of all students, faculty and researchers in the government institutions

The Union Cabinet, chaired by Prime Minister Shri Narendra Modi, has approved One Nation One Subscription, a new Central Sector Scheme for providing country-wide access to scholarly research articles and journal publication. The scheme will be administered through a simple, user friendly and fully digital process.

This will be a “One Nation One Subscription” facility for the government higher education institutions and R&D laboratories of the central government.

A total of about Rs.6,000 crore has been allocated for One Nation One Subscription for 3 calendar years, 2025, 2026 and 2027 as a new Central Sector Scheme. One Nation One Subscription will build on and further enhance the scope and reach of the range of initiatives undertaken by the Government of India over the past decade in the domains of education, for maximizing access to quality higher education for the youth of India.

This will supplement the ANRF initiative to promote research and development and foster a culture of research and innovation throughout government universities, colleges, research institutions, and R&D laboratories.

The benefits of One Nation One Subscription scheme will be provided to all Higher Educational Institutions under the management of the Central or State Government and Research & Development Institutions of the Central Government, through a national subscription coordinated by a central agency, namely the Information and Library Network (INFLIBNET), an autonomous inter-university centre of the University Grants Commission (UGC).

This list covers more than 6,300 institutions, translating into nearly 1.8 crore students, faculty and researchers, who will be able to potentially avail benefits of One Nation One Subscription.

This is in line with the goals of Viksitbharat@2047, National Education Policy (NEP) 2020 and Anusandhan National Research Foundation (ANRF). The initiative will expand access to scholarly journals to a vast diaspora of students, faculty, researchers and scientists of all disciplines, including those in tier 2 and tier 3 cities, thereby promoting core as well as interdisciplinary research in the country. The ANRF will periodically review the usage of One Nation One Subscription and publications of Indian authors of these institutions.

The Department of Higher Education will have a unified portal “One Nation One Subscription” through which the institutions will be able to access the journals. The ANRF will periodically review the usage of One Nation One Subscription and publications of Indian authors of these institutions.

The DHE and other Ministries having HEIs and R&D Institutions under their management shall be proactively conducting Information, Education and Communication (IEC) campaigns among students, faculty and researchers of these institutions about availability and method of access to One Nation One Subscription, resulting in improved usage of the facility across the country.

The State Governments will also be requested to carry out campaigns at their level for maximizing usage of the unique facility by students, faculty and researchers of all government institutions.

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Press Information Bureau
Government of India

Ministry of Science & Technology

Mon, 25 Nov 2024

DST to Announce Quantum Start-ups under National Mission on Interdisciplinary Cyber Physical Systems and National Quantum Mission

Start-ups selected for support under the newly established guidelines in Quantum Technologies will be officially unveiled by the Union Minister of State (Independent Charge) for Science and Technology, Minister of State (Independent Charge) for Earth Sciences, MoS PMO, Department of Atomic Energy, Department of Space, Personnel, Public Grievances and Pensions, Dr. Jitendra Singh at an event, scheduled for 26th November 2024.

Department of Science and Technology (DST) has established detailed guidelines to support and nurture startups in the field of quantum technologies. These comprehensive guidelines provide a structured framework for startups to access essential resources, funding opportunities, mentorship, and infrastructure support, empowering them to accelerate innovation and contribute to India’s quantum ecosystem.

The unveiling of the startups by the Union Minister, who will be the Chief Guest for the occasion will showcase India's growing prowess in quantum research, development, and commercialization.

A Call for Proposals was launched earlier this year by the I-HUB Quantum Technology Foundation, a Technology Innovation Hub (TIH) established at the Indian Institute of Science Education and Research (IISER), Pune, under the National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS). The response from start-ups across the nation showcased the increasing interest in quantum technologies and the potential for ground-breaking advancements.

The selected start-ups, representing cutting-edge innovation across diverse domains such as quantum communication, computing, sensing, and materials, were chosen through a rigorous evaluation process. These pioneering ventures are poised to contribute significantly to India’s quantum ecosystem, addressing critical technological challenges and driving economic growth.

