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समाचार पत्रों से चयनित अंश
Newspapers Clippings

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

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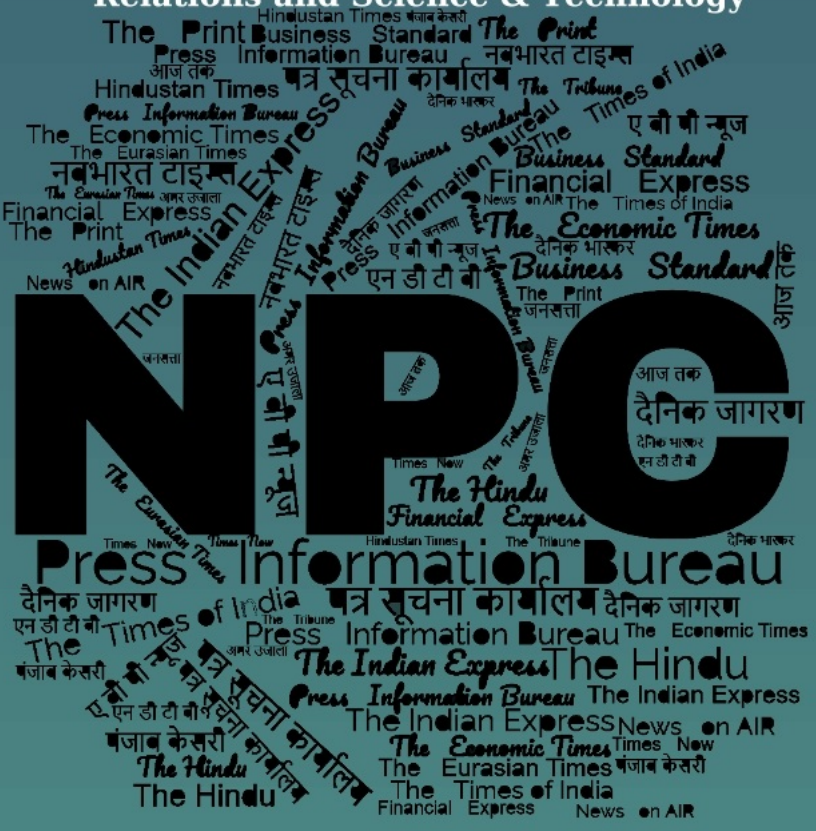

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DRDO News

Wed, 25 Dec 2024

क्या ब्रह्मोस के बाद अब भारत 'प्रलय' मिसाइल का करेगा निर्यात, कितना खतरनाक है इसका ट्विन-लॉन्चर?

भारत की रक्षा अनुसंधान और विकास संगठन (DRDO) जल्द ही अपनी प्रलय टैक्टिकल बैलिस्टिक मिसाइल के निर्यात संस्करण का परीक्षण कर सकती है. इस मिसाइल की रेंज को 290 किमी तक सीमित किया गया है, ताकि यह मिसाइल टेक्नोलॉजी कंट्रोल रिजीम (MTCR) के दिशा–निर्देशों का पालन कर सके. यह बदलाव भारत की बढ़ती रक्षा निर्यात क्षमताओं को ध्यान में रखकर किया गया है. खास बात यह है कि आर्मेनिया इस उन्नत मिसाइल प्रणाली के संभावित ग्राहक के रूप में उभरा है.

अभी प्रलय मिसाइल 150 से 500 किमी तक की रेंज में संचालित होती है, जो इसे सामरिक युद्धक्षेत्र में बेहद प्रभावी बनाती है. हालांकि, अंतरराष्ट्रीय दिशा–निर्देशों और गैर–MTCR देशों को निर्यात की सुविधा के लिए, इसकी रेंज को 290 किमी तक सीमित किया गया है. यह बदलाव विश्व स्तर पर और हथियारों के निर्यात के नियमों का पालन करने के लिए गए. हालांकि उससे भी मिसाइल की ऑपरेशनल क्षमता बनी रहेगी.

आर्मेनिया जो अपने रक्षा क्षमताओं को आधुनिक बना रहा है, उसने भारत की स्वदेशी प्रलय मिसाइल प्रणाली में दिलचस्पी दिखाई है. यह मिसाइल एक हाई कैपेसिटी के साथ लक्ष्य पर प्रहार करने में सक्षम है. जो इसे उन देशों के लिए एक बेहतरीन विकल्प बनाता है जो एडवांस, भरोसेमंद और दमदार हथियार और मिसाइल सिस्टम की तलाश में हैं. आर्मेनिया की रुचि भारत की स्वदेशी रक्षा तकनीकों के बढ़ते वैश्विक महत्व को दर्शाती है.

प्रलय मिसाइल का ट्विन–लॉन्चर कॉन्फ़िगरेशन

डीआरडीओ ने प्रलय मिसाइल के लिए ट्विन–लॉन्चर कॉन्फ़िगरेशन का परीक्षण करने की भी तैयारी कर ली है. यह अपग्रेड एक ही लॉन्चर पर दो प्रलय मिसाइलों को ले जाने और दागने की शक्ति देगा, जिससे युद्धक्षेत्र में फॉर्स का मूवमेंट और एक्शन दोनों ही आसान होगा और इससे दुश्मन के खिलाफ ऑपरेशन करने में आसानी होगी. प्रलय के शुरुआती परीक्षणों में लॉन्चर एक बार में केवल एक मिसाइल ले जा सकता था, लेकिन आने वाले समय में परीक्षणों में ट्विन–लॉन्चर सेटअप की क्षमताओं से इजाफा किया जाएगा.

ट्विन–लॉन्चर कॉन्फ़िगरेशन प्रलय सिस्टम को निर्यात ग्राहकों के लिए और भी दिलचस्प बनाएगा. यह हाई स्पीड वाले युद्धक्षेत्र में तुरंत और प्रभावी हमला करने की क्षमता प्रदान करेगा. जिससे यह सिस्टम सामरिक ऑपरेशनों में बेहद जरूरी होगा. प्रलय मिसाइल का यह नया संस्करण भारत को दुनिया के रक्षा बाजार में एक प्रमुख खिलाड़ी के रूप में स्थापित करेगा और भारत की स्वदेशी रक्षा तकनीक की क्षमताओं को और अधिक बढ़ावा देगा.

प्रलय मिसाइल की परिचालन क्षमताएं

प्रलय मिसाइल तेज सटीकता और तुंरत तैनाती के लिए डिज़ाइन की गई है. यह कई प्रकार के वॉरहेड्स ले जाने में सक्षम है, जिससे यह अलग–अलग मिशन प्रोफाइल के लिए अनुकूल है. इसका सॉलिड–प्रोपेलेंट सिस्टम इसे तुरंत तैयार रहने में सक्षम बनाता है, और इसकी उच्च गतिशीलता इसे दुश्मन के इंटरसेप्ट से बचाती है.

निर्यात संस्करण और घरेलू उपयोग में संतुलन

जहां सीमित रेंज वाला संस्करण निर्यात के लिए तैयार किया जा रहा है, वहीं 500 किमी की फूल रेंज वाली घरेलू प्रलय मिसाइल भारतीय सशस्त्र बलों के लिए डिजाइन की गई है. यह विशेष रूप से विवादित सीमा क्षेत्रों में रणनीतिक लक्ष्यों पर सटीक हमले करने की भारत की क्षमता को बढ़ाती है. यानी इसका इस्तेमाल जरूरत पड़ने पर LoC और LAC कहीं भी किसी भी मौसम और किसी भी टेंप्रेचर में किया जा सकता है.

भारतीय सेना का प्रलय मिसाइल को लेकर प्लान

इंडियन आर्मी साल 2026 से प्रलय बैलिस्टिक मिसाइलों की तैनाती की तैयारी में है. 150 से 500 किलोमीटर की दूरी तक मार करने वाली ये मिसाइलें पाकिस्तान से बॉर्डर के पास LOC और LAC के पास और चीन से सटी वास्तविक नियंत्रण रेखा पर तैनात की जाएंगी. प्रलय मिसाइलों को खासतौर से सीमाओं पर पड़ोसी देश की चालबाजियों का मुंहतोड़ जवाब देने के लिए डिजाइन किया गया है. प्रलय मिसाइल को 2022 में भारतीय वायुसेना के लिए मंजूरी दी गई थी. इसके बाद, अप्रैल 2023 में इसके दो यूनिट्स को भी मंजूरी मिली. अब, भारतीय सेना भी इसे अपनी रॉकेट फोर्स में शामिल करने की तैयारी कर रही है.

प्रलय मिसाइल की खासियत यह है कि यह दुश्मन के ठिकानों को आसानी से नष्ट कर सकती है. इसकी कम दूरी की वजह से यह बहुत जल्दी दुश्मन के बेस, बंकर, तोपों और हथियार डिपो को तबाह कर सकती है. दिसंबर 2021 में इसे 24 घंटे के भीतर दो बार सफलतापूर्वक टेस्ट किया गया था. वहीं नवंबर 2023 में ओडिशा तट पर अब्दुल कलाम द्वीप से भी प्रलय का परीक्षण किया था. इस मिसाइल की तैनाती चीन और पाकिस्तान के सीमावर्ती इलाकों में की जाएगी.

प्रलय एक SHORT–रेंज बैलिस्टिक मिसाइल है

प्रलय मिसाइल की सटीकता और रफ्तार इसे सबसे घातक बनाती है. इसका वजन करीब 5 टन है और यह 500 से 1000 किलोग्राम तक के पारंपरिक हथियार ले जाने में सक्षम है. यह मिसाइल तीन तकनीकों पर आधारित है– प्रहार, पृथ्वी–2 और पृथ्वी–3. इसकी तेज रफ्तार इसे और भी ज्यादा खतरनाक बनाती है.

प्रलय मिसाइल रात के समय भी हमले करने में सक्षम है. यह क्षमता इसे दुश्मन के लिए और भी अधिक घातक बनाती है. इसमें लगे इन्फ्रारेड या थर्मल स्कैनर की मदद से यह रात में भी सटीक हमले कर सकती है. यह मिसाइल इन्शियल गाइडेंस सिस्टम पर चलती है और इसका ईंधन सॉलिड प्रोपेलेंट है. प्रलय मिसाइल भारत की स्वदेशी तकनीक से विकसित की गई एक SHORT–रेंज बैलिस्टिक मिसाइल (SRBM) है.

प्रलय मिसाइल की खासियत:

- रेंज: 150–500 किमी
- पेलोड: 1000 किग्रा
- ऊंचाई: 30–50 किमी

- गति: मैक 5 (5 गुना ध्वनि की गति)
- मार्गदर्शन प्रणाली: इनर्शियल गाइडेंस सिस्टम

प्रलय मिसाइल का उद्देश्य:

- सैन्य ठिकानों पर हमला
- दुश्मन के बुनियादी ढांचे पर हमला
- युद्ध के मैदान में दुश्मन की सेना पर हमला

प्रलय मिसाइल के फायदे:

- स्वदेशी तकनीक
- कम लागत
- उच्च सटीकता
- तेजी से मार्गदर्शन

भारत की स्वदेशी मिसाइलों की गूंज विदेशों तक पहुंच रही है. भारत इन मिसाइलों को अर्मेनिया को भी निर्यात कर सकता है. सूत्रों के अनुसार आर्मेनिया ने प्रलय मिसाइलों की खरीदारी में दिलचस्पी दिखाई है, जिस पर बातचीत जारी है.

https://www.tv9hindi.com/india/will-india-export-pralaya-missile-know-how-dangerous-is-its-twin-launcher-features-advantages-drdo-3020619.html

ET Manufacturing

Tue, 24 Dec 2024

Kaveri engine approved for inflight testing: A breakthrough in Indian aerospace

India's Gas Turbine Research Establishment (GTRE), part of the Defence Research and Development Organisation (DRDO), announced the Kaveri engine's clearance for inflight testing on December 23, 2024. This signifies a major step for India's self-reliance in aero-engine technology, particularly for unmanned aerial vehicles (UAVs) like the Ghatak stealth UCAV program.

