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

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Sat, 12 Dec 2020

What is Quantum Key Distribution (QKD)? Know its significance, benefits and loopholes here

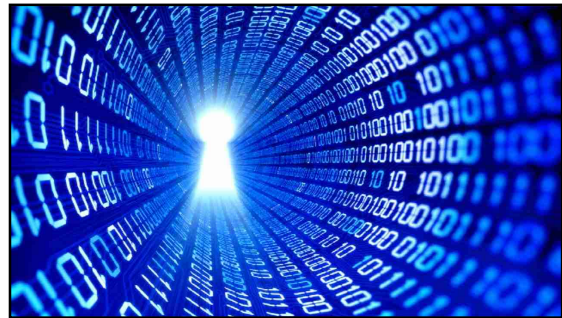
Quantum Key Distribution (QKD) has been doing rounds since the past year. Defence Research and Development Organisation, DRDO had undergone trials between two laboratories in Hyderabad. in this field. Know QKDs significance, benefits and loopholes here

By Tulika Tandon

The Quantum Key Distribution, QKD technology developed by the Defence Research and Development Organisation, DRDO has undergone trials between two laboratories in Hyderabad, where the quantum technology-based security was validated for a range of 12 km over a fibre optic channel.

Why in News?

Recently Quantum Key Distribution, QKD technology by Defence Research and Development Organisation, DRDO had undergone trials between two laboratories in Hyderabad. Here the quantum technology-based security was validated for a range of 12 km over a fibre optic channel.



What is QKD?

What is Quantum Key Distribution?

Quantum Key Dynamics is a mechanism to develop secure communication. It utilises a cryptographic protocol that involves components of quantum mechanics.

Through this technology, two communicating sides come up with different random secret keys which are known exclusively to them. Only they can use it to encrypt and decrypt messages, thus achieving highly-secure communication.

What is the Uniqueness of QKD

A unique property of quantum key distribution lies in the ability of the two communicating users detecting the presence of any third party trying to break into their knowledge of 'key'.

This can be deduced from the fundamental aspect of quantum mechanics that is when the process of measuring a quantum system generally disturbs the system.

Benefits of QKD Technology

1. The technology would be useful in enabling various start-ups and small and medium enterprises in the domain of quantum information.
2. It is expected to create a definition of standards and formulate crypto technology-related policies.
3. QKD system can be used in a unified Cipher Policy Committee (CPC) framework in India for more secure key management of various military cryptographic systems.

Loopholes in QKD

The major drawback of Quantum Key Distribution, QKD is it relying on an authenticated classical channel of communications. In modern cryptography, having an authenticated classical channel means that either any symmetric key of sufficient length has already been exchanged or public keys of sufficient security level are there. When such information is already available, anyone can achieve secure communication without using QKD. This can also be done by using the Galois/Counter Mode of the Advanced Encryption Standard.

Quantum key distribution is only used to produce and distribute a key but it cannot be used to transmit any message data.

The concept of quantum key distribution (QKD) was first proposed in the 1970s. However, it wasn't until the 1980s that it came into notice. The idea took until the 1990s to make the connection to entanglement, that physicists started to get really interested. Since then the progress has been remarkable and it is now perhaps the most mature quantum technology, being available for almost 2 decades. The world's first portable ground station for transfer of secure quantum communications is successfully connected to China's Quantum Science Satellite, also called Mozi, which was launched in August 2016.

<https://www.jagranjosh.com/general-knowledge/what-is-quantum-key-distribution-qkd-know-its-significance-benefits-and-loopholes-here-1607674545-1>

प्रभात खबर

Mon, 14 Dec 2020

आ रही है स्टील की बुलेट प्रूफ जैकेट को भेदने वाली जेवीपीसी कारबाइन

जल्द ही सेना के पास एक ऐसी कारबाइन आने वाली है जो स्टील की मोटी बुलेट प्रूफ जैकेट को भी भेदने में सक्षम है। यह कारबाइन यूजर ट्रायल के अंतिम चरण में है। इसके बाद जल्द ही यह सेना के पास होगी। इसे कुछ राज्यों की पुलिस व अर्द्धसैनिक बलों को भी दिया जा सकता है। कारबाइन बेहद हल्क होने के कारण इसे चलाना काफी आसान होगा। कारबाइन एक मिनट में सैकड़ों राउंड गोलियां निकाल देगी।

कानपुर की लघु शस्त्र निर्माण फैक्ट्री (एसएएफ) में बनी ज्वाइंट वेंचर प्रोटेक्टिव कारबाइन (जेवीपीसी) को डीआरडीओ के सहयोग से तैयार किया जा रहा है। इसका वजन तीन किलोग्राम से भी कम है। जिस कारण इसे आसानी से चलाया जा सकता है। इसमें 30 राउंड फायर की स्टील की मैग्जीन लगी है।



आयुध निर्माणी बोर्ड के उपनिदेशक गगन चतुर्वेदी ने बताया कि इस कारबाइन की मारक क्षमता 100 मीटर है जबकि फायरिंग दर 800 राउंड प्रति मिनट है। इसकी गोलियां साढ़े तीन एमएम मोटी माइल्ड स्टील प्लेट को 100 मीटर की दूरी से भेद सकती है। यह कारबाइन डायरेक्टर जनरल क्वालिटी एश्योरेंस के मानकों पर खरी उतर चुकी है। हाल ही में कारबाइन ने जनरल क्वालिटेटिव रिक्वायरमेंट के सभी मानकों को यूजर ट्रायल में पूरा कर लिया है। सेना के उपयोग के लिए यह पूरी तरह से तैयार है।

कारबाइन का उत्पादन एसएएफ में होगा जबकि इसका एम्युनिशन का उत्पादन पुणे स्थित आयुध फैक्ट्री में किया जाएगा। फरवरी 2020 में लखनऊ में लगे डिफेंस एक्सपो में रक्षामंत्री राजनाथ सिंह इसे देख चुके हैं। कई राज्यों की पुलिस व अन्य बलों को यह कारबाइन दिए जाने की तैयारी है।

<https://www.prabhatkhabar.com/national/jvpc-distinguish-steel-bullet-proof-jackets-developed-in-collaboration-with-drdo-know-details-amh>

TIMESNOWNEWS.COM

Sat, 12 Dec 2020

Sub-machine gun designed by DRDO completes successful trials: All you need to know about the 5.56x30 mm gun

The joint protective venture carbine (JVPC), designed by the Defence Research and Development Organisation (DRDO), is a gas-operated semi-automatic weapon capable of firing over 700 rounds per minute

Key Highlights

- *With an effective range of more than 100 meters, the gun is reported to weight just 3kg*
- *Its low recoil allows stabilised firing during rapid firing, enabling soldiers to operate the weapon with a single hand*
- *The JVPC's design, reportedly, borrows from modern machine pistols like the Israeli Uzi*

On Thursday, the defence ministry announced that an indigenously developed sub-machine gun had successfully undergone user trials, paving way for its induction into the armed forces. The final leg of the user trials was conducted under extreme temperature conditions in both, summer and high altitude winters.

India's Defence Minister Rajnath Singh had originally unveiled the 5.56 x 30mm weapon at the Defence Expo held in Lucknow earlier this year. The weapon has already passed trials conducted by the home ministry with procurement action already initiated by central armed police forces and other state police organisations, according to the defence ministry's statement.

What are its features?

The joint protective venture carbine (JVPC), designed by the Defence Research and Development Organisation (DRDO), is a gas-operated semi-automatic weapon capable of firing over 700 rounds per minute. With an effective range of more than 100 meters, the gun is reported to weight just 3kg.

It also fires at a muzzle velocity of 650 meters per second. Having a barrel length of 300mm, the JVPC has two modes of fire – single and auto, and can also be fitted with a bayonet, muzzle cap or sling. It also incorporates mechanical and applied safeties.

The weapon is, reportedly, ideal for short-range operations. Its low recoil allows stabilised firing during rapid firing, enabling soldiers to operate the weapon with a single hand. It also integrates ambidextrous features for cocking handle along with a retractable butt for balanced firing making it suitable for concealed area operations.



The defence ministry successfully carried out trials for the JVPC on December 10. | Photo Credit: ANI

The low recoil and retractable butt, coupled with the weapon's ergonomic design and multiple picatinny rails, makes the weapon a potent threat, especially in counter-insurgency and counter-terrorism operations.

The JVPC's design, reportedly, borrows from modern machine pistols like the Uzi. The pistol grip allows for the insertion of 30-round JVPC magazines. The cocking levers located on either side of the weapon along with the fire selectors allow soldiers to fire the weapon from the left of the right shoulder.

The picatinny railing on the receiver allows soldiers to install a range of weapon sights including reflex, infrared, or laser with iron sights built directly into the railing. The JVPC can also integrate a silencer allowing for suppressed firing. Similar to the Israeli Uzi, the JVPC is made of stamped sheet metal and polymer housing.

The original prototypes of the weapon integrated a large trigger guard but more recent versions had this replaced with traditional guards as seen in previous defence exhibitions. In 2014, the JVPC's buttstock length was changed to 500mm from 558mm.

<https://www.timesnownews.com/india/article/sub-machine-gun-designed-by-drdo-completes-successful-trials-all-you-need-to-know-about-the-5-56x30-mm-gun/693423>

AMERICAN MILITARY NEWS

Fri, 11 Dec 2020

New Indian Army submachine gun clears final trials – now goes to production

This week, India's Defense Research and Development Organization (DRDO) announced a new submachine gun for India's military has cleared its final phase of trials before it can be rolled out to the troops.

On Thursday, the DRDO tweeted, "User Trails of 5.56 X 30mm Joint Venture Protective Carbine designed by DRDO have been completed meeting all GSQR parameters."

The Times of India reported the new submachine gun, known as the Joint Venture Protective Carbine, or JVPC, cleared user trails on Dec. 7. The new weapon comes as India has been working to produce new domestically developed equipment for its military.

The Times of India reported the JVPC came about after the Indian Army's search for a new carbine for years after a previously middle-eastern rifle became stuck at the final stages of development. The DRDO opened up the development process for the JVPC and its recent success in trials is a step towards a new indigenously designed and manufactured carbine.

Indian army had a long series of tests and trials for the JVPC since its early design was unveiled. The carbine in the initial phase of designing had minor shortcomings according to Indian Army's requirements. Since then the JVPC has received improved quality and functional capabilities and the DRDO has brought forward the carbine in its complete final form, which the Indian Army accepted and cleared for mass-production.

The final series of trials were conducted in extreme temperatures in the summer and winter, with the JVPC successfully standing up to cold weather conditions.



Joint Venture Protective Carbine (JVPC). (Abhiak47, Wikimedia Commons/Released)

The JVPC, also called the Modern Sub Machine Carbine (MSMC) is a gas-operated rotating bolt semi bullpup automatic weapon, chambered in 5.56x30mm. The round reportedly boast the ability to penetrate bulletproof vests.

The carbine has 700-800 round per minute rate of firing and an effective firing range of 100-200 meters (about 328-656 feet).

The carbine weighs around 3 kg (about 6.6 pounds) and features a modern single pistol grip handle design like, similar to the famous Israeli Uzi. The JVPC also has a retractable buttstock, low recoil, improved ergonomics, modular 30 round magazine fed through the pistol grip, allowing the user to use it in one hand effectively. The carbine can also be configured with various Picatinny rails to allow installation of various sights and weapon attachments.

JVPC was developed by DRDO's arms development wing, the Armament Research and Development Establishment (ARDE) and manufactured by the state-owned Ordnance Factory Board at a small-arms factory in Kanpur and the Ordnance Factory Tiruchirapalli.

The Ministry of Home Affairs already accepted the JVPC in 2019 for its Central Reserve Police Force and Central Industrial Security Force, and now the carbine is in production to fill orders placed by the Central Police Force and various state police forces like Chattisgarh Police.

India also plans to market the JVPC for export after successfully inducting it into its own military and police forces first.