With the growing momentum in India’s start-up ecosystem, the National Quantum Mission is dedicated to nurturing ventures in quantum technology, and propelling the nation toward world-wide excellence in this transformative field.

https://pib.gov.in/PressReleasePage.aspx?PRID=2076900

Press Information Bureau
Government of India

Ministry of Science & Technology

Mon, 25 Nov 2024

National Workshop deliberated on strengthening India's Geospatial Ecosystem

Policymakers, experts and industry leaders came together to discuss ways to advance India's geospatial sector in alignment with the National Geospatial Policy (NGP) 2022 at the National Workshop on Strengthening the Geospatial Ecosystem today at Bharat Mandapam, New Delhi. The workshop organised by the Survey of India (SoI), the National Mapping Agency under the Department of Science and Technology (DST), featured extensive discussions on key aspects of geospatial development.

"The National Geospatial Policy 2022 is not just a government initiative; it is a collective responsibility. Every citizen, every institution, and every industry have a role to play in realizing the promise of this policy. As we embrace the power of geospatial technologies, let us work together to ensure that the benefits are felt by all," said Secretary DST, Professor Abhay Karandikar.

"The focus now should be on working together, reducing duplication and cross-collaboration in Geospatial schemes. Avenues of collaborative funding should be sought out in the larger interest of the nation," said Shri Hitesh Kumar S. Makwana, Surveyor General of India. Participants explored the collaborative roles of central ministries and state governments in implementing NGP-22 to build a robust geospatial ecosystem. The event also highlighted the impact of Operation Dronagiri, launched on 13th November 2024, as a pioneering initiative leveraging geospatial technologies to address challenges in agriculture, infrastructure, transportation and livelihoods. The initiative is a step towards positioning India as a leader in geospatial innovation, driving economic growth and sectoral development through data-driven solutions.

The workshop laid special focus on the challenges and strategies for establishing a uniform and modernized National Geodetic Reference Frame to support integrated services and sustainable development. Discussions also addressed the importance of capacity development in the geospatial sector through curriculum standardization, skill-development programs and cutting-edge research initiatives.

The workshop in which Shri Manoj Joshi, Secretary Department of Land Resources and Shri Srikant Shastri, Chairman GDPDC participated, served as a significant step toward realizing the vision of NGP-22, fostering innovation, economic prosperity and technological leadership.

It reinforced India's commitment to becoming a global leader in the geospatial sector by building a collaborative ecosystem involving government, academia and the private sector.

https://pib.gov.in/PressReleasePage.aspx?PRID=2076908

THE HINDU

Tue, 26 Nov 2024

MACE in Ladakh opens its one-of-a-kind eye to cosmic gamma rays

The Major Atmospheric Cherenkov Experiment (MACE) telescope is a state-of-the-art ground-based gamma-ray telescope inaugurated in Hanle, Ladakh, on October 4. Located at around 4.3 km above sea level, it is the highest imaging Cherenkov telescope in the world. It boasts of a 21-metre-wide dish, the largest of its kind in Asia and second-largest in the world.

The facility was built by the Bhabha Atomic Research Centre, the Tata Institute of Fundamental Research, the Electronics Corporation of India Ltd., and the Indian Institute of Astrophysics.

Light comes in a wide range of wavelengths but humans can only see a small portion. In the electromagnetic spectrum, gamma rays have the shortest wavelength and the highest energy, with each light-particle possessing more than 100,000 electron volts. (Visible-light photons have around 1.63-3.26 eV each.)

A strange blue light

Gamma rays are produced by exotic energetic objects in the cosmos, including rapidly spinning pulsars, supernova explosions, hot whirlpools of matter around black holes, and gamma-ray bursts. Because of their high energy, gamma rays are a health hazard.

They can damage living cells and may even trigger deleterious mutations in DNA. Fortunately the earth’s atmosphere blocks gamma rays from reaching the ground. Thus, astronomers who want to study objects that emit gamma rays prefer using space observatories — although there are indirect techniques to detect gamma rays with very high energies from the ground.