The Kaveri engine, initially planned for the Tejas Light Combat Aircraft (LCA), faced setbacks and was decertified. However, DRDO continued development, focusing on a dry version for UAVs. After rigorous testing, including high-altitude simulations in Russia, the engine is ready for real-world evaluation on a flying test bed (FTB). This achievement reduces India's reliance on foreign engine suppliers and supports its aerospace ambitions. Challenges remain, including

proving the engine's endurance and efficiency in extended flight tests. DRDO and GTRE aim to refine the engine further with the planned Kaveri 2.0.

The Kaveri engine project began in the late 1980s with the goal of powering the Light Combat Aircraft (LCA) Tejas. Technical challenges led to its decertification for the LCA. The DRDO shifted focus to developing a dry version of the Kaveri engine suitable for UAV applications. This version has now received clearance for inflight testing. The Kaveri engine has undergone extensive ground testing, modifications, and enhancements over the years. It has been tested in high-altitude simulations in Russia and ground trials in India. These tests demonstrated promising results in reliability, thrust output, and operational stability, meeting the required performance metrics for inflight testing.

“This clearance is not just a technical achievement but also a strategic one, enhancing India’s path towards self-reliance in aero-engine technology.”

The current dry version of the Kaveri engine produces approximately 49-51 kN of thrust. This thrust level is suitable for UAV applications like the Ghatak, India's stealth UCAV program. The DRDO plans to integrate an afterburner to increase the thrust to 73-75 kN for more demanding scenarios.

In 2018, the Kaveri engine passed a Safran audit, indicating it had reached a maturity level suitable for aircraft integration, although on a limited scale. The next phase involves mounting the engine on a flying test bed (FTB). This will evaluate the engine’s performance in various flight conditions. Testing will also assess its integration with aircraft systems and overall reliability in dynamic environments. “It signifies a reduction in dependence on foreign engine suppliers, which is critical for India’s defense strategy and its broader aerospace industry ambitions.”

This development marks a significant advancement in India’s indigenous aerospace capabilities. The clearance for inflight testing represents a crucial step towards self-reliance in aero-engine technology, a key aspect of India’s defense strategy. It also reduces India’s dependence on foreign suppliers, which is crucial for its broader aerospace industry ambitions. “While this is a milestone, challenges remain. The engine must prove its endurance, efficiency, and adaptability over extended inflight tests.”

While this clearance is a major milestone, challenges still lie ahead. The Kaveri engine must demonstrate its endurance, efficiency, and adaptability during extended inflight tests. The DRDO and GTRE are committed to further refining the Kaveri engine. Plans include developing a Kaveri 2.0 with the potential to match or surpass the thrust of engines currently used by the Indian Air Force.

The December 23, 2024 announcement comes from the GTRE, under the DRDO, as reported by AFI. The article was published with the categories tag only. The DRDO and GTRE remain dedicated to ongoing improvements and future developments for the Kaveri engine program. The eventual success of the Kaveri engine program holds significant implications for India’s self-reliance in critical defense technologies.

https://manufacturing.economictimes.indiatimes.com/news/aerospace-defence/kaveri-engine-approved-for-inflight-testing-a-breakthrough-in-indian-aerospace/116615602

Defence News

Defence Strategic: National/International

Hindustan Times

Wed, 25 Dec 2024

HAL to start trial of new Tejas fighter jet in January next year

State-run plane maker Hindustan Aeronautics Limited (HAL) is set to begin in January 2025 critical trials on the new Tejas light combat aircraft (LCA Mk-1A), involving the testing of the indigenous Astra beyond-visual-range missile, the aircraft's locally made electronic warfare suite and the Israeli Elta radar, as it now targets a March 31 deadline to deliver the first fighter jet to the Indian Air Force after completing the necessary certification requirements, senior officials aware of the matter said on Tuesday.

Simultaneously, HAL is in talks with US firm GE Aerospace to expedite the delivery of the F404 engines for the new aircraft, with top Indian officials visiting America earlier this month to get a first-hand assessment of the 404 production line that has been restarted at a facility near Boston, the officials said, asking not to be named.

GE has not committed to a delivery schedule for the 99 engines on order, but the US engine maker indicated to the Indian delegation, led by HAL chief DK Sunil, that the production issues have been resolved and the supply of the first units could begin in March 2025, HT has learnt.

The first few LCA Mk-1As are expected to be delivered to the IAF with reserve engines that will be replaced with the F404s as and when GE begins supplying them.

"The upcoming Astra missile firing, the electronic warfare suite testing and the ongoing software updates on the new systems are the final processes before HAL can deliver the first LCA Mk-1A to the IAF, which wants the aircraft to be delivered with a certain capability. The project has been plagued by some delays, but HAL has the capability and capacity to catch-up in production once the F404 engines start coming in," said one of the officials cited above. The electronic warfare suite consists of the radar warning receiver and the advanced self-protection jammer.

The first aircraft will be delivered to the IAF in the desired configuration by March 31, he added.

The IAF is concerned about the current pace of the LCA Mk-1A programme because of the possible risks a delay in the induction of new fighter planes could pose to the air force's combat

effectiveness. The air force ordered 83 Mk-1A fighters for ₹48,000 crore in February 2021 and plans to buy 97 more Mk-1As at a cost of around ₹67,000 crore.

The first aircraft was to be delivered to the IAF by March 31, 2024, but that didn't happen due to a combination of factors including delays in some key certifications and GE's inability to supply the engines on time. The US firm should have delivered six engines to HAL in the financial year 2023-24.

"GE had stopped the F404 production line at Lynn in Massachusetts a few years ago. When they restarted that production line there were some issues related to the certification of parts and components. Those issues have been fixed. HAL officials also held talks with GE's critical vendors earlier this month, and things seem to be on track now," said a second official.

To be sure, there is still no clarity on the final delivery schedule though both GE and HAL are optimistic about the early supply of engines after the latest round of talks. HAL will keep building the planes and delivering them to the IAF with Category B engines (reserve ones), which will be replaced by the F404s when they arrive.

Replacement does not take time, but the numbers that GE can deliver every year will be clear only after the first engine rolls out of the production line in Massachusetts, said the first official.

HAL has set up a new production line in Nashik for LCA Mk-1As to meet IAF's growing needs. The state-run firm says it can build 16 LCA Mk-1As every year in Bengaluru, and the Nashik line will help it ramp up production to 24 jets.

LCA Mk-1A is an advanced variant of the LCA Mk-1, which has already been inducted by the IAF. LCA is set to emerge as the cornerstone of IAF's combat power in the coming decade and beyond.

IAF, the world's fourth largest air force, is expected to operate around 350 LCAs (Mk-1, Mk-1A and the future Mk-2), with a third of those already ordered, some inducted, and the rest figuring prominently on the air force's modernisation road map and expected to be contracted in the coming years.

In October, IAF chief Air Chief Marshal AP Singh said HAL must stick to its promise of producing 24 aircraft every year to offset the delay, while stressing that lessons learnt should guide critical future projects, including the LCA Mk-2 and the advanced medium combat aircraft (AMCA), a stealth fighter.

HAL is also negotiating a deal with GE Aerospace for the joint production of F414 engines in India. The two firms signed a memorandum of understanding in Washington in June 2023 to produce 99 F414 engines for the LCA Mk-2 programme. The deal will involve 80% transfer of technology (ToT) and is estimated to be worth around $1 billion.

The joint production of the engines will help the country overcome a striking technology gap, lay the foundation for indigenous development of bigger jet engines and possibly open doors to exports.

https://www.hindustantimes.com/india-news/hal-to-start-trial-of-new-tejas-fighter-jet-in-january-next-year-101735068257239.html

Wed, 25 Dec 2024

भारतीय सेना को AI बेस्ड आत्मघाती ड्रोन से खतरा, 10 लाख ड्रोन्स खरीदने वाला है चीन

रूस–यूक्रेन की जंग ने दुनिया को नया हथियार दिया है. ये है FPV ड्रोन्स. यानी फर्स्ट पर्सन व्यू. कैमरा लगा है. टर्बो जेट इंजन ताकत दे रहा है. जीपीएस से लैस. बाकी हथियार. टारगेट फिक्स करो और तबाही का मजा लो. ये सस्ते हैं. सटीक हैं. टारगेट रुका हुआ हो या फिर भाग–दौड़ रहा हो. अब ऐसे ही चीन के ड्रोन्स से भारत को खतरा है.

जीपीएस गाइडेड आर्टिलरी शेल यानी तोप से दागा जाने वाला गाइडेड गोला जिसकी कीमत 1 लाख डॉलर प्रति गोला होती है. यानी 8.53 लाख रुपए. उससे सस्ते हैं FPV ड्रोन. इनकी कीमत मात्र 1500 डॉलर्स होती है. यानी 1.28 लाख रुपए. इतनी ही कीमत में ड्रोन और हथियार दोनों हो जाते हैं. कीमत में इतना अंतर सेना के लिए फायदेमंद है.

टैंक हो या सैनिक किसी पर भी कर सकते हैं हमलाये ड्रोन्स एंटी–टैंक हथियारों से लैस किसी भी हाई–टारगेट वैल्यू को हिट कर सकते हैं. यहां तक कि आर्टिलरी, टैंक या मिसाइल साइलो उड़ा सकते हैं. इन्हें एंटी–टैंक गाइडेड मिसाइल की तरह भी इस्तेमाल किया जा सकता है. अगर 500 से 1000 FPV एकसाथ हमला करें तो ये किसी भी एयर डिफेंस सिस्टम को बर्बाद कर सकते हैं.

ये FPV ड्रोन्स किसी भी तेज चलती हुई वस्तु, मिलिट्री ढांचे, बख्तरबंद वाहन, सैनिकों के वाहन या मिसाइल साइलो को टारगेट कर सकते हैं. पारंपरिक तौर पर ये ड्रोन्स रेडियो फ्रिक्वेंसी सिग्नल पर चलते हैं. इससे इन्हें ब्लॉक किया जा सकता है. यानी इलेक्ट्रॉनिक वॉरफेयर सिस्टम के जरिए. लेकिन अब ये भी एडवांस होते जा रहे हैं.