<https://americanmilitarynews.com/2020/12/new-indian-army-submachine-gun-clears-final-trials-now-goes-to-production/>



Sun, 13 Dec 2020

Indigenous artillery gun to complete trials by mid-2021

Investigation is under way to determine the cause of a barrel burst

By Dinakar Peri

New Delhi: User trials of the indigenous Advanced Towed Artillery Gun System (ATAGS) developed by the Defence Research and Development Organisation (DRDO) jointly with private industry are scheduled to be resumed later this month and proceed with winter and summer trials to be completed by mid next year, a defence official said.

Trials which began in September were paused after the gun suffered a barrel burst and an investigation is under way to determine the cause.

“The guns will move sometime next week to Balasore for initial proof firing trials. Winter trials should happen sometime in January. As the temperatures go up, we will do the summer trials by mid next year,” the official said.

The ATAGS is a 155mm, 52 calibre artillery gun jointly developed by the DRDO in partnership with Bharat Forge of the Kalyani Group and the Tata Power SED.

The DRDO is also writing to the Army to involve their teams right away so that the approval can be speeded up and compress the timelines. In August, 2018 the Defence Acquisition Council had accorded approval for the purchase of 150 of these guns at an approximate ₹3,365 crore which would be split between the two companies. The deal will be split in 60:40 ratio between the lowest bidder (L1) and L2.



A view of the Advanced Towed Artillery Gun System. File | Photo Credit: R.V. Moorthy

Once the user trials are over, the Army has to give the Request For Proposal (RFP) and the initial lot can be supplied immediately, the official said. The Army requires 1,580 guns in this category and Israeli firm Elbit Systems was shortlisted for a tender floated to procure them.

In September, the ATAGS had suffered a barrel burst during trials which have since been stopped. A committee was set up consisting of DRDO scientists, Army representatives and the Ordnance Factory Board (OFB) officials to determine the cause and submit an evaluation report.

It certainly does not appear to be a design issue and investigation will determine if it is an ammunition issue, the official said. "One of the members from the OFB advised some more tests which would be done shortly after which the report will come out."

The official said the price is not yet determined and for now its only for the initial limited order. "Price for the bigger order of 1,580 guns has to be negotiated and industry can bring it down significantly."

In the past, the Army had flagged overweight compared to its requirements which has also been addressed. "The Army wanted to lower the weight so they can carry it in the mountains. They wanted around 18 tonnes — by and large we are in that range," the official said.

<https://www.thehindu.com/news/national/indigenous-artillery-gun-to-complete-trials-by-mid-2021/article33314956.ece>

THE TIMES OF INDIA

Mon, 14 Dec 2020

Upgraded India-made tank 'Arjun' still awaits Army order

By Rajat Pandit

New Delhi: 'Arjun' may have ultimately vanquished 'Bhishma' in the battlefield of Kurukshetra, but the Army still does not have faith in the former. The 13-lakh force continues to drag its feet in approving the long-pending order for 118 'improved' Arjun Mark-1A main-battle tanks.

The DRDO, however, is confident that the Rs 6,400 crore indent to produce the indigenous tanks will be placed on the Heavy Vehicles Factory (HVF) at Avadi before this fiscal ends on March 31. The mood is buoyant after PM Narendra Modi took aride on the Arjun in Jaisalmer last month.

"The Mark-1A tanks have better firepower, mobility, protection and endurance than the first 124 Arjuns inducted by the Army over a decade ago. As per HVF, each Mark-1A tank will cost Rs 54 crore," said a defence scientist.

But the Army is not convinced yet. The force continues to bank upon the Russian-origin T-90S tanks, christened 'Bhishma', for its "shock and awe" capabilities on the western front. In November 2019, another Rs 20,000 crore indent was placed on HVF for 464 more upgraded T-90S tanks to add to the 1,193 such tanks already inducted.

After the first 657 T-90S tanks were imported for Rs 8,525 crore from 2001 onwards, the next 1,000 are being licensed produced by HVF with Russian kits. Arjun has been a long running feud between the Army and DRDO.

The force contends the "extra-heavy" Arjun Mark-1 tanks (62.5-tonne as compared to 46.5-tonne T-90S tank) is plagued by "maintenance, sustenance and ammunition issues". The DRDO, however, says "all issues" have now been resolved for the first 124 tanks. Moreover, there are 14



major and 58 minor “improvements” or capability enhancements on the Mark-1A tanks to meet the Army’s requirements.

“Validation trials of Arjun Mark-1A tanks, which were driven over 6,000-km, were successfully completed in December 2018. They met all technical requirements. The only requirement left is the cannon launched guided missile (CLGM),” said a Scientist.

“While substantive issues have been addressed, additional upgrades or modifications are required in view of technology advances. The case for procurement of Arjun Mark-1A tanks is under active consideration and will be progressed accordingly,” a senior Army officer said.

As per MoD officials, HVF has promised to produce the first five Mark-1A tanks within 30 months of the indent being placed. “Once approved after tests by the Army, HVF will deliver 30 tanks per year,” said an official.

<https://timesofindia.indiatimes.com/india/upgraded-india-made-tank-arjun-still-awaits-army-order/articleshow/79712460.cms>

Defence News

Defence Strategic: National/International



Mon, 14 Dec 2020

Army Chief Gen. Naravane holds talks with Royal Saudi Land Forces Commander on defence cooperation

Gen Naravane, who arrived in Saudi Arabia on the second leg of his two-nation visit that included the United Arab Emirates, is the first-ever head of the Indian Army to travel to the two strategically important Gulf countries

Riyadh: Indian Army Chief General M M Naravane on Sunday discussed issues of bilateral defence cooperation with Commander of the Royal Saudi Land Forces General Fahd Bin Abdullah Mohammed Al-Mutir during his historic visit to the Gulf Kingdom.

Gen Naravane, who arrived in Saudi Arabia on the second leg of his two-nation visit that included the United Arab Emirates, is the first-ever head of the Indian Army to travel to the two strategically important Gulf countries.

“COAS discussed issues of bilateral defence cooperation with General Fahd Bin Abdullah Mohammed Al-Mutir, Commander Royal Saudi Land Forces,” the Indian Army’s Additional Directorate General of Public Information said in a tweet on Sunday.



Gen Naravane’s visit comes in the midst of fast-paced developments in the Gulf region including normalisation of Israel’s relations with several Arab countries.(ANI)

He also received a Guard of Honour at headquarters of the Royal Saudi Land Forces.

Earlier, Gen Naravane visited the UAE where he discussed bilateral defence cooperation and issues of mutual interest with the UAE's Commander of the Land Forces Major General Saleh Mohammed Saleh Al Ameri.

His visit is seen as a reflection of India's growing strategic ties with the two countries and is expected to further open up new avenues for cooperation in the defence and security sphere.

Gen Naravane's visit comes in the midst of fast-paced developments in the Gulf region including normalisation of Israel's relations with several Arab countries as well as situation arising out of the assassination of Iran's top nuclear scientist Mohsen Fakhrizadeh.

Ahead of his visit to the UAE and Saudi Arabia, the Army said in a statement in New Delhi that "During the visit, he will be meeting his counterparts and senior military leadership of these countries. The visit is historic in the sense that it will be the first time an Indian Army chief is visiting the UAE and Kingdom of Saudi Arabia." Gen. Naravane's visit to the Gulf region comes days after External Affairs Minister S Jaishankar's trips to Bahrain and the UAE during which he called on top leaders of the two countries.

In the last few years, India's ties with Saudi Arabia and the UAE have witnessed a major upswing. Last month, the Army chief travelled to Nepal on a three-day visit that had significant diplomatic overtone.

In October, Gen. Naravane travelled to Myanmar along with Foreign Secretary Harsh Vardhan Shringla on a very crucial visit during which India decided to supply an attack submarine to the Myanmar Navy besides agreeing to further deepen military and defence ties.

<https://www.hindustantimes.com/india-news/army-chief-gen-naravane-holds-talks-with-royal-saudi-land-forces-commander-on-defence-cooperation/story-WWYWyx0WKIWJUvkdTlYeI.html>

THE TIMES OF INDIA

Mon, 14 Dec 2020

Indian defence forces to stock weapons, ammunition for 15-day intense war

New Delhi: In the middle of a conflict with China, India has taken a significant step by authorising the defence forces to enhance their stocking of weapons and ammunition for a 15-day intense war.

Making use of the extended stocking requirements and the emergency financial powers in the ongoing conflict with China in Eastern Ladakh, the defence forces are expected to spend over Rs 50,000 crore for acquisition of equipment and ammunition from both local and foreign sources.

The authorisation to increase the weapon and ammunition reserves to minimum 15-I levels from the earlier existing 10-day stocking is to prepare the defence forces for a two-front war with both China and Pakistan.

"A number of weapon systems and ammunition are being acquired now under the authorisation of having reserves to fight a 15-day intense war with the enemies. The stocking would now be at 15-I level from the 10 I levels," government sources told ANI.

The authorisation for enhanced stocking for the defence forces was approved some time ago, they said.

As per the authorisation many years ago, the armed forces were supposed to stock for a 40-day intense war but it was then brought down to 10-I level due to issues with the storage of weapons and ammunition as well as the changing nature of warfare.



After the Uri attack, it was realised that the war wastage reserves stocks were low and the then Manohar Parrikar-led defence ministry enhanced financial powers of the vice chiefs of Army, Navy and Air Force to Ra 500 crore from Rs 100 crore.

The three services were also given the emergency financial powers to procure items worth Rs 300 crore to buy any equipment which they felt could be of use to them for fighting wars.

The defence forces have been buying a number of spares, weapons, missiles and systems for effectively taking on the two adversaries.

Sources say a large number of missiles and ammunition for tanks and artillery have been acquired in satisfactory amounts to shed worries for the troops on the ground.

India has been engaged with China in the Eastern Ladakh sector where the Chinese have been transgressed at multiple locations and trying to change the status quo on the LAC.

<https://timesofindia.indiatimes.com/india/indian-defence-forces-to-stock-weapons-ammunition-for-15-day-intense-war/articleshow/79704412.cms>



Sun, 13 Dec 2020

चीन से तनातनी के बीच उत्तराखंड बॉर्डर पर लगेंगे रडार, आपात स्थिति में एयर फोर्स इस्तेमाल करेगी एयर स्ट्रिप

देहरादून: चीन सीमा पर तनाव को देखते हुए वायु सेना को राज्य के हैलीपैड और एयर स्ट्रिप का आपात उपयोग करने की इजाजत दी जा रही है। इसके लिए मुख्य सचिव ने लिए गृह, लोनिवि और नागरिक उड्डयन विभाग के अधिकारियों की अहम बैठक बुलाई है। वहीं, वायु सेना चीन से खतरे को देखते हुए बॉर्डर पर रडार लगाने जा रही है।

चीन के साथ पिछले कई महीनों से सीमा पर तनाव चल रहा है। तनाव को देखते हुए सेना बॉर्डर पर अपनी स्थिति को मजबूत करने में जुटी हुई है। राज्य से लगती चीन सीमा पर भी पिछले कई महीनों से सेना की सतर्कता कई गुना बढ़ गई है। बॉर्डर की सड़कों व अन्य सुविधाओं को भी बढ़ाया जा रहा है। इसी कड़ी में अब राज्य के एयर स्ट्रिप और हैलीपैड आपात स्थिति में वायु सेना के उपयोग की इजाजत दी जा रही है।



मुख्य सचिव ओम प्रकाश की ओर से इस संदर्भ में 14 दिसंबर को नागरिक उड्डयन विभाग के साथ ही लोक निर्माण विभाग और गृह विभाग के अधिकारियों की बैठक बुलाई गई है।

इसमें चमोली के जिलाधिकारी और पुलिस अधीक्षक भी शामिल होंगे। नागरिक उड्डयन विभाग से राज्य के सभी एयर स्ट्रिप, हैलीपैड की रिपोर्ट के साथ ही नए निर्माणाधीन और प्रस्तावित हैलीपैड की जानकारी उपलब्ध कराने को भी कहा गया है।

