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India draws up nations' list for Akash, BrahMos export

By Rajat Pandit

New Delhi: In its quest to emerge as a major arms exporter and bolster strategic ties with “friendly” countries, India has drawn up a list of nations to whom the Akash surface-to-air missile systems, BrahMos supersonic cruise missiles and other weapons can be sold in the years ahead. The case for exporting BrahMos missiles, developed jointly with Russia, to the Philippines is already with the cabinet committee for security for final approval, say defence sources.

The second country on the list is Indonesia, while Vietnam, UAE, Saudi Arabia and South Africa have also shown an interest in acquiring the BrahMos, which has emerged as the “precisionstrike weapon of choice” for Indian armed forces.

There are nine countries, in turn, which have shown interest in the indigenously developed Akash missile systems, which can intercept hostile aircraft, helicopters, drones and subsonic cruise missiles at a range of 25km. They are Kenya, Philippines, Indonesia, UAE, Bahrain, Saudi Arabia, Egypt, Vietnam and Algeria.



“Being over 96% indigenous, there is no need to seek any third country’s concurrence to export Akash. For BrahMos, Russia has to be on board,” said a source.

Though the range of BrahMos is now being extended to over 400km, with India and Russia even planning to test an 800km variant this year, the export version will be the 290km one. “This is due to the Missile Technology Control Regime (prevents proliferation of missiles over 300-km range) and some other issues,” said the source.

The Akash export version will also be slightly different from the one inducted by the armed forces. The 100-km range air-to-air Astra missiles, now entering production after successful trials from Sukhoi-30MKI fighters, also have “good export potential”, said sources.

India will have to export “bigger weapon systems” if it wants to come anywhere near the ambitious annual target of \$5 billion (Rs 36,500 crore) by 2025. Towards this end, the Union Cabinet on December 30 approved the export of Akash systems.

It also set up a committee of defence minister Rajnath Singh, external affairs minister S Jaishankar and national security adviser Ajit Doval to “authorise subsequent exports” to various countries in an expeditious manner.

Both BrahMos and Akash are “tried, tested and successfully inducted systems”. Indian armed forces have ordered Akash systems worth Rs 24,000 crore over the years, with another contract for Rs 10,000 crore on the way now. Contracts for BrahMos have crossed Rs 36,000 crore.

<https://timesofindia.indiatimes.com/india/india-draws-up-nations-list-for-akash-brahmos-export/articleshow/80144307.cms>

आखिर ऐसा क्या खास है भारत में बने आकाश मिसाइल सिस्टम में, जो वियतनाम से लेकर UAE तक सबको ये चाहिए

आकाश जमीन से हवा में हमला करने वाला एक मिसाइल सिस्टम है। सीसीएस की मंजूरी मिलने के बाद आकाश मिसाइल को कुछ मित्र देशों जिसमें कुछ आसियान के देश जैसे वियतनाम और फिलीपींस भी शामिल हैं, उन्हें निर्यात किया जाएगा।

पिछले दिनों प्रधानमंत्री नरेंद्र मोदी की अध्यक्षता वाली कैबिनेट सुरक्षा समिति (सीसीएस) ने स्वदेशी आकाश मिसाइल सिस्टम के निर्यात पर मोहर लगाई है। आकाश मिसाइल सिस्टम फिलहाल सेना और वायुसेना दोनों में ही शामिल है। भारत ने पांच बिलियन डॉलर तक के रक्षा निर्यात का लक्ष्य तय किया है और आकाश मिसाइल के निर्यात की मंजूरी इसी दिशा में एक बड़ा कदम है। आकाश जमीन से हवा में हमला करने वाला एक मिसाइल सिस्टम है। सीसीएस की मंजूरी मिलने के बाद आकाश मिसाइल को कुछ मित्र देशों जिसमें कुछ आसियान के देश जैसे वियतनाम और फिलीपींस भी शामिल हैं, उन्हें निर्यात किया जाएगा।

भारत का पहला रक्षा निर्यात

जो बयान सीसीएस की तरफ से जारी किया गया, उसमें कहा गया, 'कैबिनेट की मंजूरी के साथ भारतीय उत्पादकों ने रिक्वेस्ट फॉर प्रपोजल हिस्सा लिया जिसे कई देशों की तरफ से जारी किया गया था। मित्र देशों ने सेनाओं में शामिल होने के बाद देश में बनी आकाश मिसाइल को खरीदने की इच्छा जताई है।' जो आकाश मिसाइल निर्यात की जाएगी, वह उस सिस्टम से पूरी तरह से अलग है जिसे सेनाएं फिलहाल प्रयोग कर रही हैं। आकाश मिसाइल सिस्टम पहला ऐसा हथियार है जो भारत में बना है और जिसे निर्यात किया जाएगा। भारत फास्ट पेट्रोल बोट्स, हेलीकॉप्टर्स और दूसरे हथियारों के साथ ही अंतरराष्ट्रीय ग्राहकों के लिए रडार्स भी तैयार कर रहा है।



आकाश मिसाइल सिस्टम पहला ऐसा हथियार है जो भारत में बना है और जिसे निर्यात किया जाएगा।

2014 में हुई वायुसेना में शामिल

आकाश मिसाइल को भारतीय वायुसेना में सन् 2014 में और सेना में 2015 में शामिल किया गया था। इसकी रेंज 25 किलोमीटर है। इसकी वजह से ही यह हेलीकॉप्टर्स, फाइटर जेट्स और ड्रोन को कई संवेदनशील संस्थानों पर हमला करने में मदद करती है। इस मिसाइल के 96 प्रतिशत तक सिस्टम पूरी तरह से देश में तैयार हैं। मिसाइल गुप मोड या फिर ऑटोनोमस मोड में एक साथ कई टारगेट्स को निशाना बना सकती है। आकाश मिसाइल बिल्ट-इन-इलेक्ट्रॉनिक काउंटर-काउंटर मेजर्स (ईसीसीएम) फीचर्स से लैस है। इस पूरे सिस्टम को मोबाइल प्लेटफॉर्म पर कनफिगर किया जा चुका है।

मेक इन इंडिया की सक्सेस स्टोरी

इसे डिफेंस रिसर्च एंड डेवलपमेंट ऑर्गनाइजेशन (डीआरडीओ) की तरफ से डिजाइन किया गया है और इसे पब्लिक सेक्टर यूनिट भारत इलेक्ट्रॉनिक्स लिमिटेड (बीईएल) की तरफ से डेवलप किया जा रहा है। कई देशों की तरफ से ब्रह्मोस मिसाइल को खरीदने की भी इच्छा जताई गई है जिसे रूस के साथ मिलकर तैयार किया गया है। लेकिन आकाश मिसाइल पहली पसंद बन गई है। आकाश मिसाइल सिस्टम 'मेक इन

इंडिया' पहल की सफलता का बड़ा उदाहरण है। माना जा रहा है कि वियतनाम आकाश मिसाइल सिस्टम का पहला ग्राहक बन सकता है। इसके अलावा यूएई की तरफ से भी इसे खरीदने की इच्छा जताई गई है। वैज्ञानिकों की मानें तो आकाश मिसाइल की विभिन्नताएं इसे पसंदीदा हथियार बनाती हैं।

हर मौसम में दुश्मन पर करेगी वार

आकाश मिसाइल हर मौसम और हर ऊंचाई पर प्रभावी तरीके से काम करती है। यह लद्दाख में ठंडी जगह पर भी दुश्मन को निशाना बना सकती है तो थार के रेगिस्तान में भी दुश्मन को पलभर में ढेर कर देती है। इसकी यही खासियत इसे बाकी मिसाइल सिस्टम से अलग बनाती है। इस मिसाइल सिस्टम को बहुत ही बेसिक डिजाइन के तहत डेवलप किया गया है। इसका कमांड कंट्रोल सिस्टम, सॉफ्टवेयर, लॉजिस्टिक्स भी पूरी तरह से देश में बने हैं। इस वजह से भारत हमेशा ही मिसाइल के खरीदार की जरूरत को पूरा करने में सक्षम होगा।