चीन के ड्रोन हमले से भारत को बड़ा खतरा है

चीन की पीपुल्स लिबरेशन आर्मी (PLA) ने 10 लाख आत्मघाती ड्रोन्स मंगाने की तैयारी कर ली है. 2026 तक इनकी डिलिवरी हो जाएगी. ये हल्के, सटीक और घातक होंगे. इतना ही नहीं ये AI आधारित होंगे. चीन भविष्य के जंग की पूरी तैयारी कर चुका है. इससे खतरा ये है कि ये ड्रोन्स फिर पाकिस्तान और बाद में बांग्लादेश को मिल सकत हैं. इससे भारत को तीन तरफ से खतरा बढ़ जाएगा. AI आधारित आत्मघाती ड्रोन्स आठ घंटे तक उड़ान भर सकते हैं. ये भारत के एयर डिफेंस गन्स और काउंटर ड्रोन सिस्टम को धोखा दे सकते हैं. ये भारत के महत्वपूर्ण कमांड सेंटर्स पर सटीक हमला कर सकते हैं. अगर ज्यादा मात्रा में इन्हें लॉन्च किया जाए तो ये किसी भी एयर डिफेंस सिस्टम को बर्बाद कर सकते हैं. दूसरी लहर आने पर भारी मात्रा में जानमाल का नुकसान हो सकता है.

चीन ने शुरू की सैनिकों की ट्रेनिंग, भारत भी कर रहा तैयारी

चीन की सेना अपने सैनिकों को इस तरह के ड्रोन ऑपरेट करने की ट्रेनिंग देना शुरू कर चुका है. ड्रोन स्वॉर्म की ट्रेनिंग चल रही है. यानी एक बार में सैकड़ों ड्रोन्स से घातक हमला. अगर भारत के महत्वपूर्ण मिलिट्री ढांचों और सैनिकों के मूवमेंट की बात करें तो इन्हें इलेक्ट्रॉनिक वॉरफेयर सिस्टम से सुरक्षा मिलती है. अगर इस सिस्टम को

ही ड्रोन धोखा दे दें तो बचना मुश्किल है. इसलिए अब भारतीय रक्षा मंत्रालय सबसे सटीक, किफायती, आसान और मारक काउंटर सिस्टम की खोज में लग गया है. साथ ही भारतीय डिफेंस उद्योग से भी कहा गया है कि ऐसे खतरों से बचने के लिए जरूरी सिस्टम तैयार किए जाएं.

https://www.aajtak.in/defence-news/story/chinas-ai-enabled-drone-swarms-are-threat-to-indian-national-security-rptc-2129302-2024-12-25

THE ECONOMIC TIMES

Wed, 25 Dec 2024

China 2024: Military standoff with India ends in Ladakh, long freeze over

It was a breakthrough year in India-China ties after a near freeze in their ties for over four years - the longest since the 1962 war - with an agreement to end the eastern Ladakh military standoff.

After "amassing of a large number of troops by China along the Line of Actual Control (LAC) in Eastern Ladakh" in April-May 2020, as External Affairs Minister S Jaishankar said in a recent statement in Lok Sabha, resulting in the Galwan valley clash in June 2020, there had been a breakdown in the relations between the two Asian giants.

The post-1962 war chill lasted till the then Prime Minister Rajiv Gandhi's visit to Beijing in 1988.This time, the two countries held periodic talks between the top commanders and through the Working Mechanism for Consultation and Coordination (WMCC), resulting in disengagement in stages from four points -- the Galwan Valley, the Pangong Lake, Hot Springs, and Gogra -- in eastern Ladakh by creating buffer zones.

Finally, on October 21, India and China firmed up an agreement on patrolling and disengagement of troops along the LAC in eastern Ladakh at the remaining friction points of Depsang and Demchok.

The agreement led to the first structured meeting between Prime Minister Narendra Modi and President Xi Jinping on the sidelines of the BRICS summit at Kazan in Russia soon after, their first in five years.

Subsequently, Jaishankar met Chinese Foreign Minister Wang Yi on the sidelines of the G20 meeting in Brazil in November where they reached an understanding that the Special Representatives (SRs) and the Foreign Secretary-level mechanisms will be convened soon.Constituted in 2003 to comprehensively address the vexed dispute of the India-China border spanning to 3,488 kms, the Special Representatives mechanism is headed by NSA Doval and Foreign Minister Wang.

Defence Minister Rajnath Singh too met his Chinese counterpart Dong Jun at the ASEAN Defence Ministers' meeting in Vientiane in Laos in November.

After the 23rd SR dialogue between Doval and Wang in December, the Ministry of External Affairs (MEA) said the extensive talks focussed on a "positive" direction for cross-border cooperation, including resuming the Kailash Mansarovar Yatra and border trade, while the Chinese side said a six-point consensus, including continuing to take measures to maintain peace at borders and promote healthy and stable development of relations, was reached between the two sides.

While there was no clarity from China on why it moved its troops near the LAC in 2020, equally puzzling is the timing for the agreement to bring down the border tensions with India, months ahead of the 75th anniversary of their diplomatic relationship.

But Beijing, in recent months, appeared to be mellowing down after its economy struggled to reverse its slowdown, weighed down by issues such as property crisis and rising unemployment.Throughout the over four-year crisis, bilateral trade was not impacted. In fact, it continued to boom.

The bilateral trade, according to Chinese official figures, totalled USD 138.2 billion in 2023, with Chinese exports climbing to USD 122 billion and Indian exports to China standing at USD 16.2 billion. India's trade deficit with China amounted to USD 105.8 billion last year.

The trade deficit in the first six months of this year climbed to USD 41.89 billion, with Chinese exports totalling USD 50.35 billion against India's exports to China USD 8.46 billion, according to data from the Indian Embassy in Beijing.In 2025, amid stubborn attempts by the US and EU to restrict Chinese exports with heavy tariffs, China looks to push its exports as well as investments in India, especially electric vehicles.

Experts here see the trade expansion with India, currently the fastest growing economy in the world, also as a new avenue to partly offset its likely damages in the Trump 2.0 era.

China also recalibrated its foreign, trade and military policies ahead of this year's US Presidential elections, especially after President-elect Donald Trump vowed to enhance tariffs over and above what he imposed against China in his first tenure.

Officials here say there is considerable concern in Beijing that India-US relations under Trump's Presidency will pick up further momentum, especially the Quad grouping comprising the US, India, Australia and Japan, which China perceives as an alliance aimed at containing it.Besides India, China also sought to recalibrate frayed ties with Australia and Japan.

Meanwhile, as China marked 75 years of communist party rule, a crucial meeting of the ruling Communist Party in July adopted a resolution for comprehensive reforms to lift the sluggish growth by achieving socialist modernisation by 2035.

President Xi, who continued to crack the corruption whip on the ruling Communist Party and the military officials, asked them in January to turn the knife inwards and carry the anti-graft campaign without any mercy.

Xi's anti-graft campaign in the military has drawn global attention, which his critics say enabled him to consolidate his hold on power.

China also announced to raise its retirement age from January 2025 after its population dipped for a second consecutive year. The demographic crisis was further highlighted as China's marriage

registrations in the first half of 2024 fell to a record low since 1980, not to mention the reduced number of kindergartens and drop in the number of children enrolled in them.

In June, Chinese spacecraft Chang'e-6 successfully touched down in the South Pole-Aitken Basin - the far side of the Moon, in the first endeavour of its kind in human history to collect samples from the rarely explored terrain and brought back the soil.

Meanwhile, Tibet and Arunachal Pradesh continued to be contentious issues as China celebrated the 65th year of its takeover of Tibet. In March, the Joe Biden administration recognised Arunachal Pradesh as Indian territory. Biden also signed into law the 'Promoting a Resolution to the Tibet-China Dispute Act' in July, triggering a sharp response from Beijing.

https://economictimes.indiatimes.com/news/defence/china-2024-military-standoff-with-india-ends-in-ladakh-long-freeze-over/articleshow/116649062.cms

THE ECONOMIC TIMES

Wed, 25 Dec 2024

BSF relies on tech in unfenced areas near Bangladesh: Daljit Singh Chawdhary, DG

Border Security Force director general Daljit Singh Chawdhary on Tuesday said that BSF is using technology solutions, apart from patrolling, CCTVs and floodlights, in unfenced areas close to the border with Bangladesh.

West Bengal shares an extensive international border with Bangladesh, he said. When asked about the unfenced border, Chawdhary said: "These zones are unfenced because of huge riverine areas. Wherever there are gaps, we are using technological solutions to bridge them. We have used obstacles and flood lights. There is continuous patrolling in such areas. Our aim is to thwart infiltration through unfenced areas."

Asked about the infiltration problem, Chawdhary said, "We are trying to build fences in unfenced areas and it will be done soon. But that does not mean that infiltration is happening through unfenced areas. We have enhanced patrolling in these areas. CCTVs have been installed and flood lights are being used."

"Our borders are protected by BSF while the Bangladesh side is guarded by Border Guard Bangladesh and both the forces work in close coordination. We always take initiative that no infiltration or exfiltration takes place," he noted.

The DG was visiting Diamond Harbour in South 24 Parganas to meet 20 female BSF personnel who completed the 53-day Ganga River Rafting Expedition, covering 2,500 km from Gangotri to Gangasagar - where the river meets the Bay of Bengal.

https://economictimes.indiatimes.com/news/defence/bsf-relies-on-tech-in-unfenced-areas-near-bangladesh-daljit-singh-chawdhary-dg/articleshow/116640136.cms

THE ECONOMIC TIMES

Tue, 24 Dec 2024

HFCL inaugurates defence manufacturing unit in Hosur

Domestic telecom gear maker HFCL inaugurated its defence equipment manufacturing facility in Hosur, Tamil Nadu, the company said on Tuesday. The new facility will produce defence technologies, including HFCL's indigenously developed thermal weapon sights, electronic fuzes, high-capacity radio relay (HCRR) systems and surveillance radars.

"HFCL is proud to inaugurate this advanced defence equipment manufacturing facility in Hosur, which symbolises our unwavering dedication to innovation, excellence, and national progress. This facility will allow us to deliver world-class defence technologies to armed forces, enabling them to operate with greater efficiency and confidence in critical missions," HFCL Managing Director Mahendra Nahata said.

The facility has the capacity to manufacture up to 5,000 thermal weapon sights, 250,000 electronic fuzes, 1,000 units each of high-capacity radio relays and ground surveillance radars annually, the statement said.

HFCL's thermal weapon sights are compatible with small arms, such as rifles, light machine guns (LMGs), and rocket launchers, and offer features like high-resolution imaging etc.

https://economictimes.indiatimes.com/news/defence/hfcl-inaugurates-defence-manufacturing-unit-in-hosur/articleshow/116638346.cms

THE WEEK

Tue, 24 Dec 2024

Pakistan to have 40 fifth-generation stealth J-35 fighter jets soon. Is this a threat to India's air dominance?

In less than two years, the air capabilities of Pakistan are set to have a major boost with the procurement of 40 fifth-generation stealth fighter jets Shenyang J-35, developed by China's Shenyang Aircraft Corporation.

Quoting Pakistani broadcaster 24 News HD, South China Morning Post reported that the deal, which could potentially alter the military dynamics in South Asia and give Pakistan an edge over India in aerial capabilities, would make Islamabad the first importer of these fifth-generation jets. These fighter jets are expected to replace Pakistan's ageing fourth-generation F-16s and French Mirage fighters.

Designed primarily for multirole combat, the J-35 fighter aircraft features advanced stealth capabilities and is aimed at enhancing air superiority and improving the effectiveness of ground attack missions.

Media reports had earlier said Pakistan Air Force pilots had begun training for J-31 stealth fighter jet (the land-based version of J-35) in China.