चीन बॉर्डर पर रडार लगाएगी वायु सेना

वायु सेना चीन से खतरे को देखते हुए राज्य की सीमा पर रडार लगाने जा रही है। इसके लिए वायु सेना की ओर से राज्य सरकार से जमीन उपलब्ध कराने को कहा गया है। मुख्य सचिव ओम प्रकाश की ओर से

बुलाई गई बैठक में सीमा पर वायु सेना के रडार की स्थापना के लिए जगह के संदर्भ में भी निर्णय लिया जाएगा।

'एलएसी पर चीन से गतिरोध पर कोई भविष्यवाणी नहीं'

वहीं, विदेश मंत्री एस जयशंकर ने एलएसी पर तनाव के लिए एक बार फिर चीन को जिम्मेदार ठहराया है। उन्होंने एक कार्यक्रम में शनिवार को कहा कि इस वर्ष कुछ घटनाएं बहुत विचलित करने वाली हुई हैं। पूर्वी लद्दाख में चीन से जारी गतिरोध हाल फिलहाल में यह खत्म हो जाएगा या यह लंबा खिंचेगा। इस सवाल पर विदेश मंत्री ने कहा है कि मैं इस बारे में कोई भविष्यवाणी नहीं करूंगा। इस साल की घटनाएं बेहद विचलित करने वाली हैं। दूसरे पक्ष ने समझौतों का पालन नहीं किया है। वास्तविक नियंत्रण रेखा का सम्मान हो और वहां गतिविधियों पर नजर रखी जा सके, इसीलिए हम वहां मौजूद हैं।

<https://www.livehindustan.com/uttarakhand/story-indian-air-force-demands-land-to-install-radar-along-uttarakhand-china-border-air-strip-to-be-used-by-air-force-during-emergency-uttarakhand-government-3680085.html>

The Hitavada

Mon, 14 Dec 2020

Project 17A stealth frigate to be launched today

Kolkata: DEFENCE PSU GRSE-built first Project 17A stealth frigate, an addition to the naval power of the venerable Indian Navy, will be launched on Monday, an official said here. Chief of Defence Staff General Bipin Rawat will be the chief guest at the ceremony, he said.

After touching water, the first of the three state-of-the-art naval ships being built by the GRSE under Project 17A, will undergo extensive trials and fittings of ultra-modern gadgets before it is delivered to the Navy. The ship will be launched by Madhulika Rawat, wife of General Rawat, at the Garden Reach Shipbuilders and Engineers (GRSE) here on the banks of river Hooghly. P17A ships are guided missile frigates, each of which is 149 metres long, with displacement of approximately 6,670 tonnes and a speed of 28 knots, another official said.



These stealth frigates are being built deploying the latest integrated construction methodology with enhanced pre-outfitting to augment quality and reduce build periods considerably, he said. The Rs 19,294 crore contract for construction of the three stealth frigates under Project 17A is the largest-ever order for the company, the official said. The first ship is expected to be delivered in 2023 and the two others in 2024 and 2025, respectively.

<https://www.thehitavada.com/Encyc/2020/12/14/Project-17A-stealth-frigate-to-be-launched-today.html>

Future ships of the Indian Navy

With a long coastline of more than 7,800km, the Indian Navy faces the challenge of protecting the country's maritime interests at all times

With a long coastline of more than 7,800km, the Indian Navy faces the challenge of protecting the country's maritime interests at all times.

The navy continues to add key assets to its fleet, based on its strategic requirements and to maintain its dominant position as one of the major naval forces in the world.

Naval Technology details some of the major future ships of the Indian Navy.



Naval Technology details some of the major future ships of the Indian Navy either under construction or in planning stage.

Naval Technology details some of the major future ships of the Indian Navy either under construction or in planning stage.

Aircraft carriers

Vishal will be the most expensive defence platform of India, subject to funding approval from the Ministry of Defence (MoD). Still in its conceptual phase, the proposed aircraft carrier will join INS Vikramaditya and INS Vikrant, the latter of which is expected to undergo sea trials by the end of 2020. Vishal will be the second indigenous aircraft carrier after Vikrant.

With three carriers, the Indian Navy will have the capability to ensure the availability of at least two carriers at sea, while the other undergoes overhaul, repair and maintenance in the yard. Vikrant will be developed with catapult assisted take-off but arrested recovery (CATOBAR) capability and an electromagnetic launch system (EMALS). Its advanced catapults will enable the launch of heavier and larger aircraft. Although it was previously planned to be nuclear-propelled, the Indian Navy scrapped those plans.

The third aircraft carrier's significant \$7bn cost estimate (excluding the cost of fighter jets) and budget woes have, however, impacted the progress of the development. Vikrant is expected to enter service in the 2030s.

INS Vikrant, on the other hand, has [completed basin trials](#) at Cochin Shipyard Limited's (CSL) facility in Kochi in November 2020. The 262m-long aircraft carrier has a displacement of 40,000t and is expected to carry up to 40 fighter aircraft. Equipped with a short take-off but arrested recovery (STOBAR) mechanism with ski-jump, it is anticipated to join the Indian Navy's fleet by the end of 2021 or early-2022.

Submarines

The Indian Navy will procure six diesel-electric submarines under the Project-75 India (Project-75I or P75I) programme worth Rs550bn (\$7.51bn). Being developed as the successor of the Project 75 Kalvari-class programme, Project-75I will deliver a new class of attack submarines equipped with advanced air-independent propulsion systems that will allow them to stay submerged for longer duration and ensure increased operational range.

The advanced P75I submarines will be built in India through technology transfer under the Indian Government's Strategic Partnership model, which encourages the participation of domestic private firms in defence to boost the country's defence manufacturing capabilities. The government shortlisted two domestic firms, namely Mazagon Dock Shipbuilders Limited (MDSL) and Larsen & Toubro, and five foreign original equipment manufacturers in January 2020.

The programme requires the two Indian firms to work in collaboration with one of the foreign firms, including Russia's Rubin Design Bureau, Germany's ThyssenKrupp Marine Systems, France's Naval Group, South Korea's Daewoo Shipbuilding & Marine Engineering, and Spain's Navantia. Technical and financial bids for the project are anticipated to be submitted by the end of 2020.

The Indian Navy plans to acquire a total of 24 submarines, including six nuclear-capable submarines. A project to build a new class of 13,500t ballistic missile submarines is also underway. Known as S-5, the submarines will be twice the weight of the Arihant-class submarines and have the capacity to carry 12 nuclear missiles, according to Indian media. Final design work for the submarine is ongoing. Furthermore, the proposed \$17bn Project 75 Alpha nuclear-powered attack submarines (SSN) programme is progressing, with the preliminary design phase completed as of February 2020.

Frigates

The Project 17A programme, which will deliver seven advanced frigates, was approved by the Indian Government in February 2015 to enhance the Indian Navy's combat capability. MDSL will construct four Nilgiri-class frigates while GRSE will build the remaining three, under the project worth approximately Rs500bn (\$7bn). The lead ship of the class, INS Nilgiri, was launched in September 2019 while the keel of the third frigate of the class was laid in September 2020.

Based on the Project 17 Shivalik-class, the stealth frigates will be fitted with weapons, sensors, and integrated platform management system. The ship will provide significantly improved air defence capabilities due to the integration of the Barak-8 surface-to-air missile that can be fired from a vertical launch system with the capability to launch multiple missiles simultaneously. It will also be armed with BrahMos, the world's fastest supersonic cruise missile.

A larger 127mm-calibre main gun will offer enhanced range while the multi-function surveillance track and missile guidance radar (MF-STAR) will enable the detection of multiple air and surface stealth targets at the same time. The 6,670t guided-missile frigate will be powered by two MAN Energy Solutions' diesel engines and two General Electric LM2500 gas turbines. It will have a top speed of 28k while the range is expected to be 5,500nm.

Support vessels

The Indian Ministry of Defence will acquire five new fleet support vessels for the Indian Navy. A \$2.3bn contract was signed between Hindustan Shipyard Limited (HSL) and the TAIS consortium between five Turkish shipbuilders for the collaboration to design and build the vessels.

The first ship will take four years to complete, while the remaining will be built ten months apart from each other. To be built indigenously through technology transfer from the Turkish consortium, the fleet support vessels will be used to transport food and ammunition for replenishment. Anadolu Shipyard, which is part of TAIS, will provide design and technical support to HSL for building the 45,000t ships.

India also approved the procurement of six next-generation offshore patrol vessels (NGOPVs) for the Navy in August 2018. Each NGOPV will displace approximately 2,500t and carry more than 150 people, including 20 officers and 130 sailors. To be deployed both in blue and littoral waters, the vessels would be used for protection of offshore assets, search and seizure operations, surveillance missions, and maritime interdiction.

Anti-submarine warfare shallow watercraft (ASW SWC) ships

The Indian Navy placed contracts with CSL and Garden Reach Shipbuilders & Engineers (GRSE) for the construction of 16 anti-submarine warfare shallow watercraft (ASW SWC) ships in May 2019. CSL and GRSE will build eight ships each, with deliveries expected to start from 2022. The ASW SWC warships will have lower draught and be incorporated with indigenous integrated platform management systems, propulsion, and auxiliary equipment.

Being procured under a \$1.88bn project, the ASW ships will boost the Indian Navy's coastal shallow-water anti-submarine warfare capability. The ships will provide coastal subsurface surveillance and mine-laying capabilities and support submarine-hunting operations in shallow waters.

The ASW SWC will be 70m-long with a displacement of 700t. Its stealthy design will offer low acoustic and infrared signature. The warship is expected to be equipped with an ASW combat suite, including hull-mounted sonar, low-frequency variable depth sonar (VDS), torpedo tube

launcher, rocket launcher, and fire control system, as well as a remote control gun with optronic control.

<https://www.naval-technology.com/features/future-ships-indian-navy/>



Sat, 12 Dec 2020

China trawlers ravaging the Indian Ocean Region! Indian Navy keeps a tab on its growing presence

Sources have confirmed the presence of three research vessels – “Xiang Yang Hong 01 and Xiang Yang Hong 03 have also been docked in the Colombo Port since last month. And, another survey vessel HAI CE 3301 is around the Strait of Malacca.”

By Huma Siddiqui

The last few years have witnessed a rise in numbers of Chinese fishing as well as research vessels in the Indian Ocean Region (IOR), almost ninety-degree east ridge and south-west Indian ridge. Sources have confirmed the presence of three research vessels – “Xiang Yang Hong 01 and Xiang Yang Hong 03 have also been docked in the Colombo Port since last month. And, another survey vessel HAI CE 3301 is around the Strait of Malacca.” Adding, “This survey vessel has been identified and is known to have in the past conducted extensive maritime surveys in the Western Pacific Ocean.”

As per the International Regulations, the research activities are allowed. However, the data which is generated has a dual-use—military or simply to monitor the water for the movement of the Indian Navy’s presence.

“The Indian Ocean Region with its large number of middle and low-income economies and large coastal populations, dependent for their sustenance on the sea, are especially vulnerable to the depredation of marine resources if allowed to go unchecked,” Indian Navy veteran Commodore Anil Jai Singh tells Financial Express Online.

The number of Chinese fishing vessels has been going up in the last few years, the fishing activities have been seen in the Central Arabian Sea and South-West Indian Ocean. Though there is no presence in the Indian Exclusive Economic Zone, the trawlers are from China, Hong Kong and Taiwan.

Also, near Somalia and near the Coast of Oman has been picked up based on the based on recordings of the Automatic Identification System (AIS) onboard trawlers.

What role does IFC-IOR play?

The Information Fusion Centre – Indian Ocean Region (IFC-IOR) is fully equipped to keep a track of all the shipping and other vessels traversing in the Indian Ocean Region (IOR) and is in fact at it for the last couple of years.

According to the former spokesperson of the Indian Navy, Capt DK Sharma, “India has an agreement in place with almost 35 countries wherein information on White Shipping is exchanged in real-time basis so as to have a maritime picture of the Indian Ocean Region crystal clear.”



As per the International Regulations, the research activities are allowed. However, the data which is generated has a dual-use—military or simply to monitor the water for the movement of the Indian Navy’s presence.