लद्दाख में तैनात है आकाश

भारत और चीन के बीच पिछले आठ माह से पूर्वी लद्दाख में तनाव जारी है। लाइन ऑफ एक्चुअल कंट्रोल (एलएसी) पर टकराव के बीच ही इंडियन एयरफोर्स (आईएएफ) ने दिसंबर में आकाश एयर डिफेंस मिसाइल सिस्टम का टेस्ट किया था। भारत की तरफ से गलवान घाटी हिंसा के बाद ही आकाश एयर डिफेंस मिसाइल सिस्टम को तैनात कर दिया गया था। आकाश, एयर डिफेंस सिस्टम 40 किलोमीटर के दायरे में हवा में मौजूद किसी भी टारगेट को आसानी से ध्वस्त कर सकता है। यह मिसाइल सिस्टम कॉम्बेट एयरक्राफ्ट को कुछ ही सेकेंड्स में निशाना बना सकता है। इसमें कुछ अपग्रेडेशन हुआ है और इसके बाद यह पहाड़ों में तैनाती के योग्य हो गया है।

<https://www.ltv9hindi.com/knowledge/what-makes-indian-akash-missile-system-to-special-that-everybody-wants-it-450225.html>



Thu, 07 Jan 2021

Indian Air Force set to sign a whopping \$7 billion deal for Tejas fighter jets & C-295 Aircraft – Report

The indigenous Tejas will have a bigger force multiplier effect on the Indian industry reeling under the impact of the lockdown and economic downturn owing to the Covid-19 pandemic

By Smriti Chaudhary

The two long-standing deals for the Indian Air Force worth approximately Rs 50,000 crore are expected to get approval this year bringing in the 83 indigenous Tejas fighters and 56 medium-transport C-295 aircraft.

The new Tejas aircraft contract worth over Rs 37,000 crores will mark the biggest-ever deal in the indigenous military sector, *The Times of India (TOI)* said in a report. It further revealed that the Tejas deal and Tata-Airbus joint venture may get the final approval from the Cabinet Committee on Security (CCS) to deliver 83 indigenous Tejas Mark 1A fighters and 56 twin-turboprop C-295



HAL Tejas1 – Wikimedia Commons

aircraft to the air force.

Delivery of the Tejas Mark 1As will start within three years of the contract being signed and will conclude with all aircraft delivered in five years.

The indigenous Tejas will have a bigger force multiplier effect on the Indian industry reeling under the impact of the lockdown and economic downturn owing to the Covid-19 pandemic. More importantly, it is a huge step towards creating a multi-tiered defense industrial ecosystem.

“A Rs 39,000 crore order will have a force multiplier effect of nearly seven or eight times on the economy—jobs will be created, work will be outsourced, there is going to be a tremendous downstream effect on Tier 2 and Tier 3 manufacturing in the high-tech defense aviation sector,” a Hindustan Aeronautics Limited (HAL) official earlier said.

Earlier, the price of 83 Light Combat Aircraft (LCA) Mark 1A Tejas aircraft was pegged at around Rs 56,500 crore but the air force cut down on its demand list including spares, logistics support, and other issues. HAL slashing its profit of 12 percent to a little over 6 percent bought down the total price at Rs 39,000 crore.

Reportedly, the new order of Tejas fighters will have 43 improvements over the Mark 1A already ordered by the air force. While the Aeronautical Development Agency (ADA) is developing the Mark 2 fighter, HAL is building the Mark 1A, with ADA contributing its expertise in avionics, flight controls, aerodynamics, and structural analysis.

ADA chief Girish Deodhare described Tejas Mark 1A fighter as a bridge between the current Tejas Mark 1 and the Mark 2 fighter that the agency is developing. He says the latter will be, from the standpoint of size, sophistication, and capability, far superior to the Mark 1 fighter.

While the Mark 1A light fighter will have the same fuselage and General Electric (GE) F-404 engine as the Mark 1, the Mark 2 will be a significantly larger medium fighter with the more powerful GE F-414 engine.

The Tejas Mark 1A is touted as a game-changer bringing in the required strength to indigenous aircraft projects in the country.

The Tata Airbus C-295 aircraft will replace the Indian Air Force’s fleet of Avro-748 aircraft. Reportedly, the first 16 aircraft will be built by Airbus in their facility and the rest will be built in India under the joint venture through technology transfer from Airbus to Tata.

According to Group Captain Kishore Kumar Khera, a Research fellow at Manohar Parrikar Institute for Defense Studies and Analysis, the Transfer of technology for C295 will take place in three distinct phases. “In Phase I, the focus will be on the Indian partner’s ability to assemble the aircraft from fully/semi-knocked down kits.

In the next phase, technology and wherewithal transfer may generate the ability to manufacture low technology and low-cost components. In the final phase, most parts of the aircraft could be manufactured in India,” he wrote.

The two contracts are expected to give a boost to India which is involved in a fiery standoff with China in the east and frequent border firing with Pakistan in the north.

<https://eurasianimes.com/indian-air-force-set-to-sign-a-whopping-7-billion-deal-for-tejas-fighter-jets-c-295-aircraft-report/>

इस साल होगी देश की सबसे बड़ी डिफेंस डील, यहां जानिए पूरी बात

डिफेंस पीएसयू हिन्दुस्तान एयरोनॉटिक्स (HAL) के साथ 83 तेजस मार्क-1ए की खरीद के लिए 37,000 करोड़ रुपये का सौदा स्वदेशी मिलिट्री एविएशन सेक्टर के इतिहास में सबसे बड़ा सौदा होगा। इन विमानों की आपूर्ति सौदे पर हस्ताक्षर होने के तीन साल बाद शुरू होगी।

By Dil Prakash

हाइलाइट्स:

- इस साल होंगे 50 हजार करोड़ रुपये से अधिक के दो सौदे
- HAL के साथ 83 तेजस मार्क-1ए की खरीद के लिए 37,000 करोड़ रुपये का सौदा
- 56 मीडियम ट्रांसपोर्ट एयरक्राफ्ट के लिए टाटा-एयरबस के जॉइंट वेंचर के साथ सौदा

नई दिल्ली: भारतीय रक्षा उद्योग के लिए नए साल में अच्छी खबर है। लंबे समय में पेंडिंग दो रक्षा सौदे इस साल अंजाम तक पहुंचने वाले हैं। ये सौदे सैन्य विमानों की खरीद से जुड़े हैं और इनकी कुल राशि 50,000 करोड़ रुपये से अधिक है। 83 स्वदेशी तेजस विमानों की खरीद के लिए हिन्दुस्तान एयरोनॉटिक्स (HAL) के साथ करार होगा। दूसरा सौदा 56 मीडियम ट्रांसपोर्ट एयरक्राफ्ट के लिए टाटा-एयरबस के जॉइंट वेंचर के साथ होगा। इन पर अगले कुछ महीनों में हस्ताक्षर हो सकते हैं।

डिफेंस पीएसयू हिन्दुस्तान एयरोनॉटिक्स के साथ 83 तेजस मार्क-1ए की खरीद के लिए 37,000 करोड़ रुपये का सौदा स्वदेशी मिलिट्री एविएशन सेक्टर के इतिहास में सबसे बड़ा सौदा होगा। इन विमानों की आपूर्ति सौदे पर हस्ताक्षर होने के तीन साल बाद शुरू होगी। इसमें तेजस मार्क-1 की तुलना में 43 इम्प्रूवमेंट होंगे। वायुसेना पहले ही 40 तेजस मार्क-1 का ऑर्डर दे चुकी है।

कितने साल में मिलेंगे विमान

56 ट्विन टर्बोप्रॉप सी-295 एयरक्राफ्ट बनाने का टाटा-एयरबस का प्रोजेक्ट में पहला मौका होगा जब भारत की कोई निजी कंपनी डिफेंस एयरोस्पेस सेक्टर में प्रवेश करेगी। ये विमान वायुसेना के एवरो-748 विमानों की जगह लेंगे। अनुबंध पर हस्ताक्षर होने के दो साल के भीतर एयरबस 16 विमानों की आपूर्ति करेगी। उसके बाद 40 विमान आठ वर्षों में भारत में बनाए जाएंगे। शुरुआत में इस प्रोजेक्ट की लागत 11929 करोड़ रुपये आंकी गई थी।