The J-35A's information and system architecture was designed for seamless interoperability, providing strong standalone combat capabilities and enabling coordination with other battlefield equipment, which will open up new possibilities for future missions, news agency Xinhua had quoted Wang Yongqing, chief expert at the Shenyang Aircraft Design and Research Institute of the Aviation Industry Corporation of China, as saying.

Pakistani Air Chief Marshal Zaheer Ahmed Baber Sidhu had, in January, said “the foundation for acquiring the J-31 stealth fighter aircraft has already been laid”.

The reports of Pakistan's plans to acquire China’s latest fighter jets come in the backdrop of the visit of top PLA General Zhang Youxia to Pakistan last month, during which he held one-on-one talks with Pakistan’s Army chief Gen Asim Munir.

China has delivered four advanced naval frigates to the Pakistan Navy in the last few years to enable it to play a bigger role along with its navy in the Indian Ocean and Arabian Sea.

Meanwhile, there were reports that said Pakistan's move to acquire the fighter jets may prompt the US to offer India the F-35A, a fifth-generation fighter, with enhanced stealth, situational awareness, and reduced vulnerability.

https://www.theweek.in/news/defence/2024/12/24/pakistan-to-have-40-fifth-generation-stealth-j-35-fighter-jets-soon-is-this-a-threat-to-indias-air-dominance.html

THE WEEK

Tue, 24 Dec 2024

Ebola for biowarfare? Russia alleges US Army involved in smuggling virus from Africa

The Russian defence ministry claimed that the US Army Medical Research Institute of Infectious Diseases (USAMRIID)—a unit of the US Army which is involved in advancing medical biological defense to protect the military and the country and provide medical capabilities to deter and defend against current and emerging biological threat agents—was involved in the illegal export of samples of the Ebola virus from Africa to the US.

Major General Alexey Rtischev, Deputy Head of the Radiation, Chemical and Biological Protection Forces, said representatives of US-based company Metabiota smuggled the samples from Africa and handed them over to the USAMRIID.

According to a report by an international panel of experts involved in fighting the 2014 Ebola outbreak in Sierra Leone, company personnel concealed the fact that Pentagon employees were involved in the work, he said.

"The main purpose of this activity was the isolation of virulent strains and their subsequent smuggling. As a result, samples of the Ebola virus were smuggled by representatives of the company and sent to the US Army Medical Research Institute of Infectious Diseases," he added.

He further said the nations involved in the US biological control system lose their sovereignty and become dependent on America.

"The US government authorities and private contracting companies, including the so-called Big Pharma enterprises, are involved in cooperation with the relevant local ministries. The result of this selective support is the transition to American personnel training standards, transfer and generalization of information on the biological situation, the degradation of national health care systems, and the imposition of suppliers of medical equipment and medications," he said.

https://www.theweek.in/news/defence/2024/12/24/ebola-for-biowarfare-russia-alleges-us-army-involved-in-smuggling-virus-from-africa.html

ThePrint

Wed, 25 Dec 2024

All about 'Surat', last warship of Visakhapatnam class destroyers, set to be commissioned into Navy

In a boost to its capabilities, the Indian Navy is all set to commission its latest stealth-guided missile destroyer "Surat". The ship was delivered to the Navy on 20 December by the Mumbai-based shipyard Mazagon Dock Ltd.

"Surat" is the fourth ship of the Visakhapatnam class, also known as the Project 15B ships. The ship's three predecessors—INS Visakhapatnam (commissioned in 2021), INS Mormugao (2022) and INS Imphal (2023)—are already in service with the Navy. The tag of INS is given to warships after they are commissioned into the Navy.

The Indian Navy commissioned the third ship, INS Imphal, in December last year. Project 15B is a makeover of Project 15A Kolkata-class destroyers with significant capability enhancements. The destroyer will join Indian Navy's frontline stealth frigate Nilgiri and submarine Vagsheer in being commissioned in January as reported by ThePrint.

"Surat" is the first naval ship to be named after a city in Gujarat, which is known for its maritime heritage. The stealth-guided missile destroyer has a displacement of 7,400 tonnes and an overall length of 164 metres.

A versatile platform, “Surat” is equipped with state-of-the-art weapons and sensors, including surface-to-air missiles, anti-ship missiles and torpedoes. Surat is powered by a combined gas and gas (COGAG) propulsion set, comprising four gas turbines. The destroyer has achieved speeds in excess of 56 km per hour during sea trials. What stands out about it is that it is the first Artificial Intelligence (AI) enabled warship utilising indigenously developed Al solutions which would enhance its operational efficiency.

Last ship of destroyer project

The delivery and commissioning of “Surat” is significant given it is the last ship of the indigenous destroyer-building project of the Indian Navy, which began with Project 15. This included the three Delhi-class destroyers (1997-2001) and were followed by Project 15A (three Kolkata-class destroyers between, 2014-2016) and Project 15B (four Visakhapatnam-class destroyers, 2021-2024). These ships are designed by the Indian Navy’s Warship Design Bureau.

The “Surat” warship’s keel was laid on 7 November, 2019, and launched on 17 May, 2022. The ship has been delivered to the Indian Navy in 31 months from launch to delivery. This is the fastest that a destroyer has been developed and built indigenously. In a period of six months, the ship started contractor sea trials on 15 June, 2024, and completed her final machinery trials on 25 November.

With the commissioning of “Surat” and “Nilgiri”, the Indian Navy will get an additional frontline warship in a matter of only a month. Defence Minister Rajnath Singh commissioned INS Tushil on 9 December, 2024, in Kaliningrad, Russia. The warship was built in that country.

Only days after it was commissioned, the frigate set sail from Kaliningrad for India on 17 December. This marked the beginning of the frigate’s maiden operational deployment. The ship will traverse the Baltic Sea, the North Sea, the Atlantic Ocean, and finally, the Indian Ocean. It will make port calls at several friendly foreign countries along the way.

The ship will also carry out joint patrolling and maritime partnership exercises with a number of navies, including in piracy hotspots in the region, as per a press statement. The ship’s first port of call was London.

https://theprint.in/defence/all-about-surat-last-warship-of-visakhapatnam-class-destroyers-set-to-be-commissioned-into-navy/2418734/

ThePrint

Wed, 25 Dec 2024

Joint India-Nepal military exercise Surya Kiran in January, one Gorkha Rifles battalion to take part

The Indian and Nepalese armies will start the new year by jointly conducting Exercise Surya Kiran in the first two weeks of January.

Surya Kiran is a battalion-level exercise. Sources in the defence and security establishment revealed that one battalion of the Gorkha Rifles will represent the Indian contingent in this iteration, which will take place in Nepal.

The primary aim of the exercise is to enhance interoperability between the two armies under the mandate of the United Nations. This exercise is conducted alternately in each country, with the upcoming edition focusing on counter-terrorism operations, humanitarian assistance and disaster relief within the framework of the UN Charter on peacekeeping operations.

As in previous editions, this year's exercise will include the utilisation of drones and counter-drone measures, medical training, aviation operations and environmental conservation initiatives. The last edition was held in Pithoragarh, Uttarakhand, during November and December of the previous year.

Sources indicated that these activities are designed to improve the troops' operational capabilities, refine their combat skills and enhance coordination during challenging scenarios. The exercise will also facilitate the exchange of best practices and operational procedures between the Indian and Nepalese armies.

A notable aspect of the India-Nepal military relationship is the longstanding tradition of Gorkhas from Nepal serving in the Indian Army's Gorkha Rifles regiments. However, the introduction of the Agnipath Scheme in 2022 by the Government of India has raised concerns about the continuation of this practice. The scheme permits recruits, known as Agniveers, to serve for a period of only four years, after which only 25 percent are retained for long-term service. In response, the Nepalese government expressed strong objections and declined to allow its citizens to participate in recruitment rallies for the Indian Army under this scheme.

In November, the Chief of Army Staff (COAS) General Upendra Dwivedi visited Nepal, where he was conferred the honorary rank of general of the Nepalese Army by the President of Nepal, Ram Chandra Paudel, in Kathmandu. Similarly, General Ashok Raj Sigdel, COAS of the Nepalese Army, visited India and was conferred the rank of honorary general of the Indian Army by the President of India, Droupadi Murmu.

https://theprint.in/defence/joint-india-nepal-military-exercise-surya-kiran-in-january-one-gorkha-rifles-battalion-to-take-part/2417962/

Business Standard

Tue, 24 Dec 2024

Pakistan may fly Chinese stealth jets in 2 years: Could it outpace IAF?

Pakistan's reported procurement of fifth-generation stealth fighter jets from China raises the possibility that it might outpace India in deploying such advanced aircraft.

Recent reports highlight contrasting strategies between the two nations, with Pakistan opting for external procurement while India focuses on developing its own indigenous solutions.

Pakistan's acquisition of J-35 jets

According to the South China Morning Post (SCMP), the Pakistan Air Force (PAF) has approved the purchase of 40 J-35 jets from China, with deliveries expected within two years. The J-35, an export-oriented variant of China's J-31 stealth fighter, is designed for both air superiority and strike missions. Featuring next-generation avionics and advanced stealth technology, the J-35 is said to be smaller than the J-20 but reportedly incorporates improvements for ground and maritime target capabilities.

SCMP reports that this would mark China’s first export of fifth-generation fighter jets to a foreign ally, potentially recalibrating regional power dynamics. The stealth fighters are expected to replace Pakistan’s ageing fleet of American F-16s and French Mirage fighters.

The move follows earlier developments, including reports from Pakistan's BOL News that PAF pilots began training for the J-35 in China earlier this year. Pakistani Air Chief Marshal Zaheer Ahmed Baber Sidhu also stated in January that the foundation for acquiring the J-35 had already been laid. If the acquisition proceeds, these jets will join the PAF's arsenal, which already includes J-10CE medium multi-role combat aircraft delivered by China two years ago.

Strategic implications

Experts quoted in the SCMP have weighed in on the potential impact of this development. Brendan Mulvaney, director of the US Air Force's China Aerospace Studies Institute, described Pakistan's reported move as "a clear shift away from the West, the US and France to China". He added that this acquisition could place the PAF "ahead of the Indian Air Force (IAF)", though he noted that operational effectiveness would depend on the weaponry and support systems provided by China.

“The jet may be great, but if it doesn’t have the weapons, the sensor suite, and the C4ISR [Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance] to enable it, then it matters far less,” Mulvaney explained.

Retired PAF officer Zia Ul Haque Shamsi told the SCMP that acquiring fifth-generation fighters would give Pakistan a strategic advantage over India for the next 12 to 14 years. However, other analysts offered a more conservative view, suggesting a seven- to eight-year advantage.

India's indigenous efforts

Meanwhile, India is progressing with its fifth-generation Advanced Medium Combat Aircraft (AMCA) programme. According to the Parliamentary Standing Committee on Defence's Demands for Grants (2024-25) report, the IAF expects to receive deliveries of the AMCA only in the next decade. Designed to replace the Mirage 2000, MiG-29, and Jaguar jets, the AMCA will feature advanced stealth capabilities, sensors and data fusion.

The significant time and complexity involved in developing such platforms domestically highlight the challenges faced by the Defence Research and Development Organisation (DRDO) in realising the AMCA project.