“The problem arises when IUU fishing trawlers enters this area and make forays into the EEZ of littorals for catching fish and other marine life. These illegal activities are increasing by the day and are a concern world over. Indian Navy is doing its best to check this menace of IUU,” Capt Sharma explains to Financial Express Online.

“Mission Based deployments by ships, regular sorties by Long and Medium range maritime surveillance aircraft (LRMR aircraft) are undertaken to keep an eye on this. Time has come now to take stringent actions against this menace and I am pretty sure that Govt of India has a plan to stop this in time,” says Capt Sharma.

Expert View

Sharing his views, Commodore Anil Jai Singh, who is also Vice President Indian Maritime Foundation opines, “There was a time about three decades ago when it was said that the Indian Ocean is the only ocean where fish die of old age. Today the situation is quite the opposite with an alarming reduction in the numbers caused by excessive and poorly regulated fishing which is upsetting the ecological balance of the fragile marine eco-system. The need for a well-regulated regional architecture is more urgently required than ever before to ensure sustainable development of the maritime domain. It is also included in the regional commitment to the Sustainable Development Goals (SDG). A lackadaisical approach, as prevails at present will lead to irreversible damage and besides hazarding lives and livelihoods, will become an existential security threat to the region.”

In his view, “The Indian Ocean region is faced with a multitude of traditional, non-traditional and transnational maritime threats from within and also from predatory extra-regional powers like China who think nothing of bullying their way into the sovereign waters of other nations and poach for resources. In fact, China’s increasing presence in the Indian Ocean which was earlier restricted to naval platforms now also include research ships and fishing fleets.”

“In the last one year or so itself, Chinese research vessels have been a constant presence and though careful to stay on the high seas are gaining information and knowledge of these waters and the weaknesses which it will not hesitate to exploit. Large numbers of fishing vessels including large trawlers (reports indicate a number in excess of 450) have started entering the Indian Ocean for fishing. They are careful in operating on the periphery of the EEZs but often go dark by switching off their AIS transponders so that their movement cannot be tracked and probably make forays within the EEZ secure in the knowledge that these small countries do not have the wherewithal to keep a constant vigil on their waters which is then exploited to the fullest” explains the former submariner of the Indian Navy.

“This unprincipled and unethical Chinese behaviours, often bordering on criminality is getting bolder and has an expanding footprint as the demand for resources within the country increases,” says Commodore Singh.

How can India control this menace?

In his opinion, “The threat from IUU is amongst the most severe because it has a direct impact on the health and livelihood of large coastal populations and in some cases entire populations. If these populations are deprived of the nutritional benefits of seafood and other marine resources, it could lead to malnutrition and the attendant health issues making these populations vulnerable to external destabilising influences.”

“ As a net security provider in the Indian Ocean, India should take the lead in developing an inclusive regional security architecture and a robust regulatory framework to ensure adherence from the countries within while deterring such activity from predatory external powers,” Commodore Singh suggests.

In conclusion he says, “any moves by China, however innocuous they may seem must be monitored and nipped in the bud since these are all part of that country’s larger strategic design on the Indian Ocean and beyond.”

<https://www.financialexpress.com/defence/china-trawlers-ravaging-the-indian-ocean-region-indian-navy-keeps-a-tab-on-its-growing-presence/2148161/>

Three options that will boost India's defence prospects in 2021

India needs to maximise its military's operational capacity and increase the possibility of indigenisation without confusing the two and ending up nowhere

By Abhijit Iyer Mitra

For 70 years, the Indian military has been in a state of flux — after several bouts of sanction, we've endured several failed quests for indigenisation.

In any military the competition is usually between indigenisation (investing in the future) and operational capability (invest in here and now). Yet we have failed at indigenisation, nor have we an enviable operational capability — this despite a military budget that is higher than Russia, Britain, France, Germany, Japan, South Korea, Brazil, Italy and Israel all of whom have outstanding defence products to sell.

If we have failed at indigenisation, it is because of the touchingly naïve belief that domestic defence development can happen in isolation from an abysmal education system, capricious industrial regulation, an unloved MSME sector and obsolete labour regulations.

If we have failed to create operational capability proportionate to the size of our forces on paper or the defence budget, it is because of the mix-and-match purchases, constantly shifting requirements, obsolete thought, wilful disregard of realistic budgeting, and the childlike innocence of believing that drafting the 'perfect' defence procurement procedure can overcome a massive human capacity deficit in the procurement process.

The question is what can India do in 2021 that may not solve these problems, but will certainly help us on the path to variously maximising operational capacity or increasing the possibility of indigenisation without confusing the two and ending up nowhere.

The first is to enlarge the lease model. In 2020, India for the first time in its history leased US MQ-9 reaper drones. This is a particularly important precedent because it opens up a whole new world of fighter replacement options for India.

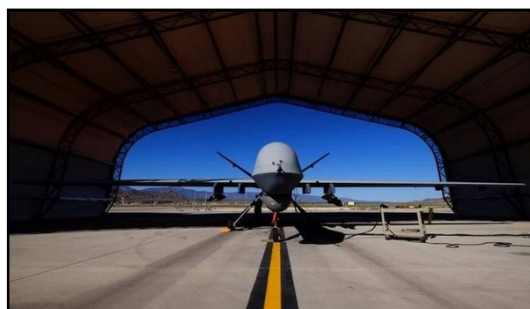
Thus far, the light fighter replacement has gone nowhere. The Tejas remains an operationally dubious product, the first MRCA contest to replace the MiG-21 was surreptitiously hijacked into the MMRCA contest that saddled us with yet another heavy fighter, the Rafale, which was too expensive to buy in large numbers.

The second iteration of the MRCA contest (announced after the Rafale purchase) has again been derailed by allowing twin jets to compete which in all likelihood be steered towards a repeat order of the exorbitant Rafale.

India, therefore, desperately needs light fighters in large numbers now.

Enacting lease options means we can get access to a large number of second-hand F-16s, Mirage 2000s and Gripens — which won't derail the Tejas, but will boost capability enormously by allowing us to not just retire the MiG-21 but also MiG-29s and Jaguars, while filling a huge gap left by the retirement of the MiG-27 with vastly superior aircraft while rationalising the fleet.

Most importantly what we should remember is that despite these being second-hand aircraft, they vastly outclass the light fighters China and Pakistan field at the moment. Remember that the



FILE PHOTO: A U.S. Air Force MQ-9 Reaper drone sits in a hanger at Creech Air Force Base May 19, 2016. The base in Nevada is the hub for the military's unmanned aircraft operations in the United States. REUTERS/Josh Smith/File Photo

Indian Air Force chose not its new 1997 model Sukhois to conduct the Balakot strikes, but the 1982 vintage Mirage 2000. What's more, one can also get early model F-15s for the air force in a heavy strike role or lease earlier F-18 variants for the navy till the naval Tejas gets ready, with the possibility of a rent-try-buy (lease purchase) agreement if the Tejas fails.

The second option to look at is naval — to down select one engine (the Rolls Royce MT30, the Lockheed LM2500, or the Ukrainian Zorya) and make it compulsory for all large surface ships (combat or supply). This will create economies of scale to indigenise, vastly simplify logistics, and force a design and procurement discipline on the navy.

Finally, we need to set up a proper fund in India for funding private defence development. The Air Force's 'Meher Baba' contest for building surveillance drones is the biggest example of the abject failure in this regard. It envisages a final order of Rs 100 crore, but the components required would take between develop Rs 20-30 crore to develop. This was announced as a pre-funded incubator for defence companies.

Yet halfway through the competition — the participants were informed the winner would not be funded, and they would have to raise capital for development themselves. This farcical flip-flop essentially knocked the wind out of a number of promising competitors who had no means of raising such capital given the extraordinary unpredictability of Indian defence orders and notorious non-payment of dues.

India's defence problems run deep. But the three options described above, are simple, straightforward, ruffle no feathers, can be operationalised in a short time and will have far-reaching consequences. The question is if the defence establishment has even the slightest willingness to change its record.

(Abhijit Iyer-Mitra is a defence economist and senior fellow at Institute of Peace and Conflict Studies, New Delhi. Twitter: @iyervval. Views are personal.)

<https://www.moneycontrol.com/news/opinion/three-options-that-will-boost-indias-defence-prospects-in-2021-6216821.html>



Sat, 12 Dec 2020

SMASH-2000: Israel's another game-changing weapon for Indian troops to check-mate Chinese, Turkish drones?

Israeli SMASH-2000 Plus 'fire control system' looks like any other expensive optical sight attached to a rifle, but packs a lot more technology than a casual electro-optic technology

By Haider Abbas

India is set to acquire an unspecified number of SMASH-2000 plus system- Israeli cutting-edge fire control systems that would help tackle drone threats from close range besides improving a soldier's accuracy and speed of hitting targets.

As reported by EurAsian Times, the SMASH-2000 'fire control system' looks like any other expensive optical sight attached to a rifle, but it certainly packs a lot more technology than a casual electro-optic technology.

SMASH-2000 is developed by Smart Shooter, a company that has been developing systems to help militaries track and engage moving targets.

Israel is perhaps the only country that has served as the bedrock of India's defense in recent months. It has provided India every opportunity to prime its frontiers, which surely has given the latter an edge in its technological capability to counter China and Pakistan.

The Indian Army along with the Border Security Force are already in talks with an Israeli firm, Smart Shooter for the supply of SMASH-2000 Plus fire control systems, which will be installed mainly on AK-47 and AK 203 rifles. SMASH is a kind of electro-optic sight system.

“SMASH 2000 Plus provides an inimitable hard-kill solution against the growing threats of drones, and delivers proven ability to hit any ground or airborne targets and eliminate the threat quickly and effectively,” Michal Mor, the (Israeli) company’s CEO was quoted by media as saying.

“We will be happy to keep offering the Indian Military diverse cutting-edge solutions for protection against ground and aerial threats at land, air, and sea,” she added. According to the company, the built-in targeting algorithms in SMASH 2000 Plus can track and hit very small drones skimming along at high speed, at ranges of up to 120 meters, with the first shot.



SMASH 2000 Plus mounted on a rifle

Based on the SMASH 2000 system, SMASH 2000 Plus includes the whole feature set with an additional advanced Counter-UAS (Unmanned Aerial Systems) mode, which provides the accurate hard-kill capability to counter the emerging drone threat.

Introduced by the company in the market in 2019, the electro-optic (EO) sight system provides a day and night rapid target acquisition capability to target small, fast-moving aerial threats such as incendiary balloons and kites (which had been used by the Hamas in Gaza). This was later upgraded to target small, moving drones from closer ranges.

Interestingly, the Indian Navy’s new order has come within a week of Navy Day (December 4) when the Chief of Naval Staff Admiral Karambir Singh had reiterated to buy a third aircraft carrier, that would be in sync with the country’s aspiration to become a 5 trillion USD economy.

The Navy chief had made it “absolutely necessary for an aspirational India that has nearly one-fifth of the global population and wants to raise its overall stature”. The Navy has been pitching for three aircraft carriers to deal with China’s growing naval prowess and its growing influence over the Indian Ocean region. At present, India has only one aircraft carrier – INS Vikramaditya, which is a Russian-origin platform.

But, surprisingly, this proposal has not gone well off with Chief of Defense Staff Bipin Rawat, who had expressed that the proposal, in February last, would not get approval owing to its extremely high cost.

In fact, India has been on a weapon buying spree from all across the world, be it the US, Israel or France, and other countries. Hence, citing a financial constrain is certainly out of place, but unfortunately, it did bring ‘the not so required spat’ between Karambir Singh and Bipin Rawat in the open.

India knows it too well that Turkish drones have come in handy to Azerbaijan in its recent war (November 2020) with Armenia, which made Ukraine seek 50 Turkish Bayraktar drones, on November 26, 2020.

Turkey is gearing up to supply the same to Pakistan, according to EurAsian Times on November 29, 2020. Hence, it is imperative for India to counter the drone challenge from Turkey, which has also supported Pakistan on the issue of Kashmir.