इस साल होगी देश की सबसे बड़ी डिफेंस डील, यहां जानिए पूरी बात

दोनों प्रोजेक्ट मंजूरी के लिए कैबिनेट कमेटी ऑन सिक्योरिटी को भेज दिए गए हैं। एक अधिकारी ने कहा कि कमेटी पहले तेजस प्रोजेक्ट को मंजूरी देगी। इस पर फरवरी की शुरुआत में हस्ताक्षर होने की उम्मीद है। इसके बाद सी-295 को मंजूरी मिलेगी जिसमें टाटा ग्रुप घरेलू प्रोडक्शन एजेंसी के तौर पर शामिल होगा।

<https://navbharattimes.indiatimes.com/business/business-news/hal-and-tatas-set-to-create-history/articleshow/80131475.cms>

India to finalise two mega military deals to procure Tejas fighter jets, 56 transport aircraft for IAF

India is expected to finalise USD 2.5 billion deal to procure 56 transport aircraft for the IAF at a cost of USD 2.5 billion

New Delhi: Moving ahead with its 'Make in India' programme, the government is expected to ink a deal with defence PSU Hindustan Aeronautics Limited (HAL) for 83 Tejas Mark-1A fighter jets for the Indian Air Force (IAF) within few months. The deal would be worth over Rs 37,000 crore and it would be the biggest-ever deal in the indigenous military aviation sector.

India is also expected to finalise USD 2.5 billion deal to procure 56 transport aircraft for the IAF at a cost of USD 2.5 billion. The aircraft would replace IAF's Avro planes.

The aircraft will be manufactured by a Tata-Airbus joint venture, a report published in ToI read. As per reports, Airbus will supply 16 C-295 transport aircraft in flyaway condition while 40 planes will be manufactured in India.

Reports also said that the procurement process for the aircraft has almost been completed and a final decision on the deal is likely to be made soon.

In a big boost to Make in India programme, Defence Acquisition Council headed by DEfence Minister Rajnath Singh approved proposals to procure equipment worth Rs 27,000 crore from domestic industry.

In December 2020, the DAC approved Capital Acquisition proposals of various weapons/platforms/equipment/systems required by the Indian Army, the Indian Navy and the Indian Air Force at an approximate overall cost of Rs 28,000 crore.

Six of the seven proposals, that is, Rs 27,000 crore out of Rs 28,000 crore for which Acceptance of Necessity were granted will be sourced from the Indian industry to give a boost to the 'Make in India' and 'Atmanirbhar Bharat' initiatives of the government.

Acquisition proposals approved included the DRDO designed and developed Airborne Early Warning & Control (AEW&C) Systems for the Indian Air Force, Next Generation Offshore Patrol Vessels for the Indian Navy and Modular Bridges for the Indian Army.

<https://www.timesnownews.com/india/article/india-to-finalise-two-mega-military-deals-to-procure-tejas-fighter-jets-56-transport-aircraft-for-iaf/703446>



MRSAM: DRDO की बड़ी कामयाबी, Israel के सहयोग से Surface to Air Missile डिफेंस सिस्टम का सफल परीक्षण

MRSAM सिस्टम आज के दौर की चुनौतियों को ध्यान में रखते हुए तैयार किया गया है। इजरायली रक्षा कंपनी के अधिकारी लेवी ने कहा, 'ट्रायल में मिली कामयाबी महत्वपूर्ण है। DRDO के साथ काम करना गर्व की बात है। हम आगे भी साथ चलने के लिए प्रतिबद्ध हैं।'

खास बातें

1. अभेद हुई भारत की आसमानी सरहद की सुरक्षा
2. नए मिसाइल डिफेंस सिस्टम का कामयाब परीक्षण
3. इजरायल-भारत के सहयोग से विकसित हुई तकनीक

जेरुसलम: भारत (India) और इजरायल (Israel) ने सतह से हवा (Surface-to-Air Missile) में मार करने वाली मिसाइल रक्षा प्रणाली का कामयाब परीक्षण किया है। दुश्मन देशों के हवाई हमले से निपटने के लिए संयुक्त रूप से विकसित हुए इस मिसाइल डिफेंस सिस्टम का परीक्षण पिछले हफ्ते हुआ। डीआरडीओ (DRDO) और इजराइल एयरोस्पेस इंडस्ट्रीज (IAI) की नई ईजाद अपने आप में अनूठी है। जिससे पार पाना किसी के बस की बात नहीं होगी।



इंडो-इजरायल रक्षा सहयोग का नतीजा है MRSAM

MRSAM एक ऐसा एयर और मिसाइल डिफेंस सिस्टम है जो विभिन्न प्रकार के एरियल प्लेटफार्म्स को अभेद सुरक्षा कवच प्रदान करता है। रक्षा विशेषज्ञों के मुताबिक MRSAM दुश्मन के विमानों को खुद से 50 से 70 Km की दूरी पर तबाह कर सकता है। इजरायल और भारत की साझेदारी में विकसित, MRSAM का उपयोग भारतीय सेना के तीनों विंग्स में होगा। इजरायल (Israel) के सुरक्षा बल भी इसका इस्तेमाल करेंगे। इसमें मौजूद हाईटेक रडार, मोबाइल लॉन्चर, इंटरसेप्टर, एडवांस आरएफ सीकर नई तकनीक से बना है। डिफेंस सिस्टम की कमांड और नियंत्रण प्रणाली भी बेहतरीन है।

डीआरडीओ के साथ काम करना गर्व की बात: IAI

इजरायल की रक्षा कंपनी IAI के सीईओ बोज लेवी के मुताबिक कोरोना काल की चुनौतियों के बीच तैयार हुआ ये MRSAM (Air & Missile Defense System) डिफेंस सिस्टम आज के दौर की चुनौतियों को ध्यान में रखते हुए बनाया गया है। लेवी ने कहा, 'ट्रायल में मिली ये कामयाबी बेहद महत्वपूर्ण है। वहीं डीआरडीओ के साथ काम करना हमारे लिए गर्व की बात है। कामयाबी के इस रास्ते पर हम आगे भी साथ चलने पर प्रतिबद्ध हैं।'

इजरायल के रक्षा उत्पादों की दीवानी है दुनिया

इजरायली रक्षा उद्योग की ओर से आई प्रतिक्रिया के मुताबिक, 'हमारे एक्सपर्ट्स और भारतीय वैज्ञानिकों की मौजूदगी में हुआ परीक्षण कामयाब रहा। इस दौरान हमने उड़ान परीक्षण के विभिन्न संदर्भों

का बारीक आंकलन किया। जो हर मानक पर कामयाब रहा। इजरायल के सहयोग से बने और भारत के सुरक्षा बेड़े में इस ब्रह्मास्त्र का वार अचूक है। इस नए रक्षा कवच को नापाक हरकतों को अंजाम देने वाले दुश्मनों के लिए एक झटका माना जा रहा है।

<https://zeenews.india.com/hindi/world/india-israel-defence-tie-ups-india-and-israel-successfully-test-surface-to-air-missile-defence-system/822365>



Thu, 07 Jan 2021

Big boost to DRDO as India, Israel successfully test MRSAM air defence system

The Medium-Range Surface-to-Air Missile (MRSAM) defence system was tested at an Indian facility and validated all components of the weapons system

Edited By Abhishek Sharma

In a major push to India's defence capabilities, India and Israel have successfully tested a Medium-Range Surface-to-Air Missile (MRSAM) defence system. This missile defence system, developed jointly to deal with airstrikes by enemy countries, was tested last week.

The new development by the DRDO and Israel Aerospace Industries (IAI) is unique in itself and will greatly improve the combat capabilities of the two countries.

MRSAM is an air and missile defence system that provides imprecise defence cover to a variety of aerial platforms. According to defence experts, MRSAM can destroy enemy aircraft from a distance of 50 to 70 km. Developed in partnership with Israel and India, MRSAM will be used in all three wings of the Indian Army. Israel's security forces will also use it. The high-tech radar, mobile launcher, interceptor, and the advanced RF seeker present in it utilise new technology. The command and control system of the defence system is also excellent.



Photo: Twitter/@ILAerospaceIAI

Taking to Twitter, the Israel Aerospace Industries (IAI) wrote: "IAI and DRDO successfully test launch the MRSAM air defence system last week at a test range in India. The MRSAM is an advanced path-breaking air and missile defence system that provides ultimate protection against a variety of aerial platforms."