When a gamma ray from a cosmic source enters the atmosphere, it interacts with molecules in the air to produce a copious shower of electron-positron pairs.

As these charged particles travel through the atmosphere at speeds greater than the speed of light in air, they emit a faint blue light, called Cherenkov radiation. This radiation has wavelengths typical of violet and blue light of the visible spectrum and of the ultraviolet wavelength range.

The light is emitted in about a fraction of a second, and the light-particles spread out evenly over a vast region on the earth’s surface. This region is a suitable place to locate a detector that can collect the photons and study them to indirectly understand the gamma rays. Instruments used for this kind of detection are called imaging atmospheric Cherenkov telescopes (IACTs). The MACE telescope is an IACT.

https://www.thehindu.com/sci-tech/science/mace-in-ladakh-opens-its-one-of-a-kind-eye-to-cosmic-gamma-rays/article68908565.ece

The Indian EXPRESS

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Significance of European solar mission, which ISRO will launch

The Indian Space Research Organisation (ISRO) will launch the European Space Agency's Proba-3 mission on its PSLV rocket to study the solar corona, the outermost and hottest part of the Sun's atmosphere, from Sriharikota on December 4. The mission will attempt the first-ever "precision formation flying", where two satellites will fly together and maintain a fixed configuration in space.

This is the latest solar mission in ESA's Proba suite of missions. Its predecessors Proba-1 (also launched by ISRO) and Proba-2 were launched in 2001 and 2009, respectively. Teams of scientists from Spain, Belgium, Poland, Italy and Switzerland have worked on Proba-3.

What is Proba-3?

Developed at an estimated cost of 200 million euros, Proba-3 has an expected mission life of two years. It will be launched into a highly elliptical orbit measuring around 600 x 60,530 km and have an orbital period of 19.7 hours.

The mission is designed with two satellites that will be launched together, separate from each other and then fly in tandem. They will then form a solar coronagraph, an instrument that helps block out the bright light emitted by the Sun to reveal the objects and atmosphere around it.

What will Proba-3 study?

Due to the corona's temperature, going up to 2 million degrees Fahrenheit, it is difficult for any instrument to observe it closely. However, it is important for scientific study, as all space weather and its associated turbulences — solar storms, solar winds, etc. — originate from the corona.

These phenomena influence space weather and can potentially interfere with the smooth operations of all satellite-based communications, navigation, and power grids on Earth. To study these, Proba-3 will have three instruments onboard:

- The Association of Spacecraft for Polarimetric and Imaging Investigation of the Corona of the Sun (ASPIICS) or the coronagraph. Its field of view is between the Sun's outer and inner corona, a circular belt normally observable during solar eclipse events. The instrument has a 1.4-metre diameter occulting disk mounted on it, to block the Sun's light and facilitate a close-up view of this belt.
- The Digital Absolute Radiometer (DARA) will maintain a continuous measurement of the Sun's total energy output, known as the total solar irradiance.
- The 3D Energetic Electron Spectrometer (3DEES) will measure electron fluxes as it passes through Earth's radiation belts, providing data for space weather studies.

Why is Proba-3 unique?

The two satellites — Occulter Spacecraft (weighing 200 kg) and the Coronagraph Spacecraft (weighing 340 kg) — will mimic a natural solar eclipse. They will manoeuvre precisely in Earth's orbit so that one satellite casts a shadow onto the other.

A naturally occurring solar eclipse allows solar physicists to observe and study the Sun's corona for 10 minutes, across an average of about 1.5 eclipse events per year. Proba-3 will give six hours, equivalent to 50 such events annually, which will help deepen understanding of the Sun's corona like never before. Both the Occulter and the Coronagraph will face the Sun at all times. They will maintain a formation of a few millimetres and then move to a position where they will be 150 metres for six hours at a time.