Turkey, Pakistan, and China, supported by Russia, are now firmly in a bloc pitched against India, which has aligned with the rival bloc led by the US, after signing BECA with it.

India’s growing military alliance with Israel also has strengthened the two-bloc rivalry. How India will meet the new challenge, particularly, after the US President-elect Joseph Biden assumes office, only time will tell.

<https://eurasianimes.com/israel-equips-indian-army-with-another-game-changing-weapon-amid-flaring-tensions-with-pakistan-china/>

China-Pak air exercises: Why the iconic F-16 is missing from the line-up | **India Today Insight**

Strict US end-user monitoring of the aircraft prevents its deployment with a potential foe, the PLAAF

By Sandeep Unnithan

Delhi: On December 9, China and Pakistan began their ninth joint air force exercises. This iteration of the Shaheen-IX (eagle) air exercises, which began in the Pakistan Air Force's (PAF's) newest airbase in Bholari, Sindh, and featured 50 fighter aircraft, are believed to be the most complicated so far in the decade since the two countries began the exercises to enhance defence cooperation. That the exercises come during a military stand-off between India and China in eastern Ladakh is the reason why it will be closely monitored by the India Air Force (IAF). The exercise includes the PAF JF-17s, Mirage-IIIs and the People's Liberation Army (PLA) Air Force J-10 and J-11s heavy fighters.

Missing from the line-up, though, as they have been in every iteration of the exercise, was the Pakistan Air Force's F-16 fighter aircraft. This might seem surprising because Bholari, commissioned in 2017, is Pakistan's third F-16 base. The US-built single-engine fighter is one aircraft Chinese pilots might want to match their skills against since they are in service with the South Korean and Taiwanese air forces. The People's Liberation Army Air Force's (PLAAF's) J-10 itself is widely believed to be a copy of an F-16 copy—a Chinese built version of Israel's F-16 copy, the 'Lavi' fighter jet. For Pakistan to deploy F-16s in these exercises, however, would mean violating end-user agreements that Pakistan signed with the US when it bought the aircraft. A breach of these agreements could potentially lead to the cancellation of US's technical support to Pakistan's F-16 program.



A PLAAF J-11, with PAF F-7, JF-17 and Mirage-IIIs at Pakistan's Bholari Airbase at the start of Shaheen-IX air exercises, December 9

The agreements date back to the arms sales made by the US to Pakistan, following the 9/11 terror attacks of 2001. Pakistan was then under severe US sanctions for its nuclear weapons program. In 2001, the US resumed military sales to Pakistan in exchange for Pakistani assistance in the 'Global War on Terror'. Over \$10 billion worth of military hardware exported to the Pakistan military included 36 F-16 fighter jets of the newest Block 50/ 52 standard and the upgrading of the PAF's existing fleet of 32 F-16s purchased in the early 1980s. The deals, though, came with strings attached—the end-user agreements which monitored how the aircraft were being used and who had access to them. These agreements are monitored by US military personnel and contractor representatives physically present on the ground in Pakistani airbases. Among the key components of a \$125 million program to support Pakistan's F-16 program approved by the US state department last year, was the inclusion of at least 60 "contractor representatives" working for a US-based firm assist in the overseeing of the operations. The reasons for these intrusive controls are not hard to see. The US is wary of letting adversary China from laying their hands on the top-of-the-line US military hardware or knowing about their performance parameters like radar emissions which would enable them to develop countermeasures. Last year, for instance, the US cancelled a sale of F-35 fighter jets to Turkey because Ankara persisted with its purchase of

Russian S-400 air defence systems. The US military had concerns that the S-400's radars could be used to track its fifth generation fighter aircraft.

US contractor representatives track the deployments of the PAF's F-16. One Indian intelligence official recalls an incident from a few years ago when a US contractor representative had flown into an airbase to check why a PAF F-16 had made an unscheduled diversion there. The PAF might own the aircraft but the ownership is, clearly, largely conditional.

<https://www.indiatoday.in/india-today-insight/story/china-pak-air-exercises-why-the-iconic-f-16-is-missing-from-the-line-up-1749211-2020-12-13>

THEWEEK

Sun, 13 Dec 2020

'Bunker buster' for Rafale: Fighter tests 1,000kg version of HAMMER missile

Safran states this new weapon will give the Rafale an enhanced strike capability

French defence company Safran has announced that it has successfully completed two 'separation' tests of a heavy version of the AASM smart munition from a Rafale fighter. The AASM (Armement Air-Sol Modulaire) is also known as the HAMMER (Highly Agile Modular Munition Extended Range).

A separation test involves the release of a weapon or aircraft component in flight to ensure it clears the launch platform safely. Separation tests are a necessary precursor to start of trials of the weapon itself.

A press release from Safran on Friday announced the tests of the 1,000kg variant of the HAMMER were conducted at the French defence procurement agency's Cazaux flight test centre in southwest France.



A Rafale flying with three 1,000kg AASM HAMMER weapons | © ERIDIA Studio via Dassault Aviation

The 1,000kg version of the HAMMER would be the heaviest weapon to be deployed on the Rafale, with exception of the Scalp cruise missile, which weighs around 1,200kg.

Safran stated the first live firing tests of the 1,000kg version of the HAMMER—which would involve validation of the weapon's sensors and range—would be conducted in 2021 before the system is qualified for service entry by 2022.

Like the Israeli-supplied SPICE smart bombs that the Indian Air Force used in the Balakot attack last year, the AASM HAMMER is actually an add-on kit to an existing 'gravity' bomb.

Part-bomb, part-missile

But unlike the SPICE, the AASM HAMMER is unique in the sense that it has features of both a missile and a glide bomb. Safran claims the HAMMER "adds a propulsion kit and a choice of guidance kits to standard bombs". The fact that it is propelled allows the AASM HAMMER to be used at low altitudes or in hilly terrain, unlike normal bombs that are unpropelled.

The AASM HAMMER is a modular weapon, which can be equipped with a variety of guidance systems such as satellite guidance, infra-red seeker and laser. According to Safran, the AASM HAMMER can be fired at ranges of anywhere between 20km to 70km, enabling the launch aircraft to stay out of range of enemy air defences.

The AASM HAMMER kit can be fitted to bombs of different sizes: 125kg, 250kg, 500kg and 1,000kg. The French military has ordered over 1,500 units of the 250kg version of the HAMMER.

In early press releases on the AASM, Safran had described the 1,000kg version of the AASM as a 'bunker buster' weapon because of its capability to penetrate several meters of reinforced concrete.

Bigger, better?

Safran notes, "The 1,000kg AASM features a guidance kit derived from the 250kg version and a specific range extension kit." Explaining the advantages of the 1,000kg version of the AASM HAMMER, Safran stated, "This new weapon will give the Rafale an enhanced strike capability, with payload configurations of up to three 1,000kg AASMs per aircraft. Its standoff range is also extended, thanks to the integrated propulsion system."

While the Scalp cruise missile can also penetrate reinforced targets, the 1,000kg HAMMER would achieve the same at a lower cost.

In July, reports emerged that the Indian Air Force would be ordering the HAMMER on an emergency basis. Other export users of the AASM HAMMER are Qatar, Egypt and Morocco. Greece is also expected to buy the weapon when it signs a contract to buy the Rafale.

<https://www.theweek.in/news/sci-tech/2020/12/12/bunker-buster-for-rafale-fighter-tests-1k-kg-version-of-hammer-missile.html>

Science & Technology News



Sat, 12 Dec 2020

ISRO to launch communication satellite on December 17, maiden SSLV launch to follow

This will be the 42nd communications satellite to be launched by the space agency

By Anonna Dutt

New Delhi: Just over a month after the first launch mission of the year, the Indian Space Research Organisation (Isro) is gearing up to launch a communication satellite aboard India's workhorse Polar Satellite Launch Vehicle (PSLV) on December 17. The launch will take place at about 3.41pm.

The mission, which was to take place on December 14, was postponed by a few days owing to adverse weather conditions.

This will be the 42nd communications satellite to be launched by the space agency and will provide coverage over the entire country for disaster management and satellite internet connection.

The satellite, named CMS-01, will be the first in a new series of communication satellites by India after the INSAT and the GSAT series. The previous satellite launched by Isro also had an altered nomenclature; it was called EOS (Earth Observation Satellite) 01. Previous earth observation satellites were thematically named by the space agency depending on their task or the kind of instrumentation carried. EOS-01 had previously been named RISAT-2BR2, short for Radar Imaging Satellite (RISAT).

The new satellite will replace the current GSAT-12 in orbit, which was launched in 2011.

The next much anticipated mission of the space agency is the maiden flight of the newly developed Small Satellite Launch Vehicle (SSLV), with the capacity to launch a light 500kg satellite in the lower Earth orbit.

The new rocket will cost about Rs30 crore, compared to the Rs120 crore it costs to manufacture the currently used PSLV. It can also be assembled by a team of six within seven days, in comparison to a team of 600 people and a few months it takes to assemble a PSLV.

The SSLV has been developed by Isro mainly for commercial launches.

Before the pandemic, India was only able to complete one satellite mission—GSAT-30—this year, launched by the international launcher Arianespace from Kourou, French Guiana, in January.

The space agency had nearly 20 satellite and launch missions planned for the year, including the big-ticket Aditya L1, India's first mission to the sun. The purely scientific mission would have seen Isro sending a satellite 1.5 million km away from the Earth to the L1 point. The L1, or Lagrangian point, between the Earth and the Sun, is where the gravitational pull of both the bodies on the satellite is equal to the centripetal force needed to keep the satellite in orbit.

The first unmanned flight under the Gaganyaan mission was also scheduled for December 2020.

A third Chandrayaan mission with just a lander and rover was to take place either in late 2020 or early 2021. All the missions were delayed due to the pandemic.

<https://www.hindustantimes.com/india-news/isro-to-launch-communication-satellite-on-december-17- maiden-sslv-launch-to-follow/story-rmDeMrOpf7YxAMLppIzcYI.html>

Telangana Today

Mon, 14 Dec 2020

AWS comes forward to help India chart its new space journey

AWS this year announced a new business segment called 'Aerospace and Satellite Solutions', dedicated to accelerating innovation in the global aerospace and satellite industry

New Delhi: As the Indian government embarks on a new space exploration journey by wooing the private sector with liberal policies, Amazon Web Services (AWS) which is the Cloud arm of Amazon, has come forward to help the country transform its space sector and tap into the multi-billion-dollar opportunity.

AWS this year announced a new business segment called 'Aerospace and Satellite Solutions', dedicated to accelerating innovation in the global aerospace and satellite industry.

For Teresa Carlson, Vice President for Public Sector and Regulated Industries, AWS, the new vertical will bring AWS services and solutions to the space enterprise and India is on their priority list as the country opens up the space sector for the private players and startups.

"We have so many lessons learnt from our startups in the agriculture sector in India and we can apply the same learnings and key best practices with the startups in the field of space, and really lead them," Carlson told IANS during a virtual interview.

"We'll be listening to ISRO (Indian Space Research Organisation) and our partners in India in terms of what we can provide them but from everything we know, they need humongous data storage and to make sense of huge space datasets, they need edge computing and have to work on their virtual mission operations just like NASA is doing," she elaborated.

Several young startups such as Agnikul, Pixxel, Bellatrix Aerospace and Vesta Space have raised funds and joined the fray.



The Department of Space this month signed a non-disclosure agreement (NDA) with Chennai-based small rocket company Agnikul to access the facilities and technical expertise available in ISRO centres.

The new AWS space business segment, according to Carlson, would help India reimagine space system architectures, transform space enterprises, launch new services that process space data on Earth and in orbit and provide secure, scalable and cost-efficient cloud solutions to support government missions and companies.

On May 16, Finance Minister Nirmala Sitharaman announced that Indian private sector will be a co-traveller in India's space sector journey and a level-playing field will be provided for them in satellites, launches, and space-based services.

According to Sitharaman, the private sector will be allowed to use the facilities of ISRO and other relevant assets to improve their capacities.

On the other hand, ISRO chief K. Sivan had said many startup companies have expressed interest in the space sector while big corporates are yet to come to the front.