A press release by Israel Aerospace Industries (IAI) on Tuesday said, last week the test was conducted at an Indian facility and validated all components of the weapons system.

According to Boz Levy, CEO of Israeli defence company IAI, the MRSAM defence system was designed keeping in mind the challenges of today's era. "This success found in the trial is very important. It is a matter of pride for us to work with DRDO. We are committed to walking ahead on this path of success," Levi said.

According to the response from the Israeli defence industry, the test was successfully conducted in the presence of our experts and Indian scientists. During this time, various references of flight tests were assessed which was successful on every standard.

<https://www.dnaindia.com/india/report-big-boost-to-drdo-as-india-israel-successfully-test-mrsam-air-defence-system-2866297>

Thu, 07 Jan 2021

DRDO's Super 30; to support 30 start-ups every year

New Delhi: Defence Research and Development Organisation (DRDO) Chairman, Dr G Satheesh Reddy has said that at least 30 startups should be supported every year to develop innovative products for our forces.

He said this on the 63rd Foundation Day of DRDO establishment.

Addressing the DRDO fraternity, Chairman DRDO highlighted that the academic institutes, R&D organizations and industry need to work together on advanced and futuristic technologies to make India self-reliant in the defence sector.

'A number of SMEs and MSMEs are supplying small components to subsystems for all DRDO projects and have been nurtured by DRDO. Now they have become partners in all new developments.

He stated that DRDO conducted a competition "Dare to Dream" for Startups and very enthusiastic responses have been received," he said.

"At least 30 startups should be supported every year to develop innovative products for our forces," he added.

In his speech, he also called upon DRDO Scientists to focus on next generation needs including cyber security, space and artificial intelligence.

"The immense potential available in DRDO has been a catalyst for the development of industries in the defence manufacturing sector," an official statement from the Defence Ministry said.

DRDO Chairman further said that the latter should make efforts towards strengthening long term ties with the Academia and aim to leverage the academic expertise available in the country and increase the synergy with them.

"DRDO should concentrate on applied research and translational research and then make prototypes from the applied research. The industry should be in a position to adopt these technologies and have necessary infrastructure, and scale these up to market with sustained quality," he added.

He also underlined the need to focus on documentation and productionisation for faster induction and said that many new initiatives towards enabling the industry and empowering youth for Defence R&D will be taken by DRDO.

Chairman DRDO also launched an Online Industry Partner Registration Module to simplify the process of vendor registration. He released the DRDO Monograph on "Issues on Development of Communication Technology using Orbiting Satellites" and also the Environmental Safety Manual and Guidelines for Disposal of Life Expired Chemicals and Gases at DRDO Laboratories.

He stated that an eventful year has passed and a new one is about to begin and asked scientists to innovate and create for the Nation. He said that efforts of DRDO have given a quantum jump to India's self-reliance in defence, contributing towards Aatmanirbhar Bharat.

He highlighted the contributions of DRDO during COVID Pandemic and said that nearly 40 DRDO laboratories developed more than 50 technologies and over 100 products on war footing to develop products & technologies for combating COVID 19 pandemic in India. These included PPE kits, Sanitizers, Masks, UV Based disinfection systems, Germi Klean and critical parts of ventilators leading to ventilator manufacturing in the country in a very short span of time. He further said that DRDO has established three dedicated COVID hospitals at Delhi, Patna and



DRDO's Super 30; to support 30 start-ups every year

Muzaffarpur in a record time for strengthening the medical infrastructure. In addition, Mobile Virology Research and Diagnostics Laboratory (MVRDL) were developed to speed-up the COVID-19 screening and R&D activities at various locations for strengthening the COVID testing capabilities.

DRDO was established in 1958 with just 10 laboratories to enhance the research work in Defence sector and was tasked with designing and developing cutting edge defence technologies for Indian Armed Forces. Today, DRDO is working in multiple cutting edge military technology areas, which include aeronautics, armaments, combat vehicles, electronics, instrumentation, engineering systems, missiles, materials, naval systems, advanced computing, simulation, cyber, life sciences and other technologies for defence.

<https://knnindia.co.in/news/newsdetails/sectors/drdo-super-30-to-support-30-start-ups-every-year>

Defence News

Defence Strategic: National/International



Thu, 07 Jan 2021

IAF Chief RKS Bhadauria assures Arunachal Pradesh of full support during need

RKS Bhadauria on Wednesday assured Arunachal Pradesh of the full support of the Indian Air Force whenever required

Itanagar: Chief of Air Staff Air Chief Marshal RKS Bhadauria on Wednesday assured Arunachal Pradesh of the full support of the Indian Air Force (IAF) whenever required.

Bhadauria, in his maiden visit to the state, called on Governor Brig (Retd) Dr B D Mishra and Chief Minister Pema Khandu and discussed issues pertaining to the national security, recruitment of the state's youth into the force and the IAF's humanitarian missions in Arunachal Pradesh.

The IAF chief assured Khandu of providing Defence pilots to meet the shortage of pilots for fixed-wing civilian aircraft to be operated in the state, an official statement said.

Discussions were held on Advanced Landing Grounds (ALGs) for Dirang and Anini, to which the IAF responded favourably, it said.

Khandu assured the IAF of government cooperation for defence preparedness.

The chief minister expressed gratitude to the IAF for being at the forefront of extending humanitarian assistance in the state, especially during the COVID-19 pandemic.

The governor thanked the IAF for airlifting the people of the state during emergencies and suggested Bhadauria to conduct recruitment rallies to encourage youths from the state to join the force.



IAF chief RKS Bhadauria (Photo | PTI)

He recalled an incident when he had requested the air officer commanding of the Air Force Station in Assam's Tezpur for a helicopter to air-lift a woman with complicated pregnancy from Tawang and it was carried out instantly and effectively.

<https://www.newindianexpress.com/nation/2021/jan/06/iaf-chief-rks-bhadauria-assures-arunachal-pradesh-of-full-support-during-need-2246419.html>

Thu, 07 Jan 2021

Macron's top advisor Emmanuel Bonne to meet NSA Ajit Doval as France turns the screws on Pak

Emmanuel Bonne is expected to call on Prime Minister Narendra Modi and external affairs minister S Jaishankar and hold a meeting with foreign secretary Harsh Shringla on Friday

By Shishir Gupta

New Delhi: French President Emmanuel Macron's top advisor Emmanuel Bonne and National Security Advisor Ajit Doval will tomorrow hold the annual strategic dialogue between the two countries that is expected to review the progress made in the 10,000 megawatt nuclear power plant to be set up in Maharashtra and building the six diesel-electric submarines under project P-75I for the Indian navy. Besides, the two top advisors will also share notes on improving maritime security and developments in the Indo Pacific region, particularly in context of China's aggressive moves.

Bonne, President Macron's diplomatic advisor, is expected to call on Prime Minister Narendra Modi and external affairs minister S Jaishankar and meet foreign secretary Harsh Shringla on Friday.

"The two sides will hold discussions on wide-ranging bilateral and global issues," the external affairs ministry said in a statement ahead of the strategic dialogue that will seek to reinforce deep ties between the two countries. France has been one of India's most reliable partners in Europe for years but the two countries had inched closer over the last few years that led to a deal to buy 36 Rafale aircraft.

When French defence minister Florence Parly was in India last year in context of the induction of the omni-role fighter jets in the Indian Air Force, she and defence minister Rajnath Singh had agreed to stick to the Rafale template of government-to-government deals for future defence purchases.

India is expected to sign a \$2.5-billion contract this year for 56 medium transport aircraft under the Make-in-India initiative. India is also looking at acquisition of six Airbus 330 multi-role transport tanker aircraft for expanding the Indian Air Force (IAF) strike capability through latest mid-air refuelers as well as the Safran aircraft engines under the 'Make in India' programme. The jet engines, which are used by Dassault Aviation for the Rafale jets, could be used to power the twin-engine advanced multi-role combat aircraft developed by the Defence Research and Development Organisation (DRDO) till it develops its own version.