One satellite will act as a viewing telescope, kept at the centre of a shadow cast by the other satellite positioned 150 metres away. This positioning will facilitate observing the Sun's corona and will be autonomously achieved through precise flight formation. If done successfully, the Occulter will create an artificial yet stable eclipse, by masking large parts of the Sun. As a result, the Sun's blinding light will get blocked and only the solar corona will be visible to the coronagraph, which will photograph and facilitate studies of the lesser-known features.

How might India benefit?

Proba-3 is being called ESA's technology demonstration mission. The fact that ISRO has been designated to launch the mission demonstrates India's reliable space launch facilities and growing space capabilities. A cost-effective launch is also one of the highlights of the mission.

There is a strong possibility that the Indian solar physicist community will get exclusive access to the Proba-3 data. A few Indian solar physicists have also been involved in conceptualising the scientific goals of this mission along with their Belgian counterparts. Soon after the launch, India plans to host a meeting with the ESA's Proba-3 team to explore opportunities for using data from Aditya L1, India's first mission to the Sun (launched in 2023) and Proba-3 for collaborative research. This would allow Indians to work towards and contribute to newer scientific advancements related to the Sun.

https://indianexpress.com/article/explained/explained-sci-tech/significance-of-european-solar-mission-which-isro-will-launch-9690226/

THE WEEK

Mon, 25 Nov 2024

Space medicine? Here is why ISRO is focusing on microgravity for medical research

Plans are in motion at ISRO to leverage the knowledge of microgravity in medical research, to better equip astronauts. Speaking at the recently concluded Raksha Summit 2024, ISRO Chairman

S Somanath emphasised India's potential to invest in and explore the field of microgravity research, connecting it to the healthcare domain. Somanath highlighted the growing interest in medical research related to space and microgravity. He mentioned that microgravity research, which studies how things behave in extremely low-gravity environments such as space, offers immense opportunities for breakthroughs in medicine, technology, and other fields.

By fostering such partnerships, India aims to harness the unique advantages of microgravity for scientific and healthcare advancements.

How is this significant for the country and ISRO, in particular?

Microgravity is a condition where people or objects seem to be weightless. This is why astronauts and items appear to float when they are in space. However, microgravity can also be experienced in other ways beyond space environments. The term' micro' means very small, so microgravity refers to a state where gravity feels extremely weak. In this condition, astronauts can float inside their spacecraft or even during spacewalks. Even heavy objects can move around effortlessly in microgravity. For instance, astronauts can easily move equipment weighing hundreds of kilograms using just their fingertips.

"Microgravity helps scientists understand how people and equipment behave in space. It has several effects on the human body. For instance, without gravity forcing them to work, muscles and bones can become weaker over time. Astronauts living on the space station spend several months in microgravity. Similarly, astronauts travelling to Mars would spend months in microgravity during their journey to and from the planet. It is important to study the effects of microgravity to ensure astronauts stay safe and healthy during these missions," explained space expert Girish Linganna. According to NASA, many things behave differently in microgravity. For instance, fire burns in a different way, and flames become more rounded without the pull of gravity. Additionally, crystals tend to grow more effectively in microgravity. Without gravity, objects can form in more perfect shapes. These experiments allow scientists to discover things that would be difficult—or even impossible—to study on Earth.

The Department of Biotechnology and the Department of Space have joined forces through an MoU to explore biotechnology research in space. This collaboration aims to support India's Gaganyaan mission, the country's ambitious human spaceflight programme, the Somanath explained. The research could provide valuable insights and solutions to challenges faced during human space missions. The ISRO chief added that such research would enhance understanding of how the human body responds to microgravity, particularly the behaviour of body fluids. In microgravity, body fluids tend to move upwards toward the head, which can increase pressure on the eyes and potentially lead to vision problems. Without proper precautions or countermeasures, astronauts may face a higher risk of kidney stones. This is due to dehydration and the increased release of calcium from their bones in space.

Somanath also highlighted a problem with the equipment used in hospitals, noting that much of it was not made in India. Many of these technologies could be designed and manufactured locally, he said, questioning why they were not being produced in larger quantities within the country. He drew a parallel with ISRO's journey in building rockets and satellites.