Balancing regional power dynamics

Speaking to the SCMP, aviation expert Andreas Rupprecht noted that New Delhi might need to consider acquiring existing stealth fighters rather than relying solely on domestic development. If New Delhi pursues this route, its options are largely confined to the American Lockheed Martin F-35 Lightning II.

Pakistan, on the other hand, is leveraging its close defence ties with China to gain access to advanced technology. Mustafa Hyder Sayed, executive director of the Islamabad-based Pakistan-China Institute, told the SCMP that the J-35 purchase reflects Pakistan's aim to maintain a conventional balance of power and necessary deterrence in the region.

However, critics have raised concerns about Pakistan's economic capability to sustain such acquisitions. Brian Hart, a fellow at the Centre for Strategic and International Studies, pointed out to the SCMP that integrating the J-35 into Pakistan's military would pose additional challenges, including training and operational readiness.

The road ahead

As India continues its indigenous efforts and Pakistan reportedly fast-tracks its procurement plans, the race to operationalise stealth fighters highlights the contrasting defence strategies of the two countries. While Pakistan may deploy its J-35s sooner, long-term questions remain about its ability to fully integrate and sustain these advanced platforms.

https://www.business-standard.com/external-affairs-defence-security/news/pakistan-may-fly-chinese-stealth-jets-in-2-years-could-it-outpace-iaf-124122400442_1.html

The Tribune

Tue, 24 Dec 2024

Built with integrated technology, Nilgiri to join Navy next month

Adding to the Indian Navy's capabilities, the first warship constructed using the advanced 'integrated construction' technique is set to be commissioned next month. Part of the Nilgiri-class, the fleet will include seven ships, all scheduled for commissioning by early 2027.

The integrated construction approach involves building different sections of the ship — such as the hull, superstructure and internal systems — as separate blocks, each weighing around 250 tonnes. These precision-built blocks are designed to accommodate cabling and piping, allowing seamless alignment and welding. This modern technique, combined with advanced technology and design software, significantly accelerates shipbuilding, helping India match the pace of European shipyards.

Currently, more than 60 warships and submarines are under construction across multiple Indian shipyards.

The Nilgiri-class warships, among the most complex ever built in India, are upgraded derivatives of the Shivalik-class frigates, three of which were inducted between 2010 and 2012. The construction timeline for the Nilgiri-class ships is notably faster: the first three ships require 76 months from keel laying to commissioning, while the last four will take only 60 months, compared to the Shivalik class's average of 108 months.

Following the Nilgiri, its sister ships — Himgiri, Udaygiri, Dunagiri, Taragiri, Vindhyagiri and Mahendragiri — are expected to join the fleet. Four ships are under construction at Mazagon Dock Shipbuilders in Mumbai, and three at Garden Reach Shipbuilders & Engineers (GRSE) in Kolkata. Both shipyards operate under the Ministry of Defence.

Equipped with advanced systems, the Nilgiri class features supersonic surface-to-surface missiles, medium-range surface-to-air missiles, upgraded 76-mm guns and rapid-fire close-in weapon systems. With 75 per cent indigenous content, the ships underscore India's focus on self-reliance in defence production.

https://www.tribuneindia.com/news/india/built-with-integrated-technology-nilgiri-to-join-navy-next-month/

FINANCIAL EXPRESS
Read to Lead

Tue, 24 Dec 2024

Redington and Tunga aerospace join forces to drive UAV innovation in India

In a move set to revolutionize the UAV (Unmanned Aerial Vehicle) market in India, Redington Limited, a prominent IT solutions provider and a Fortune India 500 company, has partnered with Tunga Aerospace Industries, an innovative deep-tech startup recognized by the Department for Promotion of Industry and Internal Trade (DPIIT).

This strategic collaboration, rooted in Tunga's research at the prestigious IIT Madras Research Park, aims to introduce advanced UAV technology tailored for both commercial and military applications.

Strengthening India's Position in UAV Technology

The partnership will see Redington utilizing its robust pan-India distribution network to introduce a range of advanced UAVs developed by Tunga Aerospace, including the Drishya Lite, Drishya Pro, and Sahasraksha AI models.

These drones come equipped with cutting-edge features such as autonomous navigation, real-time tracking, and thermal imaging, making them suitable for a wide variety of use cases across sectors such as agriculture, defense, infrastructure, and surveillance.

For Redington, this collaboration marks a significant step in broadening its portfolio of technology-driven solutions. The company is poised to play a pivotal role in bringing advanced drone technology to businesses across India, enhancing operational capabilities and fostering growth in key sectors.

Empowering India's Self-Reliance Vision

Cdr Ramesh Madhavan, Cofounder and COO of Tunga Aerospace, expressed the company's commitment to supporting the nation's "Atmanirbhar Bharat" (self-reliant India) initiative.

He said, "There is a huge faith that our nation has reposed in the deep-tech start-ups in recent times; that of making India self-reliant. This is a huge responsibility; and we take it seriously. With Redington's powerful pan-India reach, we aspire to deliver our Make in India UAVs across the country to fulfill the Atmanirbhar Bharat aspirations of our nation."

The strategic importance of this partnership cannot be understated, as it aligns with India's larger ambitions to become a global leader in UAV and defense technologies. Tunga Aerospace's homegrown solutions are poised to play a crucial role in this vision, driving innovation and reducing dependency on foreign drone technologies.

Redington's Role in Technological Empowerment

Redington's President of the Technology Solutions Group, R. Venkatesh, emphasized the importance of this partnership in driving innovation and empowering Indian businesses. "Our strategic partnership with Tunga Aerospace marks a significant step in expanding Redington's portfolio of innovative technology solutions.

By offering Tunga's advanced UAVs, we empower businesses across India to harness the potential of drone technology. Together, we aim to drive the adoption of drone technology across various industries, enabling businesses to achieve new heights of growth and success."

With a presence in over 40 countries and a network of over 60,000 channel partners, Redington is uniquely positioned to scale the reach of Tunga Aerospace's UAV technology across India, enabling enterprises to leverage drones for improved efficiency and enhanced business outcomes.

Redington's collaboration with Tunga Aerospace represents a crucial step in India's technological evolution, particularly in the UAV space.

By combining Redington's distribution expertise with Tunga's cutting-edge innovations, this partnership is set to drive the widespread adoption of UAV technology, contributing to the country's aspirations of becoming self-reliant in advanced technologies and strengthening its position on the global stage.

https://www.financialexpress.com/business/defence-redington-and-tunga-aerospace-join-forces-to-drive-uav-innovation-in-india-3698958/

FINANCIAL EXPRESS
Read to Lead

Thu, 26 Dec 2024

Strategic Investment or Costly Indulgence? The Economic Case for India's Third Aircraft Carrier

As India's ambitions for regional leadership in the Indo-Pacific grow, its maritime strategy is being scrutinised. Central to this debate is the proposed construction of a third aircraft carrier, a project projected to cost Rs 40,000–50,000 crore.

While critics view the initiative as a costly indulgence, proponents argue it is not merely a defence requirement but a long-term economic stimulus. A third carrier could represent a strategic and economic imperative for a nation seeking to bolster its industrial capacity, enhance its global standing, and secure vital trade routes.

Economic Boost Through Shipbuilding

India's shipbuilding industry has long been an underutilised asset. The construction of the INS Vikrant, India's first indigenously built aircraft carrier, demonstrated its transformative potential. The project catalysed regional development and skill enhancement in coastal areas by engaging over 500 micro, small, and medium enterprises (MSMEs) and creating 14,000 direct and indirect jobs.

The proposed Indigenous Aircraft Carrier-2 (IAC-2) could amplify these benefits. Shipbuilding projects in India have one of the highest economic multipliers, with every Rs 1 invested generating an additional Rs 1.82 in economic activity. Beyond direct employment, ancillary industries such as steel, electronics, and engineering would see significant demand, boosting their growth and aligning with India's broader "Make in India" objectives.

Cochin Shipyard Limited (CSL), the epicentre of India's aircraft carrier construction, stands to gain immensely. Building the IAC-2 would ensure that expertise developed during the Vikrant project is not lost, avoiding the costly erosion of skills witnessed during a hiatus in submarine production at Mazagaon Dock in the 1990s.

Infrastructure and Regional Development

Large-scale naval projects drive infrastructure upgrades, particularly in regions surrounding major shipyards and naval bases. During the construction of the Queen Elizabeth-class carriers in the UK, ports and docks underwent substantial modernisation, boosting local economies. A similar trajectory is expected in India.

Developing the IAC-2 would necessitate investments in berthing facilities, dredging, and logistical hubs, particularly in cities like Kochi or Visakhapatnam. These enhancements would support defence activities and bolster India's commercial maritime infrastructure, a critical component of the Sagarmala Initiative aimed at port-led economic development.

Job Creation and Skill Development

The third carrier's construction is poised to generate substantial employment directly and indirectly. It is estimated that such a project could create over 15,000 jobs, from shipyard workers to engineers and project managers. The demand for specialised training would also drive the establishment of new educational programs and partnerships with institutions like the Indian Maritime University.

Furthermore, the skills developed through carrier construction have broader applications. Advanced technologies like Electromagnetic Aircraft Launch Systems (EMALS) and unmanned aerial systems (UAS) would enhance India's technological ecosystem, fostering innovation and creating spillover benefits for industries such as aerospace and robotics.

Export Opportunities and Global Positioning

Joining the elite club of nations capable of building aircraft carriers positions India as a significant player in the global defence market. While only seven nations currently construct carriers, several others operate them, often struggling with maintenance and refits.

India's growing expertise in carrier construction could enable it to tap into this niche market, offering maintenance services or exporting smaller platforms to friendly nations. Such ventures would align with India's goal of achieving $5 billion in annual defence exports by 2025, providing a steady revenue stream and enhancing its geopolitical influence.

Safeguarding Trade Routes and Economic Security

The economic rationale for a third carrier extends to India's maritime trade security. With 95% of trade by volume and 70% by value conducted via sea routes, ensuring the safety of shipping lanes is critical. A robust carrier fleet would allow India to project power and deter threats, from piracy to state-sponsored aggression.

Furthermore, as China expands its naval footprint in the Indian Ocean through projects like the Fujian aircraft carrier, India must counterbalance this influence to secure its trade lifelines. The economic stakes are high, as any disruption to these routes could have cascading effects on India's economy.

Addressing Cost Concerns

Critics of the project point to its hefty price tag and competing defence priorities, including modernising the Army and Air Force. However, strategic public-private partnerships could help mitigate costs while increasing efficiency. The long-term benefits—job creation, industrial growth, and enhanced trade security—justify the initial investment.

A Strategic and Economic Necessity

The debate over India's third aircraft carrier is not merely about military capabilities but also about economic opportunity. By driving industrial growth, creating jobs, and safeguarding trade, the IAC-2 could serve as both a catalyst for national development and a symbol of India's maritime aspirations.

As India seeks to establish itself as a global power, investments like the third carrier are essential. They ensure the country's security, economic resilience, and leadership in the Indo-Pacific. The carrier is more than a naval asset—it is a strategic investment in India's future.

https://www.financialexpress.com/business/defence-strategic-investment-or-costly-indulgence-the-economic-case-for-indias-third-aircraft-carrier-3700313/

Science & Technology News

Press Information Bureau
Government of India

Ministry of Science & Technology

Wed, 25 Dec 2024

DST along with AICTE announces undergraduate courses for quantum

The Department of Science and Technology (DST) in collaboration with All India Council for Technical Education (AICTE) announced a dedicated curriculum at the undergraduate level, to create a thriving quantum-trained ecosystem in India as part of the National Quantum Mission.