Officials said France had responded positively to New Delhi's concerns about access of military technology to countries which have adversarial relations with India, a reference to Pakistan. France has decided against helping Pakistan upgrade its fleet of Mirage fighter jets, air defence system and Agosta 90B class submarines, a decision that was timed after Prime Minister Imran Khan's loud criticism of French President Macron. Around the same time, France also conveyed to Qatar, which had earlier bought Rafale jets for its air force, not to allow any Pakistan-origin technicians near the aircraft for maintenance.



National Security Advisor Ajit Doval will lead the Indian team at the annual strategic dialogue with French President's diplomatic advisor Emmanuel Bonne (Vipin Kumar/HT PHOTO)

Pakistan watchers said that it was on account of the French government's restrictive approach that the Mirage 3 and Mirage 5 fighter jets in Pakistan air force's inventory did not participate in last month's joint aerial exercises, Eagle-IX, involving the Chinese and Pakistan air force.

Doval and Bonne are also expected to discuss India's other neighbour, China, in some detail, particularly given French concerns around Beijing attempting to flex muscles in the Indo-Pacific region. China has, for instance, been trying to get people in the French island group of New Caledonia to vote for independence in the three referendums being held to decide its future. This island group with an area of 18,575 sq km, located in the South Pacific east of Australia, is one of the 16 overseas territories of France that are home to 1.5 million French citizens.

In October last year, France had formalised its interest in the Indo-Pacific when President Macron appointed Christophe Penot, one of his country's most senior diplomats as the first French envoy for the Indo-Pacific. As part of this focus, France has forged new initiatives such as the trilateral dialogue launched with India and Australia in September last to enhance cooperation and strengthen multilateralism in the region.

https://www.hindustantimes.com/cricket/india-vs-australia-emotional-mohammed-siraj-tears-up-while-singing-national-anthem-in-sydney-test-watch/story-oOOEdFcuT9MxN5PXF0zruK_amp.html



Press Information Bureau
Government of India

Ministry of Defence

Wed, 06 Jan 2021 6:48PM

Government will ensure best of weapons and protective armours to our soldiers: Raksha Rajya Mantri Shri Shripad Yesso Naik

Raksha Rajya Mantri Shri Shripad Yesso Naik handed over One Hundredth thousandth Bullet Proof Jacket (BPJ) to the Chief of Army Staff General M M Naravane in a ceremony held in New Delhi on 6th January 2021.

Speaking on the occasion, Raksha Rajya Mantri said that the Government has honoured its commitment of protecting the precious lives of our soldiers fighting the enemy. He said the government led by Prime Minister Shri Narendra Modi places high emphasis on the operational safety of our soldiers. Shri Shripad Yesso Naik assured that "the Government will ensure that our soldiers will be provided with the best of weapons and protective armour and such requirements will always remain uppermost in priority." He appreciated the manufacturers, M/s SMPP Pvt Ltd for supplying the first one lakh Jackets, four months ahead of the delivery schedule. The Raksha Rajya Mantri also said that the BPJ being supplied is an indigenous product under Make in India and the company is even exporting the product all over the world making India a global hub for supply of such Defence ware in line with the Aatamnirbhar Bharat initiative of the government.

He said this Jacket has been appreciated by our soldiers who are using them on the borders and in countering insurgency.

The ceremony was also attended by Shri Raj Kumar Secretary (Defence Production), Lt Gen A K Samantara, DG Infantry, Lt Gen R K Malhotra DG DGQA and Lt Gen H S Kahlon, DG CD.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1686591>

सेना को मिली एक लाख स्वदेशी बुलेटप्रूफ जैकेट्स, तय वक्त से चार महीने पहले हुई सप्लाई

इन जैकेट्स की कंपनी ने चार महीने पहले ही डिलीवरी कर दी है। रक्षा राज्यमंत्री ने भरोसा दिलाया कि सरकार सैनिकों को उन्नत किस्म के हथियार और प्रोटेक्टिव-आर्मर देने के लिए प्रतिबद्ध है।

नीरज राजपूत

नई दिल्ली: चीन से चल रही तनातनी के बीच भारतीय सेना को एक लाख स्वदेशी बुलेटप्रूफ जैकेट्स मिल गई हैं। रक्षा राज्यमंत्री श्रीपद नाइक ने राजधानी दिल्ली में एक समारोह में थलसेना प्रमुख जनरल एमएम नरवणे को एक लाखवीं जैकेट भेंट की। इन बुलेटप्रूफ जैकेट्स को एक स्वदेशी कंपनी ने तैयार किया है।

रक्षा मंत्रालय के मुताबिक, इन बीपी जैकेट्स की कंपनी ने चार महीने पहले ही डिलीवरी कर दी है। इस मौके पर बोलते हुए रक्षा राज्यमंत्री ने भरोसा दिलाया कि सरकार सैनिकों को उन्नत किस्म के हथियार और प्रोटेक्टिव-आर्मर (रक्षा-कवच) देने के लिए प्रतिबद्ध है। इस मौके पर थलसेना प्रमुख के अलावा रक्षा सचिव (उत्पादन) राजकुमार, डीजी इंफेंट्री, लेफ्टिनेंट जनरल एके समांत्रा सहित वरिष्ठ सैन्य अफसर मौजूद थे।



रक्षा राज्यमंत्री ने कहा कि मोदी सरकार सैनिकों को सुरक्षा प्रदान करने पर खासा जोर देती है। श्रीपद नाइक ने स्वदेशी बीपी जैकेट्स बनाने वाली प्राइवेट कंपनी, एसएमपीपी की तारीफ करते हुए कहा कि कंपनी की बुलेटप्रूफ जैकेट्स एक्सपोर्ट भी हो रही हैं। नाइक ने कहा कि भारतीय सैनिक इन जैकेट्स की तारीफ कर रहे हैं। वहीं भारत रक्षा क्षेत्र में आत्मनिर्भर होने के साथ-साथ ग्लोबल हब भी बन रहा है।

कितने का हुआ था सौदा?

बता दें कि वर्ष 2018 में रक्षा मंत्रालय ने दिल्ली की एसएमपीपी कंपनी से 1.86 लाख बुलेटप्रूफ जैकेट्स का सौदा किया था। इस सौदे की कीमत करीब 639 करोड़ रुपये थी। ये बीपी जैकेट्स 360 डिग्री सुरक्षा प्रदान करती है। भारतीय सेना कश्मीर में काउंटर-इनसर्जेंसी में तैनात सैनिकों के लिए इसे इस्तेमाल करती है। कंपनी को अभी 86 हजार जैकेट्स और सेना को दी जानी हैं। वहीं भारतीय सेना को टाटा कंपनी से 50 हजार बीपी जैकेट्स पहले ही मिल चुके हैं। हालांकि भारतीय सेना को कुल 3.50 लाख बुलेटप्रूफ जैकेट्स की जरूरत है।

<https://www.abplive.com/news/india/one-lakh-bullet-proof-jacket-handed-over-army-chief-general-m-m-naravane-indian-army-shripad-naik-ann-1712322>

100,000th Bullet Proof Jacket handed over to Indian Army

Minister of State for Defence Shripad Naik handed over the 100,000th Bullet Proof Jacket (BPJ) to Army Chief General M M Naravane at a ceremony

New Delhi: The government will ensure that "the best of weapons and protective armour" are provided to the soldiers, Minister of State for Defence Shripad Naik said Wednesday.

Naik handed over the 100,000th Bullet Proof Jacket (BPJ) to Army Chief General M M Naravane at a ceremony here, the Defence Ministry said in a statement.

As per the statement, Naik said at the event that the Modi government has placed high emphasis on the operational safety of soldiers and it has honoured its commitment of protecting their "precious lives" while fighting the enemy.

Naik assured that "the government will ensure that our soldiers will be provided with the best of weapons and protective armour and such requirements will always remain uppermost in priority".

He appreciated manufacturer company SMPP Pvt Ltd for supplying the first one lakh BPJs four months ahead of the delivery schedule.

The minister noted this BPJ is an indigenous product manufactured under the 'Make in India' initiative and the company is even exporting the product all over the world making India a global hub for supply of such defence items.

The minister said this BPJ has been appreciated by Indian soldiers who are using them on the borders and in countering insurgency.