ISRO looks to one more ‘made in India’ initiative

“Initially, ISRO had relied on sourcing components and materials from different suppliers and assembling them in India. Over time, the organisation collaborated with industries to localise production, converting many items such as electronic parts, alloys, materials, connectors, chemicals and adhesives into domestically made products. Today, about 90 per cent of these components are sourced from within India,” added Linganna.

The existing ecosystem now supports advanced technology sectors such as defence and aerospace. Somanath emphasised that a similar approach should be applied to healthcare, diagnostics and hospital equipment. These items could be designed and produced in large quantities to meet the demand within the country, he explained. Somanath suggested that companies could collaborate with original equipment manufacturers (OEMs) to bring manufacturing processes to India. This would enable better innovation and reduce costs, he added. He also noted the growing interest in medical research related to space and microgravity. According to him, this field holds significant potential for research in the near future.

“Microgravity research is significant because it allows scientists to explore phenomena that are otherwise obscured by gravity. For instance, in materials science, microgravity has been used to study the crystallisation of proteins and alloys, offering insights that could lead to improved drugs and more efficient manufacturing processes. In biology, experiments in microgravity can help understand how living organisms respond to weightlessness, which is important for human health during long-term space missions. Furthermore, microgravity research has the potential to help develop new technologies for Earth, such as more efficient energy systems and novel drug delivery methods,” remarked Srimathy Kesan, founder and CEO of Space Kidz India, who also became the first Indian woman to experience zero gravity aboard a commercial flight in the U.S

India has been actively pursuing research in microgravity, even though it is still in the early stages of conducting such experiments in space. In 2007, ISRO launched its first dedicated microgravity research project aboard the “Shuttle Endeavour,” which took place as part of NASA’s space shuttle mission. This marked an important step for India’s space program in contributing to global research in microgravity. Additionally, ISRO has supported various experiments in partnership with universities and research organisations, focusing on topics such as fluid dynamics, combustion, and materials science. These experiments help scientists understand how materials behave in zero gravity, offering potential breakthroughs in technology, healthcare, and industry.

While ISRO is gradually progressing in its microgravity research, zero-gravity flights conducted in the United States provide a more accessible and economical way for researchers to conduct smaller-scale experiments. These parabolic flights, often referred to as “zero gravity flights,” offer a cost-effective means for scientists to experience weightlessness for short durations. By using specially designed aircraft that fly in parabolic arcs, researchers can achieve periods of microgravity for up to 20 to 30 seconds, enabling them to conduct a variety of scientific tests and experiments. Many universities and research organisations in the US utilise these flights to explore the effects of zero gravity on biological samples, fluids, and materials.

“The increasing use of zero gravity flights in the US as a testing ground for space research is an economical way for scientists and organisations worldwide to access the unique environment of

microgravity. By utilising such flights, researchers can gather valuable data on how materials, biological organisms, and fluids react to the absence of gravity.

This research is essential for the future of human spaceflight, as it provides insights into how we can maintain human health and develop new technologies for long-term space exploration. As ISRO continues to expand its space research capabilities, the lessons learned from these smaller experiments conducted on zero gravity flights will undoubtedly inform and enhance future Indian space missions," added Kesan.

https://www.theweek.in/news/sci-tech/2024/11/25/isro-microgravity-medical-research-somanath-raksha-summit-2024.html

Mon, 25 Nov 2024

Why ISRO Is Sending Ships to Oceans for Gaganyaan's Space Mission

India's Gaganyaan unmanned mission is tentatively scheduled for March 2025-August 2025. According to internal documents accessed by News9live, the Indian Space Research Organisation (ISRO) is preparing for this milestone by deploying ships equipped with advanced tracking systems in the Pacific and North Atlantic Oceans. This mission will be a crucial step toward sending Indian astronauts into space by 2026.

Ships as Floating Observatories

The documents reveal ISRO's detailed plan to station two ships at strategic points in the Pacific and North Atlantic Oceans. These ships, equipped with state-of-the-art tracking systems such as shipborne terminals and MV-SAT antennas, will play a critical role in monitoring the spacecraft's trajectory.