Professor Ajay K Sood, Principal Scientific Advisor to Govt. of India said that the curriculum will integrate theoretical knowledge with hands-on lab experience, aiming to deepen graduates' understanding of quantum technologies through a minor program in the subject at undergraduate level. Highlighting the progress made in the National Quantum Mission, Prof. Sood emphasised the importance of this initiative to align with the goals of the Mission in order to create a quantum-ready workforce for the country's technological advancement and global leadership.

The National Quantum Mission from the Government of India is a decisive step in accelerating the nation's research and technology development in this field. Such research and technology development will require a highly skilled workforce through immediate initiatives in teaching and training.

The curriculum will help impart training for developing this workforce to enable them to reach global standards, and simultaneously address the multi-disciplinary needs of quantum technology development -- from basic to applied research.

Professor Abhay Karandikar, Secretary Department of Science and Technology said that the announcement of this curriculum marks a significant step in building a quantum-ready workforce. 'It is designed for undergraduate students to establish a strong foundational and advanced

knowledge base keeping in mind the diversity in the institutions, and will enable all engineering students irrespective of their disciplines to undertake UG minor in quantum technologies from their third or fourth semester." he added.

"For the success of the program, training of teachers and basic lab infrastructure will also be required. National Quantum Mission will support creation of teaching labs in some select institutions and will work with AICTE for faculty development," Prof. Karandikar pointed out.

Prof. Karandikar urged institutes to adopt the curriculum proactively and also students to recognize the importance of integrating quantum technologies into research, education, and innovation strategies.

Dr. Ajai Chowdhry Chairman MGB, NQM said that while this course will help in developing manpower in quantum technology in the country, internships should also be started in parallel to create more value for the students.

Professor T G Sitharam, Chairman All India Council for Technical Education (AICTE) highlighted that this is a new beginning in quantum revolution to leverage the potential of quantum technology to create impact in society. "Our curriculum is ready and hopefully it will be included from next July session in all top institutions," he added.

While institutes of national importance have begun programs to this end, expanding such training to a larger pool of institutes across the country can enable the nation to tap into the vast resource of students who can then participate in the mission to accelerate its progress towards its goals. The course would be taken up for implementation by AICTE approved institutions across the country.

The course structure includes all four verticals of Quantum Technology -- Quantum Computing, Quantum communications, Quantum sensing and metrology, Quantum materials and devices. The proposed curriculum constitutes a minimum of 18 credits with both theory and lab courses. Each course amounts to 3 credits (1 credit translating to 1 in-class contact hour per week for a theory course or 1 session of lab for 3 hours for a lab course), thereby making the minor program span a minimum of 6 courses.

Faculty Development Programs in the areas of Quantum Technologies are also proposed to be carried out to enable them to do justice to the goals of the minor program. Such sustained teacher training efforts will also enhance the quality of the training imparted to students over the years leading to long-term benefits and enable India to become a world leader in this field.

Apart from this course, National Quantum Mission in collaboration with AICTE is also planning to support creation of labs to aid teaching in the areas of quantum technologies, writing of books for the course and quantum awareness programmes.

Proposed structure of the program:

Minimum credits to fulfil – 18

- A 3.0.0 course has 3 theory lectures per week and considering an average length of 14 weeks for a semester,
- A 3:0 course amounts to at least 36 hours of lectures (considering holidays, exam days etc).

- A **n:m** lab course has **n** hours of lectures and **m** sessions (3 hours each) of lab per week.

https://pib.gov.in/PressReleasePage.aspx?PRID=2087864

Press Information Bureau
Government of India

Ministry of Science & Technology

Tue, 24 Dec 2024

Around 830 School Students across the country performed DNA isolation at 33 CSIR Labs

A scientific activity was carried out by the Council of Scientific and Industrial research (CSIR) in its laboratories across the country. CSIR is one of the largest S&T organisations of the Nation. A Delhi based constituent laboratory of CSIR namely Institute of Genomics and Integrative Biology (IGIB) coordinated the activity by connecting simultaneously to all the other laboratoriesof CSIR through online mode. The event was inaugurated by Dr. Souvik Maiti, Director, CSIR-IGIB.

Dr. Geetha Vani Rayasam, Head, CSIR-HRDG. On the occasion, a number of senior scientists from various CSIR labs, teachers and school students were also present.

About thirty school studentsof class 9 at each of the participating CSIR laboratories isolated DNA from their own saliva using the DNA isolation kits under the guidance of Dr. Beena Pillai, Chief Scientist and Dr.Arya Sidharthan, science communicator from CSIR-IGIB. Through this exercise, the studentslearned about the scientific principles of cell structure and chemical nature of DNA.

Finally, the students were given a short questionnaire designed to evaluate their understanding of scientific principles, and assess their scientific aptitude.The outcome of the pilot study of scientific aptitude assessment followed by a larger study, is expected to help not only the students in making STEM career choices suited to their aptitude but also policy makers in designing curriculum and align with New Education Policy 2020.

In the scientific event, around 830 students joined the live interaction from 33 CSIR labs located across the country. At CSIR-IGIB, students of KendriyaVidyalaya No.1, Air Force Station, Hindan, Ghaziabad participated in the activity.

Theyalso visited the laboratories and interacted with scientists.This scientific aptitude assessment was carried out under the CSIR-Jigyasa platform which is a flagship outreach program that connects school students to scientists at CSIR labs and so far from 2017 onwards about 10 lakhs school students have participated in the program.

https://pib.gov.in/PressReleasePage.aspx?PRID=2087618

THE ECONOMIC TIMES

Tue, 24 Dec 2024

How hallucinatory AI helps science dream up big breakthroughs

Artificial intelligence often gets criticized because it makes up information that appears to be factual, known as hallucinations. The plausible fakes have roiled not only chatbot sessions but lawsuits and medical records. For a time last year, a patently false claim from a new Google chatbot helped drive down the company's market value by an estimated $100 billion.

In the universe of science, however, innovators are finding that AI hallucinations can be remarkably useful. The smart machines, it turns out, are dreaming up riots of unrealities that help scientists track cancer, design drugs, invent medical devices, uncover weather phenomena and even win the Nobel Prize.

"The public thinks it's all bad," said Amy McGovern, a computer scientist who directs a federal AI institute. "But it's actually giving scientists new ideas. It's giving them the chance to explore ideas they might not have thought about otherwise."

The public image of science is coolly analytic. Less visibly, the early stages of discovery can teem with hunches and wild guesswork. "Anything goes" is how Paul Feyerabend, a philosopher of science, once characterized the free-for-all.Now, AI hallucinations are reinvigorating the creative side of science.

They speed the process by which scientists and inventors dream up new ideas and test them to see if reality concurs. It's the scientific method -- only supercharged. What once took years can now be done in days, hours and minutes. In some cases, the accelerated cycles of inquiry help scientists open new frontiers.

"We're exploring," said James J. Collins, a Massachusetts Institute of Technology professor who recently praised hallucinations for speeding his research into novel antibiotics. "We're asking the models to come up with completely new molecules."

AI hallucinations arise when scientists teach generative computer models about a particular subject and then let the machines rework that information. The results can range from subtle and wrongheaded to surreal. At times, they lead to major discoveries.

In October, David Baker of the University of Washington shared the Nobel Prize in chemistry for his pioneering research on proteins -- the knotty molecules that empower life. The Nobel committee praised him for discovering how to rapidly build completely new kinds of proteins not found in nature, calling his feat "almost impossible.

"In an interview before the prize announcement, Baker cited bursts of AI imaginings as central to "making proteins from scratch." The new technology, he added, has helped his lab obtain roughly 100 patents, many for medical care. One is for a new way to treat cancer. Another seeks to aid the

global war on viral infections. Baker has also founded or helped start more than 20 biotech companies.

"Things are moving fast," he said. "Even scientists who do proteins for a living don't know how far things have come." How many proteins has his lab designed? "Ten million -- all brand-new," he replied. "They don't occur in nature."

Despite the allure of AI hallucinations for discovery, some scientists find the word itself misleading. They see the imaginings of generative AI models not as illusory but prospective -- as having some chance of coming true, not unlike the conjectures made in the early stages of the scientific method. They see the term hallucination as inaccurate, and thus avoid using it.

The word also gets frowned on because it can evoke the bad old days of hallucinations from LSD and other psychedelic drugs, which scared off reputable scientists for decades. A final downside is that scientific and medical communications generated by AI can, like chatbot replies, get clouded by false information.

In July, the White House released a report on fostering public trust in AI research. Its sole reference to hallucinations was about finding ways to reduce them.

The Nobel Prize committee seems to have followed that playbook. It said nothing about AI hallucinations in a detailed review of Baker's work. Instead, in a news release, it simply credited his team with producing "one imaginative protein creation after another." Increasingly, parts of the scientific establishment seem to view hallucinations as unmentionable.

Even so, experts said in interviews that the imaginings of scientific AI have major advantages compared with the hallucinations of chatbots and their kin. Most fundamentally, they said, the creative bursts are rooted in the hard facts of nature and science rather than the ambiguities of human language or the blur of the internet, known for its biases and falsehoods.

"We're teaching AI physics," said Anima Anandkumar, a professor of math and computing sciences at the California Institute of Technology who formerly directed AI research at Nvidia, the leading maker of AI chips.

For science, Anandkumar added, the physical grounding in reliable facts can produce highly accurate outcomes. She said the large language models of chatbots have no practical way to verify the correctness of their statements and assertions.The ultimate check, she said, comes as scientists compare the digital flights of fancy with the solid particulars of physical reality."You need to test it," Anandkumar said of AI results. "Something newly designed by AI hallucinations requires testing.

"Recently, Anandkumar and her colleagues used AI hallucinations to help design a new kind of catheter that greatly reduces bacterial contamination -- a global bane that annually causes millions of urinary tract infections. She said the team's AI model dreamed up many thousands of catheter geometries and it then picked one that was the most effective.

The inner walls of the new catheter are lined with sawtooth-like spikes that prevent bacteria from gaining traction and swimming upstream to infect patients' bladders. Anandkumar said the team is discussing the device's commercialization.

Echoing other scientists, Anandkumar said she dislikes the term hallucination. Her team's paper on the new catheter avoids the word.On the other hand, Harini Veeraraghavan, head of a Memorial Sloan Kettering Cancer Center lab in New York City, cited the term in a paper on using AI to sharpen blurry medical images. Its title in part read: "Hallucinated MRI," short for magnetic resonance imaging.

Researchers at the University of Texas at Austin have also embraced the term. "Learning from Hallucination," read the title of their paper on improving robot navigation.

And the head of the science division at DeepMind, a Google company in London that develops AI applications, praised hallucinations as promoting discovery, doing so shortly after two of his colleagues shared this year's Nobel Prize in chemistry with Baker.

"We have this amazing tool which can exhibit creativity," the DeepMind official, Pushmeet Kohli, said in an interview.An example, he said, was how a DeepMind computer in 2016 beat the world champion player of Go, a complex board game. The game's turning point was move 37, fairly early in the contest. "We thought it was a mistake," Kohli said. "And people realized as the game went on that it was a stroke of genius. So these models are able to produce these very, very novel insights."