<https://www.timesnownews.com/india/article/100000th-bullet-proof-jacket-handed-over-to-indian-army/703857>



Bullet Proof Jacket being handed over to the Indian Army | Photo Credit: ANI

The Statesman

IAF academic collaboration with IDSR, Gujarat University MoU signed on 29 December 20

The MoU will enable Officers of IAF to undertake Doctoral Research, Post-Graduate Programme and Post Graduate Diploma covering various areas of interest that includes Defence Studies, Defence Management, National Security, Aerospace & Aviation Science and other areas of Defence Technology

New Delhi: Indian Air Force and Institute of Defence Studies and Research (IDSR), an autonomous Institution of Gujarat University under the patronage of Government of Gujarat, signed a Memorandum of Understanding (MoU) on 29 Dec 20.

The MoU will enable Officers of IAF to undertake Doctoral Research, Post-Graduate Programme and Post Graduate Diploma covering various areas of interest that includes Defence Studies, Defence Management, National Security, Aerospace & Aviation Science and other areas of Defence Technology.

The event, held on a virtual platform, was chaired by Air Officer-in-Charge Personnel, Air Marshal RJ Duckworth VSM. MoU was signed by Air Vice-Marshal Rajeev Sharma, Assistant Chief of Air Staff (Education) and Ms Anju Sharma, IAS, Principal Secretary (Higher & Technical Education) to Government of Gujarat and Chairperson-IDSr. Prof Himanshu A Pandya, Vice-Chancellor of Gujarat University and Director-General IDSr were also present on the occasion.



The expertise of these officers would contribute towards formulation of sound strategic plan and policies in the advent of hybrid Military Operations. (Image: Twitter/@IAF_MCC)

As part of Project Akashdeep, Indian Air Force has entered into such partnership with various prestigious Academies to promote research by Officers and create a pool of think tanks with strategic knowledge and intellectual skills. The expertise of these officers would contribute towards the formulation of sound strategic plan and policies in the advent of hybrid Military Operations.

<https://www.thestatesman.com/india/iaf-academic-collaboration-idsr-gujarat-university-mou-signed-29-december-20-1502944880.html>

The Tribune

Thu, 07 Jan 2021

Western Command tests offensive concepts amid Ladakh standoff

Various units of Ambala-based Kharga Corps carry out field drills as part of winter training

Chandigarh: Amidst a volatile security atmosphere in the subcontinent, the Army's Western Command conducted an integrated training exercise involving all arms to fine tune its battle drills in line with its operational role along the western front.

Various units of the Ambala-based Kharga Corps, the Army's most potent strike formation, carried out the field drill over the past few days as part of its winter training cycle. The exercise took place even as a large number of troops, including armoured, artillery and engineer elements, continue to maintain eyeball to eyeball confrontation with the Chinese along the Line of Actual Control in the northern sector in a stand-off that has been continuing for the past about nine months. Some units from the western theatre were also moved up to eastern Ladakh.



The exercise is aimed at validating evolving military concepts and offensive manoeuvres meant to inflict a swift punitive blow to the adversary while operating in a networked and informationalised domain. Tactical air support, heli-borne operations and sub-conventional warfare also feature in such exercise.

<https://www.tribuneindia.com/news/nation/western-command-tests-offensive-concepts-amid-ladakh-standoff-194750>

US agrees to equip Indian Navy warships with heavy guns urgently

The American Navy has agreed to equip Indian Navy warships with its own naval guns urgently, to help India be better prepared for a conflict in the earliest possible timeframe

By Manjeet Negi

New Delhi: It a time when India and China are engaged in a border dispute, the American Navy has agreed to urgently equip Indian Navy warships with its own naval guns to help India be better prepared for a conflict in the earliest possible time frame.

The two sides are moving ahead with a plan to take three American Navy inventory medium caliber guns and put them on the Indian warships of large size to use them in both anti-ship and anti-aircraft roles, top government sources told India Today.

The 127 mm medium caliber guns are produced by the American BAE systems and the countries are discussing a \$600 million deal to buy 11 such weapons systems.

India has issued a Letter of Request to the US government for acquiring 11.127 mm medium caliber guns which are to be equipped on the large-size warships of the Indian Navy including the Visakhapatnam-class destroyers.

As per the new plan, the LoR issued to the American administration and the first three guns to be provided to the Indian Navy would be from the American Navy inventory so that the Indian warships are fully equipped at the earliest.

Once the production of the new guns starts in America and they are ready to be delivered, the American Navy guns on Indian warships would be replaced by fresh ones.

The medium caliber guns would be a new entry into the Indian Navy and would be an upgrade on the existing weapons of similar class in the maritime force. The Indian Navy has developed a very close working relationship with its American counterpart as majority of the new acquisitions of the force are coming from the US only.

The Russian equipment in the force including the surveillance planes have been replaced by the P-8I aircraft. The multirole helicopters are also coming from the US as the SeaKing choppers would be replaced by the MH-60 Romeos.

The American Predator drones have also been leased by the Navy from the American firm General Atomics and more such unmanned systems are expected to come as part of a triaervice deal between the two sides.

<https://www.indiatoday.in/india/story/us-agrees-to-equip-indian-navy-warships-with-heavy-guns-urgently-1756441-2021-01-06>



Photo for representation. (PTI)

Researcher cracks the hidden strengthening mechanism in biological ceramics

Ling Li, an assistant professor in mechanical engineering at Virginia Tech, has found insights into building stronger and tougher ceramics by studying the shells of bivalve mollusks.

This perspective is formed by looking at the capacity of the basic mineral building blocks in the shell to anticipate fractures, instead of focusing only on the shape and chemistry of the structure. The results of his group's findings were published in the Nov. 10, 2020, issue of *Nature Communications*.

Li's team conducted an in-depth analysis of the microscopic structures of the shells of pen shell mollusks, bivalves native to the Caribbean. The shells of these animals consist of two layers, an inner nacre layer and a brown-colored outer layer. The inner nacre layer, also known as mother-of-pearl, is often iridescent due to its regular nanoscopic layering structure, similar to the coloration mechanism for many butterfly wings.



Graduate student Zhifei Deng performs nanomechanical testing on a nanoindenter. Credit: Virginia Tech

Li's team focused their attention to the outer layer, which is composed of prism-shaped calcite crystals arranged in a mosaic pattern. Between adjacent mineral crystals, very thin (approximately 0.5 micrometers, less than one-hundredth the size of a human hair) organic interfaces are present that glue the crystals together. The calcite crystals measure approximately half a millimeter in length and 50 micrometers in diameter, resembling elongated prisms.

Unlike many geological or synthetic crystals, where the atoms within their crystalline grains are perfectly arranged in a periodic fashion, the calcite crystals in the pen shells contain many nanoscopic defects, primarily composed of organic substances.

"You can consider the biological ceramic, in this case the pen shells' calcite crystals, as a composite structure, where many nanosized inclusions are distributed within its crystalline structure," said Li. "This is especially remarkable as the calcite crystal itself is still a single crystal."

Normally, the presence of structural defects means a site of potential failure. This is why the normal approach is to minimize the structural discontinuities or stress concentrations in engineering structures. However, Li's team shows that the size, spacing, geometry, orientation, and distribution of these nanoscale defects within the biomineral is highly controlled, improving not only the structural strength but also the damage tolerance through controlled cracking and fracture.

When these shells are subjected to an outside force, the crystal minimizes plastic yielding by impeding the dislocation motion, a common mode for plastic deformation in pure calcite, aided by those internal nanoscopic defects. This strengthening mechanism has been applied in many structural metal alloys, such as aluminum alloy.

In addition to adding strength, this design allows the structure to use its crack patterns to minimize damage into the inner shell. The mosaic-like interlocking pattern of the calcite crystals in the prism layer further contains large-scale damage when the external force is spread across the

individual crystals. The structure is able to crack to dissipate the external loading energy without failing.

"Clearly these nanoscopic defects are not a random structure, but instead, play a significant role in controlling the mechanical properties of this natural ceramic," said Li. "Through the mechanisms discovered in this study, the organism really turns the originally weak and brittle calcite to a strong and durable biological armor. We are now experimenting possible fabrication processing, such as 3-D printing, to implement these strategies to develop ceramic composites with enhanced mechanical properties for structural applications."