The vessels will enable real-time communication with ISRO's control centers in Bengaluru, ensuring uninterrupted mission tracking.

Each ship will carry eight scientists tasked with operating the equipment daily. The North Atlantic-bound ship will begin its journey from a New York port, sailing 3,000 km (1,860 miles) to the observation point. This journey will take 13–14 days, ensuring the ship is positioned two days before the mission window begins.

What the Documents Say

The internal documents describe the "Gaganyaan G1 Mission" as a scientific experiment scheduled between March 1, 2025, and August 31, 2025. They outline ISRO's meticulous preparations, from deploying equipment to coordinating tracking activities for the three-day mission. The ships will enable hybrid communication circuits connecting them to ISRO's MOXISTRAC and SCC-ISTRAC centers, which played a vital role in the Chandrayaan-3 mission.

A Rehearsal for Human Spaceflight

The unmanned mission isn't just about sending a spacecraft into space—it's a critical rehearsal for the manned Gaganyaan mission planned for 2026. This human mission will see four astronauts orbit Earth at an altitude of 400 km (249 miles) at speeds of 28,000 kmph (17,398 mph) before splashing down in Indian waters.

The unmanned mission will test essential systems, including spacecraft integrity, life-support technologies, and communication networks. The lessons learned will directly shape the success of the manned mission.

Why Gaganyaan Matters

If successful, Gaganyaan will cement India's place among the world's elite spacefaring nations capable of human spaceflight. It also underscores India's ability to innovate and lead in advanced space exploration.

This mission is more than a technological milestone; it's a testament to the nation's determination to achieve its space ambitions.

https://www.news9live.com/science/isro-ships-ocean-tracking-gaganyaan-space-mission-2758969

Mon, 25 Nov 2024

Scientists Capture the Invisible: First-Ever Image of a Single Photon Revealed

University of Birmingham scientists have for the first time described the shape of a single photon, a development that could transform nanophotonics and quantum physics.

The finding, described in Physical Review Letters, offers new information on the behaviour of photons, or particles of light, as they are released by atoms and molecules and get entangled with other particles around them.

This discovery helps to explain the interaction of photons, particles of light, about which quantum physicists have been debating for decades. In this work, the team has not only presented a novel quantum theory and a computational model for the interactions between photons and emitters but also showed how these interactions affect the energy of the photon as it propagates into the far field.

It creates the basis for the design of compact and more advanced technologies in the fields of communication, pathogen identification, and chemical management.

Visualising the Invisible

The greatest leap forward was made in the ability to draw a picture of a photon. Finally, we can observe the phenomenon that was believed to be an idea beyond perception and beyond our reality. Dr. Benjamin Yuen, the person who led the study, noted that what they had done was to transform an intractable problem into a solvable one. The final image of a photon, he pointed out, is evidence of the accuracy and usability of their model.

Another co-author, Professor Angela Demetriadou, elaborated that the geometry and optical properties of the photon's environment define such parameters as its colour and existence probability. This complex relationship between light and the surrounding environment has deep significance for material science and quantum technology, which could revolutionise the way that photons are designed for different applications.

Designing the Future of Light-Matter Coupling

The findings hold out promising possibilities for further use. This means that through studying the physics of light and matter, it becomes possible to design better sensors, to create more effective and efficient solar cells, and to utilise new forms of quantum computing.

Most importantly, what was previously considered interference in photon interactions is now a treasure trove of relevant data. Dr. Yuen also explained that this work forms the basis for controlling lightmatter interactions as a means to design future nanophotonic systems.

With this enhanced understanding of photon dynamics, scientists are on the cusp of several breakthroughs ranging from creating more secure means of communication to developing precision medicine and redesigning molecules. This achievement is a step towards the realisation of the unexplored opportunities offered by light in basic research as well as in application.

https://www.news9live.com/science/scientists-capture-the-invisible-first-ever-image-of-a-single-photon-revealed-2758630