Sivan said the global space sector market size is about \$350 billion and India's share is less than three per cent and the share will not improve if ISRO remains the sole player.

The government is also working on a new launch vehicle policy and a space exploration policy while the existing Satellite Communication Policy and Remote Sensing Data Policy are being amended to make it more transparent.

The time is ripe for tech giants like AWS to step in and provide tailor-made solutions to transform the space enterprises in India.

"We will help ISRO and private Indian space companies with secure satellite connectivity, the imaging and processing of space data via intelligent analytics using machine learning and Artificial Intelligence (AI) in a cost-effective way," Carlson said.

"The world is entering an exciting and daring new age in space. New companies have moved into the space business and are launching more satellites and human missions into orbit than ever before" and India must tap into this huge opportunity, she added.

AWS Ground Station, a fully managed service already provides satellite owners and operators global access to their space workloads.

AWS Ground Station is already being used by NASA's Jet Propulsion Lab (JPL) and many other customers.

Satellites are being used by more and more businesses, universities and governments for a variety of applications, including weather forecasting, surface imaging, and communications. To do this today, customers must build or lease ground antennas to communicate with the satellites.

"Low-latency internet, high-resolution Earth observation, and ubiquitous Internet of Things (IoT) communications companies will launch thousands of new satellites over the next five years to provide sensing capabilities to customers around the world," Carlson emphasised.

Once customers upload satellite commands and data through AWS Ground Station, they can quickly download large amounts of data over the high-speed AWS Ground Station network, immediately process it in Amazon Cloud.

Using AWS Ground Station, customers can save up to 80 per cent of their ground station costs by paying for antenna access time on demand.

<https://telanganatoday.com/aws-comes-forward-to-help-india-chart-its-new-space-journey>

Faraday fabrics? MXene-coated fabric could contain electronic interference in wearable devices

Researchers at Drexel University's College of Engineering have reported that fabric coated with a conductive, two-dimensional material called MXene, is highly effective at blocking electromagnetic waves and potentially harmful radiation. The discovery is a key development for efforts to weave technological capabilities into clothing and accessories.

Materials that block electromagnetic waves had a commercial moment a handful of years ago when fears that high-tech thieves could scan or copy credit cards, passports or hack into laptops and contactless car keys had people putting them in special wallets, bags and protected pockets. While reporting suggests these fears were overblown, the demand for this sort of textile is likely to grow as more manufacturers incorporate sensing and communication technologies into fabrics.

They could also be deployed in national defense organizations to shield devices from tracing and hacking and to protect people from strong microwave radiation—the kind that might have been used against American and Canadian diplomats according to recent reports.

"Wearable devices will need shielding from the electromagnetic interference (EMI) regularly produced by mobile devices, and that shielding should be integrated as part of the garment," said Yury Gogotsi, Ph.D., Distinguished University and Bach professor at Drexel, who led research recently published in the materials science journal *CARBON*. "We have known for some time that MXene has the ability to block electromagnetic interference better than other materials, but this discovery shows that it can effectively adhere to fabrics and maintain its unique shielding capabilities."

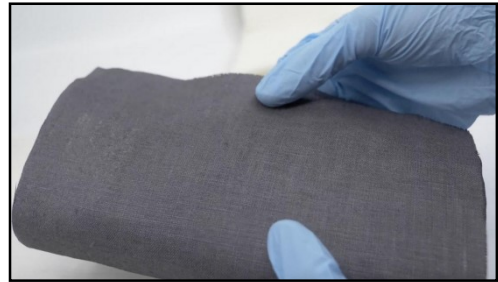
The interference comes from residual electromagnetic fields produced by electronics devices. Users notice it as a buzz, a slowing or temporary stall in a device's function. It's a momentary inconvenience, but these moments are becoming more frequent with expanded use of mobile devices and connected technology—including wearables.

Improving the design of these devices, according to Gogotsi, entails using a shielding material to contain electromagnetic field generated by the device, as well as protecting it from interference produced by other devices. Gogotsi's team, which first produced and studied the conductive two-dimensional MXene materials nearly a decade ago, has been testing MXene coatings for this role, with promising results.

"MXenes are well-suited for use as shielding because they can be stably produced as a spray coating, an ink or a paint, so they can be applied to textiles without adding much weight or taking up more room," Gogotsi said. "We have also discovered that MXene shielding can absorb and reflect electromagnetic waves, so it not protects the wearable devices and electronic gadgets, but also protect people from strong electromagnetic field."

The researchers' most recent finding shows that dip-coating regular cotton or linen fabric in a MXene solution will turn it into an equally formidable shielding material—blocking EMI at greater than 99.9% effectiveness.

MXene flakes suspended in solution naturally adhere to the fibers in conventional cotton and linen fabrics because of their electric charge. This produces a thorough and durable coating,



Drexel University researchers report that fabric coated with MXene is 99.9% effective at blocking electromagnetic interference. Credit: Drexel University

without the need for the pre- or post-treatment processes to produce most commercial conductive yarns and fabrics.

As part of the study, the MXene-coated fabrics were tested after being stored under normal conditions for two years and they showed only a slight drop in shielding efficiency—roughly 10%.

"This work provides a much-improved alternative to current EMI shielding textiles," said Simge Uzun, a doctoral student in Gogotsi's research group, who conducted this research as a part of her Ph.D. program. "Not only do MXene-coated fabrics exceed the performance of commercial metal-coated fabrics, but they can be sustainably produced by coating from aqueous solution without extra processing or chemical additives."

More information: Simge Uzun et al, Highly Conductive and Scalable $\text{Ti}_3\text{C}_2\text{T}$ -Coated Fabrics for Efficient Electromagnetic Interference Shielding, *Carbon* (2020). DOI: [10.1016/j.carbon.2020.12.021](https://doi.org/10.1016/j.carbon.2020.12.021)

Journal information: *Carbon*

<https://phys.org/news/2020-12-faraday-fabrics-mxene-coated-fabric-electronic.html>



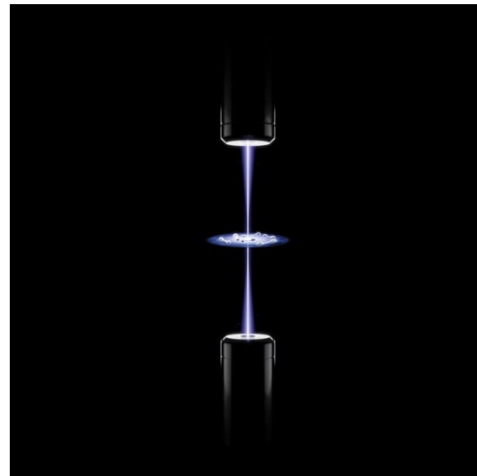
Sat, 12 Dec 2020

Physicists observe the emergence of collective behaviour

Phase transitions describe dramatic changes in properties of a macroscopic system—like the transition from a liquid to a gas. Starting from individual ultracold atoms, Heidelberg University physicists were able to observe the emergence of such a transition with an increasing number of particles. The research work was carried out in the field of quantum physics under the direction of Prof. Dr. Selim Jochim from the Institute for Physics.

In order to formulate effective theories in physics, microscopic details are set aside in favor of macroscopically observable quantities. A cup of water can be described by properties like pressure, temperature and density of the fluid, whereas the position and velocity of the individual water molecules are irrelevant. A phase transition describes the change of a macroscopic system from one state of matter, like fluid, to a different state of matter, like gaseous. The properties of macroscopic systems—so-called many-body systems—can be described as emergent because they result from the interaction of individual components which themselves do not possess these properties.

"I have long been interested in how this dramatic macroscopic change at a phase transition emerges from the microscopic description," states Selim Jochim. To answer this question, the researchers designed an experiment in which they assembled a system from individual ultracold atoms. Using this quantum simulator, they investigated how collective behavior arises in a microscopic system. To this end, they trapped up to twelve atoms in a tightly focused laser beam. In this artificial system it is possible to continuously tune the interaction strength between the atoms from non-interacting to being the largest energy scale in the system. "On the one hand, the number of particles in the system is small enough to describe the system microscopically. On the other hand, collective effects are already evident," explains Luca Bayha, a postdoc in Prof. Jochim's team.



Artist impression: Six pairs of atoms in the focus of a laser beam. Credit: Jonas Ahlstedt / Lund University Bioimaging Centre (LBIC)

In their experiment, the Heidelberg physicists configured the quantum simulator such that the atoms attract one another, and if the attraction is strong enough, form pairs. These pairs of atoms are the necessary ingredient for a phase transition to a superfluid—a state in which the particles flow without friction. The current experiments focused on when the pair formation emerges as a function of the interaction strength and the particle number. "The surprising result of our experiment is that only six atoms show all the signatures of a phase transition expected for a many-particle system," adds Marvin Holten, a doctoral student in Prof. Jochim's group.

More information: Luca Bayha *et al*, *Observing the emergence of a quantum phase transition shell by shell*, *Nature* (2020). DOI: [10.1038/s41586-020-2936-y](https://doi.org/10.1038/s41586-020-2936-y)

Journal information: [Nature](https://phys.org/news/2020-12-physicists-emergence-behaviour.html)
<https://phys.org/news/2020-12-physicists-emergence-behaviour.html>



Sat, 12 Dec 2020

Researchers find a better way to design metal alloys

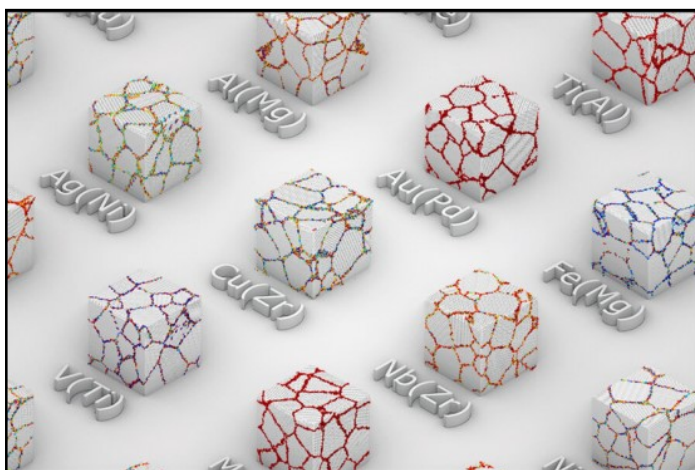
By David L. Chandler

In a step which will further enhance India's preparedness for a two-front war scenario, the Indian Army is discussing proposals to create dual-task formations. These formations will simultaneously look after both the Pakistan and China borders.

Advanced metal alloys are essential in key parts of modern life, from cars to satellites, from construction materials to electronics. But creating new alloys for specific uses, with optimized strength, hardness, corrosion resistance, conductivity, and so on, has been limited by researchers' fuzzy understanding of what happens at the boundaries between the tiny crystalline grains that make up most metals.

When two metals are mixed together, the atoms of the secondary metal might collect along these grain boundaries, or they might spread out through the lattice of atoms within the grains. The material's overall properties are determined largely by the behavior of these atoms, but until now there has been no systematic way to predict what they will do.

Researchers at MIT have now found a way, using a combination of computer simulations and a machine-learning process, to produce the kinds of detailed predictions of these properties that could guide the development of new alloys for a wide variety of applications. The findings are described today in the journal *Nature Communications*, in a paper by graduate student Malik Wagih, postdoc Peter Larsen, and professor of materials science and engineering Christopher Schuh.



Researchers have found a new way to predict the properties of metal alloys based on reactions at the boundaries between the crystalline grains of the primary metal. In this image, the colored dots indicate the likelihood that atoms will collect along these boundaries rather than penetrating through. Credit: Massachusetts Institute of Technology

Schuh explains that understanding the atomic-level behavior of polycrystalline metals, which account for the vast majority of metals we use, is a daunting challenge. Whereas the atoms in a single crystal are arranged in an orderly pattern, so that the relationship between adjacent atoms is

simple and predictable, that's not the case with the multiple tiny crystals in most metal objects. "You have crystals smashed together at what we call grain boundaries. And in a conventional structural material, there are millions and millions of such boundaries," he says.