More information: Zhifei Deng et al. Strategies for simultaneous strengthening and toughening via nanoscopic intracrystalline defects in a biogenic ceramic, *Nature Communications* (2020). DOI: [10.1038/s41467-020-19416-2](https://doi.org/10.1038/s41467-020-19416-2)

Journal information: *Nature Communications*
<https://phys.org/news/2021-01-hidden-mechanism-biological-ceramics.html>



Thu, 07 Jan 2021

Researchers fabricate arrays of atomically smooth iron-coated silicon pyramids with unusual magnetic properties

Ultra-small integrated circuits have revolutionized mobile phones, home appliances, cars, and other everyday technologies. To further miniaturize electronics and enable advanced functions, circuits must be reliably fabricated in three dimensions. Achieving ultrafine 3-D shape control by etching into silicon is difficult, because even atomic-scale damage reduces device performance. Researchers at Nara Institute of Science and Technology (NAIST) have published a new study in *Crystal Growth and Design* in which they etched silicon to adopt the shape of atomically smooth pyramids. Coating these silicon pyramids with a thin layer of iron imparted magnetic properties that until now were only theoretical.

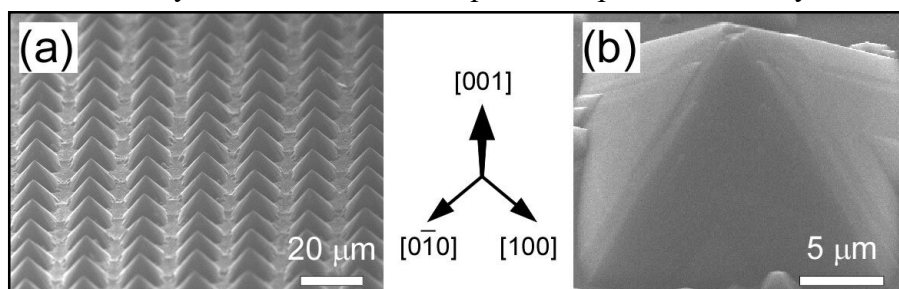
NAIST researcher and senior author of the study Ken Hattori is widely published in the field of

atomically controlled nanotechnology. One focus of Hattori's research is in improving the functionality of silicon-based technology.

"Silicon is the workhorse of modern electronics because it can act as a semiconductor or an insulator, and it's an abundant element. However, future technological advances require atomically smooth device fabrication in three dimensions," says Hattori.

A combination of standard dry etching and chemical etching is necessary to fabricate arrays of pyramid-shaped silicon nanostructures. Until now, atomically smooth surfaces have been extremely challenging to prepare.

"Our ordered array of isosceles silicon pyramids were all the same size and had flat facet planes. We confirmed these findings by low-energy electron diffraction patterns and electron microscopy," explains lead author of the study Aydar Irmikimov.



(a) Wide and (b) magnified images of the fabricated Si pyramids. Four slopes correspond to Si{111} facet surfaces. Credit: Ken Hattori

An ultrathin, 30-nanometer layer of iron was deposited onto the silicon to impart unusual magnetic properties. The pyramids' atomic-level orientation defined the orientation, and thus, the properties of the overlaying iron.

"Epitaxial growth of iron enabled shape anisotropy of the nanofilm. The curve for the magnetization as a function of the magnetic field was rectangular shaped, but with breaking points that were caused by asymmetric motion of magnetic vortex bound in pyramid apex," explains Hattori.

The researchers found that the curve had no breaking points in analogous experiments performed on planar iron-coated silicon. Other researchers have theoretically predicted the anomalous curve for pyramid shapes, but the NAIST researchers are the first to have shown it in a real nanostructure.

"Our technology will enable fabrication of a circular magnetic array simply by tuning the shape of the substrate," says Irmikimov. Integration into advanced technologies such as spintronics, which encode information by the spin rather than electrical charge of an electron, will considerably accelerate the functionality of 3-D electronics.

More information: Aydar Irmikimov et al, Atomically Architected Silicon Pyramid Single-Crystalline Structure Supporting Epitaxial Material Growth and Characteristic Magnetism, *Crystal Growth & Design* (2021). DOI: [10.1021/acs.cgd.0c01286](https://doi.org/10.1021/acs.cgd.0c01286)

<https://phys.org/news/2021-01-fabricate-arrays-atomically-smooth-iron-coated.html>



Thu, 07 Jan 2021

A bit too much: Reducing the bit width of Ising models for quantum annealing

Given a list of cities and the distances between each pair of cities, how do you determine the shortest route that visits each city exactly once and returns to the starting location? This famous problem is called the 'traveling salesman problem' and is an example of a combinatorial optimization problem. Solving these problems using conventional computers can be very time-consuming, and special devices called 'quantum annealers' have been created for this purpose.

Quantum annealers are designed to find the lowest energy state (or ground state) of what's known as an Ising model. Such models are abstract representations of a quantum mechanical system involving interacting spins that are also influenced by external magnetic fields. In the late 90s, scientists found that combinatorial optimization problems could be formulated as Ising models, which in turn could be physically implemented in quantum annealers. To obtain the solution to a combinatorial optimization problem, one simply has to observe the ground state reached in its associated quantum annealer after a short time.

One of the biggest challenges in this process is the transformation of the logical Ising model into a physically implementable Ising model suitable for quantum annealing. Sometimes, the numerical values of the spin interactions or the external magnetic fields require a number of bits to represent them (bit width) too large for a physical system. This severely limits the versatility and applicability of quantum annealers to real world problems. Fortunately, in a recent study published in *IEEE Transactions on Computers*, scientists from Japan have tackled this issue. Based purely on mathematical theory, they developed a method by which a given logical Ising model can be transformed into an equivalent model with a desired bit width so as to make it fit a desired physical implementation.

Their approach consists in adding auxiliary spins to the Ising model for problematic interactions or magnetic fields in such a way that the ground state (solution) of the transformed model is the same as that of the original model while also requiring a lower bit width. The technique is

relatively simple and completely guaranteed to produce an equivalent Ising model with the same solution as the original. "Our strategy is the world's first to efficiently and theoretically address the bit-width reduction problem in the spin interactions and magnetic field coefficients in Ising models," remarks Professor Nozomu Togawa from Waseda University, Japan, who led the study.

Manageable Bits: Making Ising Models Easier to Implement

Quantum annealing (QA) can rapidly solve combinatorial optimization problems...

...by finding the lowest energy state of an Ising model (IM)

QA requires converting a logical IM into a physical one

9,000 → 45,000

However, bit width of interactions and magnetic fields in logical IM can be too high for physical IM

New method to reduce bit width in logical IM

Original IM

Large bit width

Equivalent IM

Smaller bit width

Auxiliary spins

Theoretical & experimental demonstrations

First technique to address the bit width problem in QA

Applications:

- Logistics
- Supply chain optimization
- Artificial Intelligence

This method can help solve a variety of combinatorial optimization problems in an easy manner

How to Reduce the Bit-width of an Ising Model by Adding Auxiliary Spins
Oku et al. (2020)

WASEDA University
早稲田大学

A method that can reduce the bit width of a quantum system called the Ising model to solve combinatorial optimization problems. Credit: Waseda University

The scientists also put their method to the test in several experiments, which further confirmed its validity. Prof. Togawa has high hopes, and he concludes by saying, "The approach developed in this study will widen the applicability of quantum annealers and make them much more attractive for people dealing with not only physical Ising models but all kinds of combinatorial optimization problems. Such problems are common in cryptography, logistics, and artificial intelligence, among many other fields."

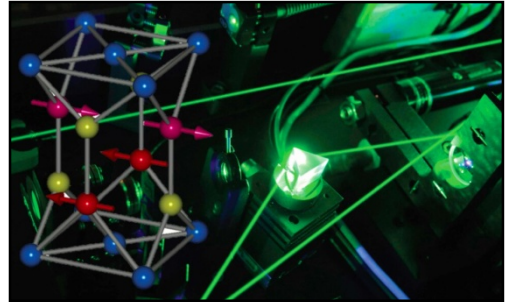
More information: Daisuke Oku et al, How to Reduce the Bit-width of an Ising Model by Adding Auxiliary Spins, *IEEE Transactions on Computers* (2020). DOI: [10.1109/TC.2020.3045112](https://doi.org/10.1109/TC.2020.3045112)
<https://phys.org/news/2021-01-bit-width-ising-quantum-annealing.html>

Study demonstrates the quenching of an antiferromagnet into high resistivity states

By Ingrid Fadelli

Antiferromagnetism is a type of magnetism in which parallel but opposing spins occur spontaneously within a material. Antiferromagnets, materials that exhibit antiferromagnetism, have advantageous characteristics that make them particularly promising for fabricating spintronic devices.