McGovern, the AI institute director, is also a professor of meteorology and computer science at the University of Oklahoma. She said AI hallucinations might be described less colorfully as "probability distributions" -- a very old term in the world of science.

Weather sleuths, McGovern added, now use AI routinely to create thousands of subtle forecast variations, or ranges of probability. She said the rich imaginings let them discover unexpected factors that can drive extreme events like deadly heat waves. "It's a valuable tool," McGovern said.

Baker, the recent Nobel Prize winner, has adopted the frank approach. "De novo protein design by deep network hallucination," read the title of one of his 2021 papers, which appeared in Nature, a top scientific journal.

The phrase de novo -- meaning "from the beginning" in Latin -- draws a sharp contrast with how scientists in the early 1980s began tweaking the structures of known proteins that occur in nature.

In 2003, Baker and his colleagues achieved a far more ambitious goal: making the world's first entirely new protein from scratch. They called it Top7. Their accomplishment was seen as a major advance because proteins are superstars of complexity. Experts liken the structure of DNA to a string of pearls and that of large proteins to hairballs. Their structures are so complicated that even detailed graphic representations are rough approximations.

As AI grew into a powerful new technology, Baker wondered if it could speed de novo design. His 2021 paper in Nature cited the inspiration of Google DeepDream -- a model that morphs existing images into psychedelia. When people look at the full moon and see a man's face, that's called pareidolia, a perceptual quirk that turns ambiguous patterns into meaningful images. A version of that tendency is what DeepDream uses to create its surreal fantasies.

Baker's plan was to see if AI could impose the pareidolia effect on ambiguous sets of amino acids, the building blocks of proteins. His team fed random strings of amino sequences into a model trained to recognize the structural features of real proteins. It worked -- in spades.

The paper said the test run created thousands of virtual proteins. It likened them to the explosion of AI cat images on the internet. "Just as simulated images of cats generated by deep network hallucination are clearly recognizable as cats," the paper said, so too the artificial protein structures "resemble but are not identical to" the natural structures.

The Baker team then sought to turn the imagined proteins into the real thing -- a step not unlike bringing digital cats to life. First, the team took information on the hallucinated molecules and used it as a blueprint to produce the strands of DNA that form genes. Then, as the 2021 paper reported, the eureka moment came as the genes were inserted into microbes and the tiny organisms churned out 129 new kinds of proteins unknown to science and nature.

Afterward, in early 2022, Baker described that moment as "the first demonstration" of how AI can accelerate de novo protein design. His follow-up papers of 2022 and 2023 once again used the word hallucination in their titles.

In an interview, Baker said his lab had taken a new step forward in the creative imaginings with an AI method known as diffusion. That is what powers DALL-E, Sora and other popular generators of visuals.

Baker praised diffusion as being better than hallucination at conjuring up novel protein designs. "It's much faster and the success rate is higher," he said.

In recent years, some analysts have worried that science is in decline. They point to a drop over recent decades in the number of breakthroughs and major discoveries.

AI backers argue that its bursts of creativity are coming to the rescue. On the design horizon, Baker and his colleagues see waves of protein catalysts that will harvest the energy of sunlight, turn old factories into sleek energy savers and help create a sustainable new world.

"The acceleration keeps on happening," said Ian C. Haydon, a member of Baker's team. "It's incredible." Others concur. "It's amazing what will come out in the next few years," Kohli said. He sees AI as unlocking life's deepest secrets and establishing a powerful new basis for curing ills, improving health and lengthening lives.

"Once we decipher and truly understand the language of life," he said, "it will be magical."

https://economictimes.indiatimes.com/news/science/how-hallucinatory-ai-helps-science-dream-up-big-breakthroughs/articleshow/116630833.cms

THE ECONOMIC TIMES

Tue, 24 Dec 2024

SpaDEX: All you need to know about ISRO’s groundbreaking space docking mission

India is set to take a major leap in its space programme with the launch of the Space Docking Experiment (SpaDEX) on December 30, 2024. The Indian Space Research Organisation (ISRO) will deploy this mission using the Polar Satellite Launch Vehicle (PSLV-C60), which is scheduled to lift off at 21:58 IST from the Satish Dhawan Space Centre in Sriharikota.

This mission is a significant milestone for ISRO, as it will demonstrate in-space docking capabilities, a critical technology for future space endeavours. The primary aim is to develop and test the systems required for the rendezvous, docking, and undocking of two spacecraft.

Mission Overview and Objectives

SpaDEX will involve the launch of two identical satellites, the Chaser (SDX01) and the Target (SDX02), each weighing approximately 220 kg. These satellites will be placed in a 470 km low-Earth circular orbit with a 55° inclination.

The mission's objectives are:

SpaDEX will involve the launch of two identical satellites, the Chaser (SDX01) and the Target (SDX02), each weighing approximately 220 kg. These satellites will be placed in a 470 km low-Earth circular orbit with a 55° inclination. The mission's objectives are:

- Demonstrating precision manoeuvres to rendezvous and dock the satellites.
- Validating the transfer of electrical power between docked spacecraft.
- Operating payloads post-undocking, with a mission life of up to two years.

ISRO stated that the PSLV-C60 vehicle has been fully integrated and moved to the First Launch Pad for final checks ahead of the mission.

A Step Towards India's Space Station

“The SpaDEX mission is crucial for India's ambitions in space exploration,” said an ISRO official. “It positions India to become the fourth country globally to achieve advanced docking technology.”

This capability is essential for missions requiring multiple launches to achieve common objectives, such as satellite servicing, formation flying, and assembly of complex structures like the proposed Bharatiya Antariksh Station (BAS).

Innovative Use of PSLV's Fourth Stage

In addition to its docking objectives, the mission will utilise the PSLV's spent fourth stage, named POEM-4 (PSLV Orbital Experimental Module), as a platform for microgravity experiments. A total of 24 payloads, contributed by academic institutions and startups, will be carried on board.

Mission Concept and Execution

The Chaser and Target will be deployed independently but simultaneously into orbit. The PSLV's precision will ensure a small initial relative velocity between the satellites. Using onboard propulsion, the Target will gradually create an inter-satellite separation of 10-20 km, known as the Far Rendezvous phase.

The Chaser will then approach the Target in stages, reducing the distance progressively to 5 km, 1.5 km, 500 m, 225 m, 15 m, and finally 3 m, where docking will occur. Once docked, the mission will demonstrate power transfer between the spacecraft before undocking them for payload operations.

Why SpaDEX Matters

The SpaDEX mission is not just a technological demonstration; it is a stepping stone for ISRO's larger goals. The ability to dock spacecraft is crucial for ambitious projects like lunar sample-return missions, interplanetary exploration, and building a sustained human presence in space.

India aims to join an elite group of nations—currently the US, Russia, and China—that have mastered in-space docking technology. This mission underscores ISRO's commitment to developing cost-effective yet highly advanced space capabilities.

With the countdown underway, SpaDEX is poised to showcase India's growing expertise in space exploration. The mission promises to unlock new avenues for research and collaboration, solidifying India's role as a key player in the global space community.

https://economictimes.indiatimes.com/news/science/spadex-all-you-need-to-know-about-isros-groundbreaking-space-docking-mission/articleshow/116618904.cms

THE ECONOMIC TIMES

Tue, 24 Dec 2024

This Christmas, the fastest human-made object will pass the sun at 430,000 mph—250 times faster than a bullet

On Christmas Eve, NASA's Parker Solar Probe made history by passing closer to the sun than any previous mission while setting a new speed record for human-made objects. The spacecraft flew within 3.8 million miles of the sun's surface, traveling at an unprecedented speed of 430,000 mph.

First human-made object to explore a star's atmosphere

The probe, launched in 2018, has been inching closer to the sun with each of its 21 previous flybys. This mission, a collaboration between NASA and the Johns Hopkins Applied Physics Laboratory, aims to deepen our understanding of the sun's atmosphere, solar wind, and related phenomena.

The challenges of flying close to the sun

The mission is not without its risks. The probe is designed to withstand temperatures nearing 2,000 degrees Fahrenheit, thanks to an advanced heat shield. Despite its success, mission scientists remain cautious.

Exploring the Alfvén surface and beyond

During its most recent perihelion, Parker ventured into an unexplored region of the sun's atmosphere, below the Alfvén surface, where the solar wind originates. This area offers a unique opportunity to study the mechanisms that accelerate solar wind and heat the sun's corona.

A mission timed with solar maximum activity

The probe's timing aligns with the solar maximum, the sun's most active phase, increasing the likelihood of observing dramatic solar events. The spacecraft has already endured coronal mass ejections and other solar phenomena.

A historic mission with lasting implications

The Parker Solar Probe's mission is a culmination of decades of planning, featuring groundbreaking discoveries such as magnetic "switchbacks" that propel solar wind and the identification of a dust-free zone near the sun. Its success could pave the way for protecting Earth from space weather and furthering the search for life in other star systems.

The spacecraft, named after solar physicist Eugene Parker, has enough fuel for several more years and two additional perihelions in 2025. After this mission, no future probe is planned to venture closer to the sun.

The Parker Solar Probe continues to push the boundaries of space exploration, with its best discoveries potentially still ahead.

https://economictimes.indiatimes.com/news/science/this-christmas-the-fastest-human-made-object-will-pass-the-sun-at-430000-mph250-times-faster-than-a-bullet/articleshow/116631545.cms

THE HINDU

Wed, 25 Dec 2024

U.S. and China renew bilateral S&T Agreement | Explained

On December 13, China and the U.S. agreed to extend the Agreement between China and USA on Co-operation in Science and Technology for an additional five years, effective from August 27, 2024. They also signed a protocol to amend it. With that the uncertainty over the Agreement's continuation came to an end.

Observers have welcomed the development as an affirmation of science and technology cooperation between the two major powers. The incoming Donald Trump administration is also likely to endorse its continuation.

The Agreement was first signed on January 31, 1979, by Chinese leader Deng Xiaoping and U.S. president Jimmy Carter at a time when both countries had established diplomatic relations and agreed to cooperate on agricultural research and technology. Since then the Agreement has been renewed every five years as well as expanding in scope. It was due to be renewed in 2023 but was extended for six months in August 2023 and again in February 2024, paving the way for a fresh renewal.

The Agreement is governed by the US-PRC Joint Commission on Scientific and Technological Cooperation; the U.S. and China each appoint co-chairs and an agency from each country is nominated as the 'executive agent'. There are also additional protocols between agencies and 40 sub-agreements in different areas, from agriculture to nuclear fusion.

Bilateral S&T agreements

Bilateral science and technology agreements have been key to promote cooperation in these fields. Often there are specific agreements or cooperation pacts as part of a larger engagement framework. While these agreements don't mention specific investments in science and technology, they often pave the way for forms of cooperation that aren't confined to state institutions. They also facilitate joint research, mobility between the countries for students and scientists, and encourage institutional cooperation, and set up bilateral research centers. India has such bilateral agreements with 83 countries.

This said, while countries routinely sign such agreements as part of routine engagements, both countries need to have the capacity and the intention to pursue the cooperation earnestly for the instruments to succeed. Token initiatives have never cut it. In this regard, the Agreement between China and the U.S. is probably the most successful of its kind.Ironically, however, its very success also called its future into question.