These boundaries help to determine the material's properties. "You can think of them as the glue holding the crystals together," he says. "But they are disordered, the atoms are jumbled up. They don't match either of the crystals they're joining." That means they offer billions of possible atomic arrangements, he says, compared to just a few in a crystal. Creating new alloys involves "trying to design those regions inside a metal, and it's literally billions of times more complicated than designing in a crystal."

Schuh draws an analogy to people in a neighborhood. "It's kind of like being in a suburb, where you may have 12 neighbors around you. In most metals, you look around, you see 12 people and they're all at the same distance away from you. It's totally homogenous. Whereas in a grain boundary, you still have something like 12 neighbors, but they're all at different distances and they're all different-size houses in different directions."

Traditionally, he says, those designing new alloys simply skip over the problem, or just look at the average properties of the grain boundaries as though they were all the same, even though they know that's not the case.

Instead, the team decided to approach the problem rigorously by examining the actual distribution of configurations and interactions for a large number of representative cases, and then using a machine-learning algorithm to extrapolate from these specific cases and provide predicted values for a whole range of possible alloy variations.

In some cases, the clustering of atoms along the grain boundaries is a desired property that can enhance a metal's hardness and resistance to corrosion, but it can also sometimes lead to embrittlement. Depending on the intended use of an alloy, engineers will try to optimize the combination of properties. For this study, the team examined over 200 different combinations of a base metal and an alloying metal, based on combinations that had been described on a basic level in the literature. The researchers then systematically simulated some of these compounds to study their grain boundary configurations. These were used to generate predictions using machine learning, which were in turn validated with more focused simulations. The machine-learning predictions closely matched the detailed measurements.

As a result, the researchers were able to show that many alloy combinations that had been ruled out as unviable in fact turn out to be feasible, Wagih says. The new database compiled from this study, which has been made available in the public domain, could help anyone now working on designing new alloys, he says.

The team is forging ahead with the analysis. "In our ideal world, what we would do is take every metal in the periodic table, and then we would add every other element in the periodic table to it," Schuh says. "So you take the periodic table and you cross it with itself, and you would check every possible combination." For most of those combinations, basic data are not yet available, but as more and more simulations are done and data collected, this can be integrated into the new system, he says.

Yuri Mishin, a professor of physics and astronomy at George Mason University, who was not involved in this work, says "Grain boundary segregation of solute elements in alloys is one of the most fundamental phenomena in materials science. Segregation can catastrophically embrittle grain boundaries or improve their cohesion and sliding resistance. Precise control of the segregation energies is an effective tool for designing new technological materials with advanced mechanical, thermal, or electronic properties."

But, he adds, "A major limitation of the existing segregation models is the reliance on an average segregation energy, which is a very crude approximation." That's the challenge, he says, that this team has successfully addressed: "The research quality is excellent, and the core idea has a significant potential to impact the alloy design field by providing a framework for rapid screening of alloying elements for their ability to segregate to grain boundaries."

More information: Malik Wagih et al. Learning grain boundary segregation energy spectra in polycrystals, *Nature Communications* (2020). DOI: [10.1038/s41467-020-20083-6](https://doi.org/10.1038/s41467-020-20083-6)

Journal information: *Nature Communications*
<https://phys.org/news/2020-12-metal-alloys.html>

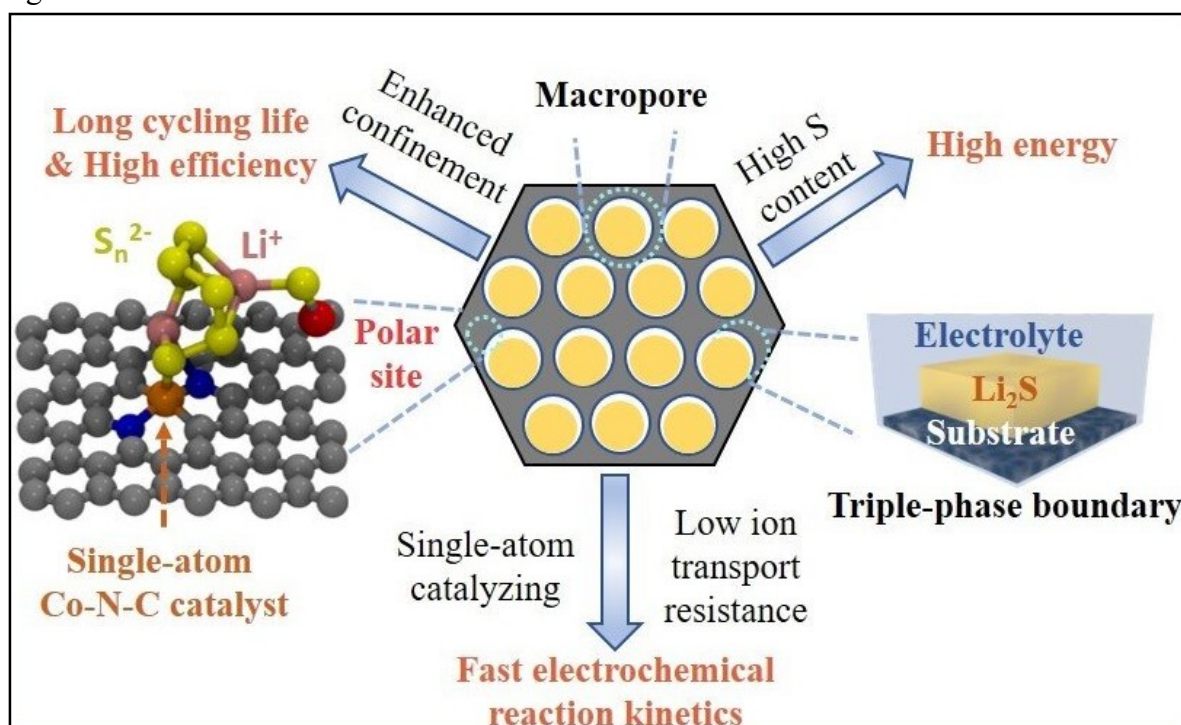


Sat, 12 Dec 2020

Novel cathode design significantly improves performance of next-generation battery

A team led by Cheong Ying Chan Professor of Engineering and Environment Prof. ZHAO Tianshou, Chair Professor of Mechanical and Aerospace Engineering and Director of HKUST Energy Institute, has proposed a novel cathode design concept for lithium-sulfur (Li-S) battery that substantially improves the performance of this kind of promising next-generation battery.

Li-S batteries are regarded as attractive alternatives to lithium-ion (Li-ion) batteries that are commonly used in smartphones, electric vehicles, and drones. They are known for their high energy density while their major component, sulfur, is abundant, light, cheap, and environmentally benign.



An all-in-one solution for the design strategy of macroporous host with double-end binding sites. Credit: HKUST

Li-S batteries can potentially offer an energy density of over 500 Wh/kg, significantly better than Li-ion batteries that reach their limit at 300 Wh/kg. The higher energy density means that the approximate 400km driving range of an electric vehicle powered by Li-ion batteries can be substantially extended to 600-800km if powered by Li-S batteries.

While exciting results on Li-S batteries have been achieved by researchers worldwide, there is still a big gap between lab research and commercialization of the technology on an industrial scale. One key issue is the polysulfide shuttle effect of Li-S batteries that causes progressive leakage of active material from the cathode and lithium corrosion, resulting in a short life cycle for the

battery. Other challenges include reducing the amount of electrolyte in the battery while maintaining stable battery performance.

To address these issues, Prof. Zhao's team collaborated with international researchers to propose a cathode design concept that could achieve good Li-S battery performance.

The highly oriented macroporous host can uniformly accommodate the sulfur while abundant active sites are embedded inside the host to tightly absorb the polysulfide, eliminating the shuttle effect and lithium metal corrosion. By bringing up a design principle for sulfur cathode in Li-S batteries, the joint team increased the batteries' energy density and made a big step towards the industrialization of the batteries.

"We are still in the middle of basic research in this field," Prof. Zhao said. "However, our novel electrode design concept and the associated breakthrough in performance represent a big step towards the practical use of a next-generation battery that is even more powerful and longer-lasting than today's lithium-ion batteries."

More information: Chen Zhao et al, Author Correction: A high-energy and long-cycling lithium–sulfur pouch cell via a macroporous catalytic cathode with double-end binding sites, *Nature Nanotechnology* (2020). DOI: [10.1038/s41565-020-00829-5](https://doi.org/10.1038/s41565-020-00829-5)

Journal information: [Nature Nanotechnology](https://phys.org/news/2020-12-cathode-significantly-next-generation-battery.html)
<https://phys.org/news/2020-12-cathode-significantly-next-generation-battery.html>



Sat, 12 Dec 2020

Record resolution in X-ray microscopy

Researchers at Friedrich-Alexander Universität Erlangen-Nürnberg (FAU), the Paul Scherrer Institute in Switzerland and other institutions in Paris, Hamburg and Basel, have succeeded in setting a new record in X-ray microscopy. With improved diffractive lenses and more precise sample positioning, they were able to achieve spatial resolution in the single-digit nanometre scale. This new dimension in direct imaging could provide significant impulses for research into nanostructures and further advance the development of solar cells and new types of magnetic data storage. The findings have now been published in the renowned journal *Optica* with the title "Soft X-ray microscopy with 7 nm resolution."

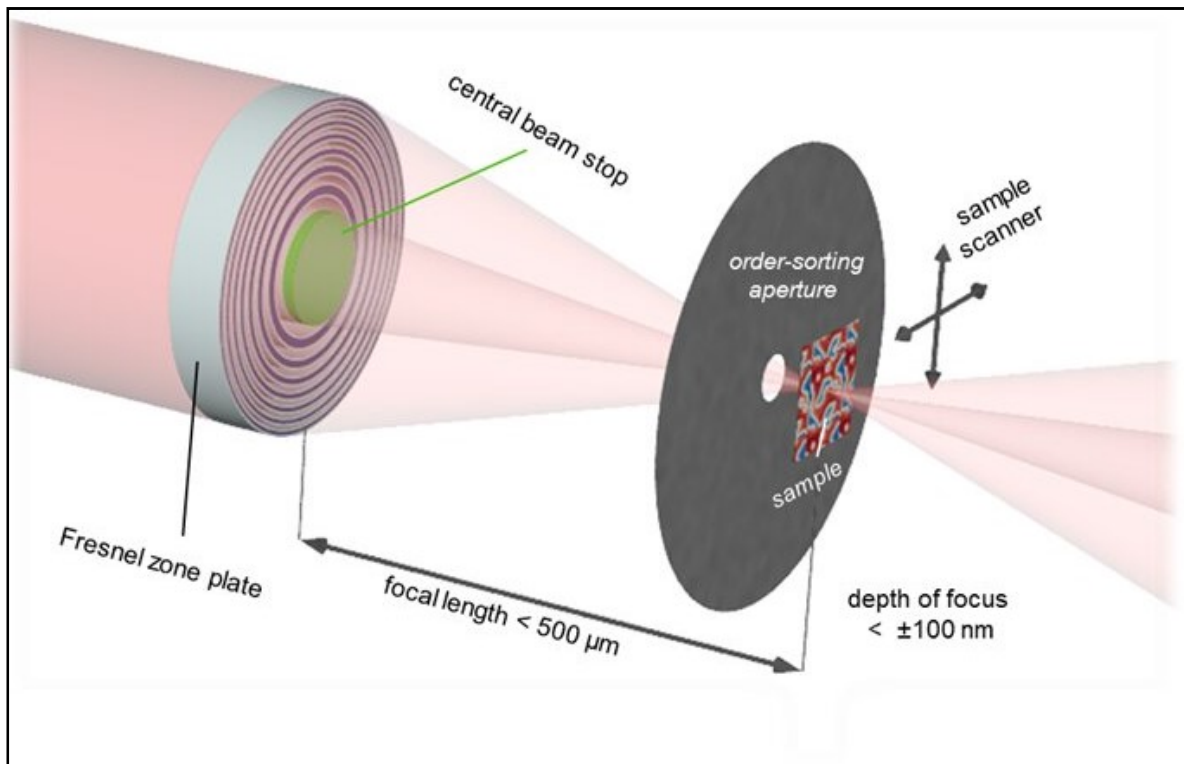
Soft X-ray [microscopy](#), which uses low-energy X-rays is used to investigate the properties of materials in the nanoscale. This technology can be used to determine the structure of organic films that play an important role in the development of solar cells and batteries. It also enables chemical processes or catalytic reactions of particles to be observed. The method allows the investigation of so-called spin dynamics. Electrons can not only transport electric charge, but also have an internal direction of rotation, which could be used for new types of magnetic data storage.