In contrast with conventional electronic devices, which use the electrical charge of electrons to encode information, spintronics process information leveraging the intrinsic angular momentum of electrons, a property known as "spin." Due to their ultrafast nature, their insensitivity to external magnetic fields and their lack of magnetic stray fields, antiferromagnets could be particularly desirable for the development of spintronic devices.



Credit: Kaspar et al.

Despite their advantages and their ability to store information, most simple antiferromagnets have weak readout magnetoresistivity signals. Moreover, so far physicists have been unable to change the magnetic order of antiferromagnets using optical techniques, which could ultimately allow device engineers to exploit these materials' ultrafast nature.

Researchers at the Czech Academy of Sciences, Charles University in Prague and other universities in Europe recently introduced a method to achieve the quenching of antiferromagnets into high resistivity states by applying either electrical or ultrashort optical pulses. This strategy, introduced in a paper published in *Nature Electronics*, could open interesting new possibilities for the development of spintronic devices based on antiferromagnets.

"Our original motivation was to address a major challenge in the field of spintronics, for which the solution seems out of reach of conventionally used ferromagnets; namely, the lack of a universal switching mechanism to achieve switching by electrical as well as optical pulses in the same device," Tomas Jungwirth, one of the researchers who carried out the study, told Phys.org. "Our antiferromagnetic devices allow for this, and we can now use pulse length from macroscopic millisecond scales all the way down to a single femtosecond-laser pulse."

In their recent study, Jungwirth and his colleagues were able to overcome a further challenge in the field of spintronics. Specifically, they were able to attain readout signals of the giant-magnetoresistance amplitudes in simple magnetic films, without the need to assemble complex magnetic multilayer structures. The researchers achieved this using CuMnAs antiferromagnetic films.

Remarkably, they were able to fabricate spintronic devices with reversible, reproducible and time-dependent switching capabilities. This ability to switch magnets allows their devices to mimic components of spiking neural networks (SNNs), artificial neural networks that mimic biological neural networks in the brain. This feature of the design introduced by Jungwirth and his colleagues has never been realized using conventional methods that switch magnets by reorienting the magnetization vector from one to another direction over the entire active part of devices.

"Our switching mechanism is fundamentally distinct: The delivered quenching pulses control the level of magnetic domain fragmentation in the device down to a nano-scale, without necessarily changing the mean direction of the magnetic-order vector," Jungwirth explained. "Remarkably to

us, this can be done in an entirely reversible and reproducible way, as we demonstrated in the paper."

In the future, the new design introduced by Jungwirth and his colleagues could enable the development of new and better performing spintronic devices. In their next studies, the researchers plan to investigate the potential of their design for neuromorphic computing applications. In other words, they plan to explore the possibility of using the devices they created to mimic some of the synaptic and neuron-like functionalities of SNNs.

"On a scientific level, we now aim to investigate and explain the physical fundamentals of our new switching mechanism by means of high space and time-resolved microscopies pushed to the atomic and femtosecond limits," Jungwirth said. "This will help us to optimize the parameters of currently used antiferromagnetic materials or identify new suitable material candidates."

More information: Quenching of an antiferromagnet into high resistivity states using electrical or ultrashort optical pulses. *Nature Electronics*(2020). DOI: [10.1038/s41928-020-00506-4](https://doi.org/10.1038/s41928-020-00506-4)

Journal information: *Nature Electronics*
<https://phys.org/news/2021-01-quenching-antiferromagnet-high-resistivity-states.html>

COVID-19 Research News

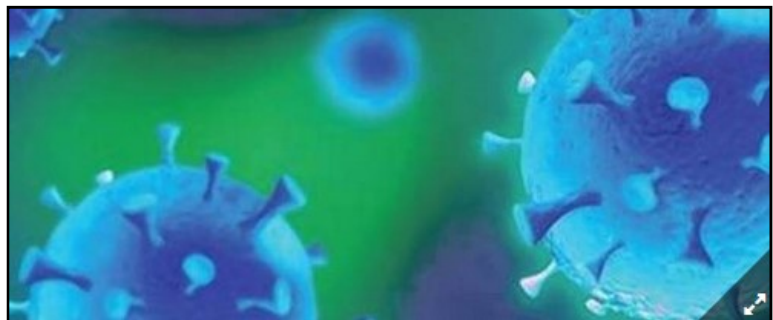
THE HINDU
BusinessLine

Thu, 07 Jan 2021

Covid-19: Testing wastewater can help foretell a coming spike

New Delhi: Surveillance of untreated wastewater can warn officials about an impending spike or decrease in Covid-19 cases up to two weeks in advance, according to a study conducted by scientists at the Indian Institute of Technology (IIT), Gandhinagar.

The researchers, including those from Gujarat Biotechnology Research Centre (GBRC), explored the association between the SARS-CoV-2 genetic load in wastewater and the number of Covid-19 cases at the district level in Gandhinagar, to establish if wastewater surveillance can be an effective tool to warn about the disease early.



"This is the first ever proof based on weekly surveillance in India that unravels this early warning capability of wastewater surveillance for Covid-19," Professor Manish Kumar from the Department of Earth Sciences, IIT-GN, who led the study, told *PTI*.

Prosun Bhattacharya, a professor at KTH Royal Institute of Technology, Sweden agreed that wastewater surveillance should be made a part of Covid management not only in India but even globally to have a stringent control of the prevalence of the SARS-CoV-2 infections.

‘Mandatory step’

“This study led by IIT-GN team strongly suggests that Water-Based Epidemiology surveillance must be made a mandatory step in a national health surveillance programme, especially as an integrated part of Covid-19 pandemic monitoring,” Bhattacharya said.

“This will help the water authorities to identify the hotspots in a city to provide up to 2 weeks lead time for improvising smart and demand driven interventions for Covid-19 management,” he added.

Bhattacharya noted that waste water surveillance from the domestic flights would also be a critical step to follow in order to track the mobility of the population who are the potential careers of SARS-CoV-2 for eventual disease spreading.

Vaccine efficacy

Kumar also claimed that WBE can help monitor the efficacy of vaccines against Covid-19 after they are rolled out.

“Wastewater surveillance can be in place for monitoring the condition of wastewater coming out from key buildings like the Parliament or Secretariat or south block in Delhi to compare the situation in the pre and post anti-Covid-19 vaccine era,” he explained.

Conducted in collaboration with the Gujarat Pollution Control Board (GPCB), the study has been posted on the preprint repository medRxiv, and is under review in the journal Environmental Research.

The research builds on a study conducted by the team in May last year in Ahmedabad, wherein the team demonstrated the first-ever successful detection in India of the genetic material of SARS-CoV-2 in wastewater.

The latest study analysed SARS-CoV-2 RNA in the 43 samples from four wastewater treatment plants during August 7 to September 30 period, last year.

Ryo Honda, associate professor at Kanazawa University, who is leading a task force on wastewater surveillance in Japan, said the study has important implications for WBE of Covid-19 in India. “In Japan we also explicitly found the WBE potential to predict the Covid-19 cases where SARS-CoV-2 was detected even when the number of reported cases was less than 1 per 100,000 people,” Honda told PTI.

“Wastewater surveillance for the athletes’ village has been proposed as one of the key elements for Covid-19 risk management during the upcoming Tokyo Olympic 2021,” Masaaki Kitajima, from Hokkaido University, added.

“We detected SARS-CoV-2 genes in the wastewater first and patients were then back-traced before the symptoms appeared,” Aaron Bivins, from the University of Notre Dame, a key member to create Global Collaboration on WBE of Covid-19, said.

The US federal government has worded a contract for monitoring of wastewater coming from one third of the US population,” he said.

<https://www.thehindubusinessline.com/news/science/covid-19-testing-wastewater-can-help-foretell-a-coming-spike/article33513483.ece>