The renewed Agreement

Conflicts between the U.S. and China, particularly over the export of certain technologies to China and concerns about China overtaking the U.S. in science and technology indicators, have become sticking points of late. To address them, the newly amended Agreement has measures to enhance provisions for researcher safety and data reciprocity.

Also the collaboration will henceforth be confined to the intergovernmental level, to basic research, and to previously identified themes of mutual benefit (including, for example, earthquake studies and basic health). The instrument will also exclude cooperation in critical and emerging technologies to assuage stakeholders that China won't extract disproportionate benefits — especially (and allegedly) at the U.S.'s expense — from the Agreement.

Indeed, the last concern isn't restricted to the fringe: experts who reviewed the Agreement flagged China's ability to make better use of the research ecosystem as well as concerns over intellectual property rights. One report by the Congressional Research Service stated: "In 2017, U.S. patent and trademark officials identified over 400 [Chinese] patents tied to [Agreement] projects that [China] commercialised without U.S. commercial benefit."

So before the Agreement was renewed this year, the U.S. was faced with three options: to renew it as usual for five years, to rescind it or to renew it with new measures to restrict the scope and add

additional conditions. The U.S.'s decision to opt for the third option implies that while there are deep concerns about the Agreement's continued usefulness to the U.S., the outgoing administration would rather not altogether allow it to expire or rescind it.

China expanded its cooperation on science and technology in the 1970s by signing agreements with the U.S. and the European Union; until then these deals had been restricted to some east European countries and the erstwhile Soviet Union. Between then and now, the country has emerged as a strong contender for the leadership of global science. According to one February 2024 paper written for the U.S. National Academies of Sciences, Engineering, and Medicine, China's spending on research and development (R&D) increased from $375 million in 1979 to $442 billion in 2021, second only to the U.S. In 1985, there were 2,770 Chinese undergraduate students in the U.S. but in 2000 there were 109,525. Concomitantly, both the number of papers coauthored by Chinese and U.S. authors and the variety of fields in which this has happened have increased.

On the back of these data, in fact, Deborah Seligsohn of the Centre for Strategic and International Studies, Washington, DC, has argued that the U.S. wasn't poorly served by the Agreement and has received significant value as well.

For the same reasons, the incoming Trump administration isn't likely to rescind the new agreement, although it might tack on more conditions and further limit its scope. Then again it will still be valuable to China because it keeps the door open for nonzero cooperation on science and technology, including to promote the mobility of its researchers. Likewise, the U.S. could maintain a handle on China's rise to strength vis-à-vis science and technology rather than lose all leverage.

In sum, the Agreement teaches us that while bilateral science and technology agreements are important, making the best use of them demands capacity-building and sustained investment in R&D. Otherwise the participating countries won't be able to absorb the principal advantages such agreements generate. The Agreement catalysed China's transformation from a 'junior partner' in 1979 to a formidable competitor in 2024. Even if the U.S. deems its success to be 'extreme', the Agreement forces the two countries to respond to each other's concerns using the language of science and technology and cooperation.

https://www.thehindu.com/sci-tech/science/us-and-china-renew-bilateral-st-agreement-explained/article69025966.ece

THE HINDU

Tue, 24 Dec 2024

A beginner's guide to quantum computing | Explained

Over the last decade or so, quantum computing has become the talk of computer town. Their potential to solve complex problems much faster than classical computers is an intriguing proposition that could benefit, if not transform, several industries.

The working of a quantum computer is based on the principles of quantum mechanics, an area of physics that deals with the smallest particles in the universe.

Physicist Richard Feynman proposed the idea of developing a computer to simulate quantum systems in 1982. He discussed the idea of a universal computer that could simulate all physics — both quantum and classical. Researchers realised classical computers, the computers of today, would struggle with the complexity of quantum systems and thus the idea of a quantum computer was born.

Since then, scientists have made significant progress in quantum computing.Basics of quantum computingClassical computers work on the principles of classical physics. Their fundamental computing unit is the bit: each bit represents one piece of information with two possible values, 0 or 1. It is possible to represent all types of information as a combination of 0s and 1s using the binary system.

Quantum computers rely on quantum bits or qubits to perform computations. Unlike classical bits, qubits can exist in the states 0, 1 or in a state that's partly 0 and partly 1. In this context, state refers to all the possible values the qubit can have.

The ability of qubits to be in two states is known as superposition. Superposition is one of two fundamental principles that animate quantum computers.Imagine a spinning coin. While the coin is spinning, it can be both heads or tails, and it isn't until the coin collapses that you can see which it is. A qubit is like a spinning coin that holds both values simultaneously.

When a qubit is measured, it collapses to one of the values, 0 or 1. This means while a classical bit holds one unit of information, a qubit can hold two. Because of this quantum computers can perform multiple computations simultaneously, with the measurement revealing one of the possible outcomes of the computations.

The second fundamental principle upon which quantum computers are based is called entanglement. This phenomenon allows qubits to be intrinsically linked no matter how far apart they physically are. Albert Einstein famously called it "spooky action at a distance".

So measuring the state of one of the qubits could immediately yield information about the state of the other. Say you have a pair of gloves. Each glove is put in a separate box and sent to different locations, and we don't know which box has which. But once a box is opened to reveal the left glove, we instantly know the other box has the right glove.

The instantaneous correlation between qubits allows shared information to be processed simultaneously, speeding up computations that would take far longer with classical computers.Superposition and entanglement can't be described by classical theories of physics. They are exclusive to quantum mechanics — and central to the potential that quantum computers have to offer.

Significant milestones

Quantum computers are technologically superior but this doesn't automatically mean they will be better than classical computers at different tasks.

Over the years, experts have developed and honed specific tasks that prove quantum computers are capable of greater feats, and also show how.

In 1994, Bell Labs computer scientist Peter Shor created the famous Shor's algorithm. The algorithm could factorise (or find the factors of) large numbers in moments rather than the millions of years required by classical computers.This has major implications for data security. Current methods to secure data involve locking the data and hiding the key to unlock it in the solution of a difficult mathematical problem.

Large-number factorisation is one such problem and classical computers require enormous amounts of resources to solve it. But using Shor's algorithm, a quantum computer could quickly solve the problem and open the locks.

The state of quantum computing came a long way in the next 25 years. In 2019, for example, IBM unveiled the world's first circuit-based commercial quantum computer Q System One. Circuit-based designs are believed to be the most versatile for general quantum-computing applications.

Q System

One uses quantum circuits composed of quantum gates that manipulate qubits, analogous to how classical computers use logic gates.In the same year, researchers at Google reported in a paper in Nature that their 53-qubit 'Sycamore' processor had achieved quantum supremacy.

A quantum computer achieves quantum supremacy when it can solve a problem that would take classical computers an unreasonable amount of time. The paper claimed Sycamore completed a task in 200 seconds that would take a supercomputer 10,000 years.

Earlier this month, in fact, Google unveiled a quantum chip called Willow, purportedly the world's first quantum processor in which error-corrected qubits improve as they scale.

Quantum states are easily prone to errors due to interactions with the environment. Quantum computers need error correction to hold information long enough to perform useful calculations with them.

Willow, Google has said, can finish a standard test in five minutes whereas the same calculation would take today's best supercomputers 10 trillion trillion years.

Present limitations

The advancements are flying thick and fast but there are still many significant challenges to overcome before quantum computers can become (relatively) common.

The chief concern is that building quantum computers remains expensive and complex. Keeping many qubits stable is also difficult because of error rates and decoherence (when a qubit loses superposition because of noise from its surroundings).

The problems for which we really need quantum computers — like discovering new drugs or cracking mysteries in astronomy — also require millions of qubits.

All said, their potential to be useful is clear. This is why India launched the National Quantum Mission in 2023. The government has set aside ₹6,000 crore for the mission to be spent over eight years, among other things to develop quantum computers.

https://www.thehindu.com/sci-tech/science/a-beginners-guide-to-quantum-computing-explained/article69022446.ece

THE TIMES OF INDIA

Tue, 24 Dec 2024

India's push for indigenous satellites draws 30 aspirants

30 companies have answered a call from the Indian National Space Promotion and authorisation centre (IN-SPACe) to create Earth observation (EO) satellite constellations.Launched through an expression of interest (EoI) in July, the initiative aims to establish a private-public partnership to reduce the nation's dependence on foreign data sources for defence, infrastructure, and mapping needs.

"We have received nine applications, with each representing a consortium of companies," said Pawan Goenka, chairman of IN-SPACe. These consortia comprise startups such as Pixxel and SatSure, backed by Google and Baring private equity, respectively, along with major players like Tata advanced systems.

IN-SPACe's eligibility criteria require applicants to raise or invest at least Rs 850 million in space projects, have a valuation of Rs 8.5 billion, or demonstrate a turnover of Rs 2 billion over the past three years. Applicants must also set up spacecraft control centres in India or collaborate with ground station service providers.

The government plans to provide the winning bidder a Rs 3.5 billion loan, with private firms funding the remaining costs. A tender process will follow technical evaluations, expected by January's end.

This initiative is part of India's broader strategy to grow its small satellite and data services market, which is projected to reach $45 billion by 2030. Since opening the sector to private players, India has established a Rs 10 billion venture fund for space startups.

While India's EO data currently relies on foreign sources like ESA and Isro, this programme underscores a shift toward self-reliance and greater private sector involvement.

https://timesofindia.indiatimes.com/science/indias-push-for-indigenous-satellites-draws-30-aspirants/articleshow/116626525.cms

Tue, 24 Dec 2024

Quantum teleportation demonstrated on busy internet cables for first time

Researchers from Northwestern University have successfully demonstrated quantum teleportation of a fibre optic cable that is already relaying internet traffic for the first time. Quantum teleportation has the potential to provide quantum connectivity over incredibly large distances. The advancement paves the way for developing quantum applications without specialised infrastructure, and deploying quantum communication at scale without dedicated distributed quantum sensing infrastructure. Apart from being ultra-fast, quantum communication is also incredibly secure. Quantum teleportation works on the principle of quantum entanglement, a phenomenon that even stumped Einstein, that links a pair of particles together irrespective of distances.

Instead of the particles themselves carrying the information, the information can be exchanged over arbitrary distances without physically carrying it. While the signals for both conventional and quantum communications are converted to right, classical communications rely on millions of photons, while quantum information use single photons. There is however a requirement to set up the method for decoding the transmitted information in advance. A destructive measurement of a single photon, transfers the quantum state to an entangled photon at any difference, resulting in the 'teleportation', and allowing for the information to be instantaneously exchanged over arbitrary distances.

The secret is in choice of wavelengthsBefore the demonstration, the conventional understanding was that the photons streaming through the internet would drown out the entangled photons. The researchers developed a method to steer the entangled photons away from the busy traffic, by studying how light scatters within fibre optic cables, and identifying a less crowded wavelength, and incorporating special filters to minimise noise from the regular photons carrying internet traffic. A paper describing the findings has been published in Optica.

Lead author of the study Prem Kumar says, "This is incredibly exciting because nobody thought it was possible. Our work shows a path towards next-generation quantum and classical networks sharing a unified fiber optic infrastructure. Basically, it opens the door to pushing quantum communications to the next level."

https://www.news9live.com/science/quantum-teleportation-demonstrated-on-busy-internet-cables-for-first-time-2781060