To improve research into these processes in the future, researchers need to be able to 'zoom' in to the single-digit nanometre scale. This is theoretically possible with soft X-rays, but up to now it has only been possible to achieve spatial resolution of below 10 nanometres using indirect imaging methods that require subsequent reconstruction. "For dynamic processes such as chemical reactions or magnetic particle interaction, we need to be able to view the structures directly," explains Prof. Dr. Rainer Fink from the Chair of Physical Chemistry II at FAU. "X-ray microscopy is especially suitable for this as it can be used more flexibly in magnetic environments than electron microscopy, for example."

Improved focusing and calibration

Working with the Paul Scherrer Institute and other institutions in Paris, Hamburg, and Basel, the researchers have now broken a new record in X-ray microscopy as they have succeeded in achieving a record resolution of 7 nanometres in several different experiments. This success is not

based primarily on more powerful sources of X-rays, but on improving the focus of the rays using diffractive lenses and more precise calibration of the test samples. "We optimized the structure size of the Fresnel zone plates which are used to focus X-rays," explains Rainer Fink. "In addition, we were able to position the samples in the device at a much higher accuracy and reproduce this accuracy." It is precisely this limited positioning and the stability of the system as a whole that have prevented improvements in resolution in direct imaging up to now.



Fresnel zone plates are most commonly used as diffractive focusing elements in X-ray microscopy. In the Erlangen-STXM at the Paul Scherrer Institute, the beam is focused onto the specimen, which is raster-scanned at the highest precision. The transmitted beam is sensitive to local X-ray absorption, which probes elemental, electronic, magnetic, or chemical variations. Credit: Dr. Benedikt Rösner, Paul Scherrer Institute

Remarkably, this record resolution was not only achieved with specially-designed test structures, but also in practical applications. For example, the researchers studied the magnetic field orientation of iron particles measuring 5 to 20 nanometres with their new optics. Prof. Fink explains: "We assume that our results will push forward research into energy materials and nanomagnetism in particular. The relevant structure sizes in this fields are often below current resolution limits."

More information: Benedikt Rösner et al, Soft x-ray microscopy with 7 nm resolution, *Optica* (2020). DOI: [10.1364/OPTICA.399885](https://doi.org/10.1364/OPTICA.399885)

Journal information: [Optica](https://phys.org/news/2020-12-resolution-x-ray-microscopy.html)
<https://phys.org/news/2020-12-resolution-x-ray-microscopy.html>

Edinburgh university researchers find 5 key genes linked to severe Covid-19

Researchers who studied the DNA of 2,700 Covid-19 patients in 208 intensive care units across Britain found that five genes involving in two molecular processes - antiviral immunity and lung inflammation - were central to many severe cases

Five key genes are linked with the most severe form of Covid-19, scientists said on Friday, in research that also pointed to several existing drugs that could be repurposed to treat people who risk getting critically ill with the pandemic disease.

Researchers who studied the DNA of 2,700 Covid-19 patients in 208 intensive care units across Britain found that five genes involving in two molecular processes - antiviral immunity and lung inflammation - were central to many severe cases.

“Our results immediately highlight which drugs should be at the top of the list for clinical testing,” said Kenneth Baillie, an academic consultant in critical care medicine at Edinburgh University who co-led the research.

The genes - called IFNAR2, TYK2, OAS1, DPP9 and CCR2 – partially explain why some people become desperately sick with Covid-19, while others are not affected, Baillie said.

The findings, published in the journal Nature, should help scientists speed up the search for potential drugs for Covid-19 by conducting clinical trials of medicines that target specific antiviral and anti-inflammatory pathways.

Among those with the most potential, he said, should be a class of anti-inflammatory drugs called JAK inhibitors, which includes the arthritis drug baricitinib, made by Eli Lilly.

Baillie’s team also found that a boost in the activity of the INFAR2 gene could create protection against Covid-19, because it is likely to mimic the effect of treatment with interferon.

Various existing drugs are being explored in clinical trials for their potential against Covid-19 including interferon-beta-1a, interleukin-1 receptor antagonist and Sanofi’s arthritis drug Kevzara.

So far, a steroid called dexamethasone and a newly developed antiviral called remdesivir, made by Gilead, are the only drugs authorised around the world to treat Covid-19 patients - although remdesivir is not recommended for severe cases of the disease and has had mixed results in trials.

Last month, the U.S. Food and Drug Administration approved Eli Lilly’s antibody drug for Covid-19, bamlanivimab, for patients who are not hospitalized but are at risk of serious illness because of their age or other conditions.

<https://www.hindustantimes.com/health/edinburgh-university-researchers-find-5-key-genes-linked-to-severe-covid-19/story-czImJTkc2MBZG8UbRWufEP.html>

India may need 1.3 lakh-1.4 lakh Covid vaccination centres: Study

By Neetu Chandra Sharma

- **2 lakh support staff or volunteers will be needed to support govt's mass-inoculation program, a FICCI-EY knowledge paper has indicated**

New Delhi: For Covid-19 vaccination, India may need 1.3 lakh-1.4 lakh vaccination centres, 1 lakh healthcare professionals as inoculators and 2 lakh support staff or volunteers to support government's mass-inoculation program, a FICCI-EY knowledge paper has indicated.

The paper on private healthcare players to augment government's capacity across the value chain of vaccine distribution and administration also highlighted that 81% of survey respondents from private healthcare industry are willing to inoculate frontline workers in local areas and 75% are willing to inoculate their local communities, 70% are willing to allocate manpower in semi-urban/rural areas for vaccination and 94% are willing to impart training for inoculation.

The paper also said that potential engagement model between public and private healthcare players is likely to emerge to bridge capacity gaps across the value chain of vaccine distribution.

"India is fully prepared for a vaccination initiative and at the threshold of receiving a vaccine. There will be no pressure on the drug regulator on the covid-19 vaccine approval and the final call on allowing its emergency use approval will be made on scientific principles," said Dr V.K. Paul, Member (health), NITI Aayog. He was addressing the session on "vaccine magic and reimagining healthcare in a post Covid-19 world", organized during FICCI's 93rd Annual Convention on Saturday wherein the knowledge paper was released.

"Globally, 33 vaccines are in clinical trial phase out of which 10 vaccines are in the advanced trial phase 3. Indian vaccines are part of the top 10 global players. The key three indigenous players- Bharat Biotech-Indian Council of Medical Research (ICMR), Zydus Cadila and Serum Institute (SII)-Astra Zeneca are in clearance phase-2, which has created an Apollo 11 moment for India," said Dr Paul.

Safety and efficacy are the primary concerns of the government while granting emergency use authorization (EUA) to any Covid-19 vaccine in the country. The government's cautious approach before approving a vaccine is apparent. The meeting of the subject expert committee of Central Drugs Standards Control Organisation on Wednesday asked Bharat Biotech International and Serum Institute of India for more data on the safety and efficacy of their shots and deferred recommending them for emergency use.

Speaking on the efficacy of the trials and its impact during trial stages, Dr Krishna Ella, CMD, Bharat Biotech International Ltd, said, "It has been crucial for the companies to protect the volunteers. The trials are completely transparent, and all data are enclosed. All Indian manufacturers are 100% sensitive and are to be completely trusted."

Zydus Cadila, which is manufacturing ZyCoV-D, said that the phase two trial of the vaccine has begun and that a promising and encouraging result has been witnessed. The vaccine may not require very cold temperature as it is a stable vaccine. India can create the vaccine with continuous support from the government.



A health worker checks a rapid kit to test for Covid-19 in Hyderabad (AP)

As the country is fast progressing towards initiation of the covid-19 vaccines, the total number of coronavirus cases climbed to 98,60,810 and the death toll mounted to 1,44,172. India's active caseload currently is 3.62% of the total active cases with 3,56,546 cases today. Total 30,254 persons were found to be Covid-19 positive in the country in the past 24 hours. Ten states/UTs have contributed 75.71% of the new cases. Kerala reported 5,949 cases in the last 24 hours. Maharashtra registered 4,259 new cases yesterday while West Bengal recorded 2,710 new cases, the government said.

At least 391 case fatalities that have been reported in the past 24 hours. Over 77.78% of them are from 10 states/UTs. None of the states/UTs reported double digit daily fatalities over the past 24 hours. At least 79.28% of new fatalities reported are from Maharashtra, which reported 80 deaths. Delhi also saw a fatality count of 47 while West Bengal reported 44 deaths within 24 hours.

<https://www.livemint.com/news/india/india-may-need-1-3-lakh-1-4-lakh-covid-vaccination-centres-study-11607865498996.html>

live**mint**

Mon, 14 Dec 2020

Covid-19 complications include kidney, lung and cardiovascular issues, finds study

- *Over half of all patients were admitted to the hospital, and approximately 5% were admitted to the intensive care unit*
- *The median age was 65 years, and 55.8% were female*

As per a new research, a larger study of patients in America has revealed that individuals who contracted coronavirus suffered from several complications like kidney, lung, and cardiovascular issues due to the infection.

According to the research published in CMAJ (Canadian Medical Association Journal), using de-identified outpatient and inpatient medical claims from a United States health database, researchers identified 70 288 patients who had a Covid-19-related health visit between March 1 and April 30, 2020.

Over half of all patients were admitted to the hospital, and approximately 5% were admitted to the intensive care unit. The median age was 65 years, and 55.8% were female. The authors looked at all possible diagnostic codes and identified those that increased in frequency after the onset of Covid-19.

Dr. William Murk, Jacobs School of Medicine & Biological Sciences, University at Buffalo, Buffalo, New York, with co-authors from Aetion, Inc., HealthVerity, Inc. and the University of Toronto, wrote "Understanding the full range of associated conditions can aid in prognosis, guide treatment decisions and better inform patients as to their actual risks for the variety of Covid-19 complications reported in the literature and media."

The most common complications associated with Covid-19 were pneumonia, respiratory failure, kidney failure, and sepsis or systemic inflammation, consistent with other studies. The absolute risk of someone with Covid-19 having these serious conditions was 27.6 percent for pneumonia, 22.6 percent for respiratory failure, 11.8 percent for kidney failure, and 10.4% for sepsis or systemic inflammation.



The authors looked at all possible diagnostic codes and identified those that increased in frequency after the onset of Covid-19. (AFP)

The researchers also found associations with a range of other lung and cardiovascular conditions, such as collapsed lung, blood clotting disorders, and heart inflammation, although the risk of these was relatively low. Contrary to the results of other studies, Covid-19 did not appear to be associated with a higher risk of stroke.

"This study provides estimates of absolute risk and relative odds for all identified diagnoses related to Covid-19, which are needed to help providers, patients, and policy-makers understand the likelihood of complications," write the authors.

Meanwhile, researchers earlier said that Covid-19 can lead to a broad range of neurological complications, including stroke, seizures, movement disorders, inflammatory diseases and more, even in moderate cases.

"We found a wide range of neurological complications--spanning inflammatory complications, stroke and other vascular conditions, metabolic problems, exacerbation of underlying neurological conditions and more," said study author Pria Anand from the Boston University in the US.

"Yet the majority of these people did not require critical care, suggesting that neurological complications may be common in people with moderate Covid-19 as well as those with severe disease," Anand added.

<https://www.livemint.com/science/health/covid-19-complications-include-kidney-lung-and-cardiovascular-issues-finds-study-11607844633507.html>

