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समाचार पत्रों से चयित अंश Newspapers Clippings

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

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CONTENTS

S. No.	TITLE	Page No.
DRDO News		1-7
DRDO Technology News		1-7
1.	Indian Army soft-pedals light tank of DRDO-L&T for China border	1
2.	DRDO offers new heating devices to Indian Army soldiers deployed in eastern ladakh	2
3.	India's DRDO delivers landing gear systems for Tapas and SWiFT UAVs	3
4.	DRDO hands over 18 types of filters for P-75 submarines to Indian Navy	4
5.	Indian Air Marshal explains why India needs to urgently & aggressively invest in unmanned technology	5
Defence News		8-19
Defence Strategic National/International		8-19
6.	Raksha Mantri Shri Rajnath Singh Inaugurates Webinar on Atal Tunnel; Says spirit of national pride is of paramount importance for building such great structures	8
7.	रक्षा मंत्री श्री राजनाथ सिंह ने अटल सुरंग पर वेबिनार का उद्घाटन करते हुए कहा कि ऐसी महान संरचनाओं के निर्माण के लिए राष्ट्रीय गौरव की भावना सबसे अधिक महत्वपूर्ण है	9
8.	Indian Navy to coordinate second edition of largest Coastal Defence Exercise – Sea Vigil 21	10
9.	भारतीय नौसेना, सबसे बड़े समुद्री रक्षा अभ्यास सी विजिल 21 के दूसरे संस्करण का समन्वय करेगी	11
10.	India-China Standoff: Defence Budget expected to be hiked to meet urgent requirements of the armed forces	12
11.	Days after Arunachal visit, CDS Gen Bipin Rawat heads to forward areas in Ladakh amid standoff	13
12.	CDS, Air Force Chief discuss operational issues in Ladakh	14
13.	US curbs loom, but India works to induct Russia S-400 systems	15
14.	India, Indonesia to soon hold joint Air Force drill to boost military ties — envoy Suryodipuro	17
15.	China pulls back 10,000 troops from Ladakh theatre	18
Science & Technology News		20-28
16.	ISRO to adopt 100 Atal Tinkering Labs to promote scientific temperament among students	20
17.	Self-folding 3-D photosensitive graphene architectures	21
18.	New nanostructured alloy for anode is a big step toward revolutionizing energy storage	24
19.	Transition metal 'cocktail' helps make brand new superconductors	26
COVID-19 Research News		27-28
20.	Sputnik V Covid vaccine meets primary endpoint of safety in Phase 2 trials: Dr Reddy's	27

Business Standard

Tue, 12 Jan 2021

Indian Army soft-pedals light tank of DRDO-L&T for China border

L&T is looking to complete delivery of its contract for 100 K-9 Vajra tracked guns by February, well ahead of schedule

By Ajai Shukla

New Delhi: Gujarat Chief Minister Vijay Rupani flagged off on Monday the 91st self-propelled howitzer that Larsen & Toubro (L&T) has built at its Armoured System Complex (ASC) in Hazira. L&T is looking to complete delivery of its contract for 100 K-9 Vajra tracked guns by February, well ahead of schedule.

After February, however, once the army has been handed over the last of these 155 mm, 52 calibre howitzers – essentially artillery guns mounted on a tank chassis for mobility – the ASC Hazira production line will fall silent. Then the expertise accumulated by L&T while building 100 K-9 Vajra guns will start dissipating.

This is because the army is soft-peddling the Defence R&D Organisation (DRDO) proposal to manufacture in L&T's facilities a line of at least 500 light tanks, which will be powered by the same 28-tonne chassis, hull and engine that powers the K-9 Vajra.

Instead of the K-9 Vajra artillery turret that mounts a heavy, 155 mm gun that shoots over the horizon, the light tank will have a smaller turret with a direct firing, high pressure 105 mm gun, ready-built by Belgian firm John Cockerill.

The DRDO is offering the light tank for the army to use in high-altitude areas such as Ladakh, where the Chinese ingress last May has already forced the deployment of two additional divisions (36,000 troops) and the impending move of another two divisions that are being diverted from a mechanised strike corps.

To supplement the two armoured regiments (each with 45 tanks) that already defended the China border, the army has additionally raised two independent armoured brigades over the preceding decade – one for operations in Ladakh and the other for Sikkim and Arunachal Pradesh. Each of these brigades fields 175-200 tanks.

All these 500-odd tanks are currently 42-tonne T-72M1s, which are too large and heavy to move and operate in the narrow, twisty roads and low-weight-bearing bridges that are found in the Himalaya. Nor are the T-72 tank engines customised to operating in the oxygen-depleted atmosphere at those altitudes.

But the army has still not backed the DRDO's efforts to replace the T-72s with a light tank that is custom built for India's rugged borders. The DRDO is offering a 30-35 tonne light tank that it says will be a match for what the army faces – China's new Type-15 light tank, also referred to as



the ZTQ-15. Built by Chinese public sector firm Norinco, the Type-15 has been deployed over the past year on the Tibetan plateau opposite Eastern Ladakh.

DRDO sources say the indigenous light tank will be at least a match for the Type-15. Engineers of the Central Vehicle R&D Establishment, the Chennai-based DRDO laboratory that designs and develops armoured vehicles, say they are working with L&T to reduce the weight of the 28-tonne Vajra chassis by 3-4 tonnes, which will bring the overall weight of the light tank to about 30 tonnes.

That will allow the Vajra's 1000 Horse Power German MTU engine and Allison transmission to create sufficient mobility for the light tank, even at high altitudes where engines deliver less than 80 per cent of the power they would at sea level.

The light tank's 105 mm gun will fire armour piercing ammunition to destroy enemy tanks, and high-explosive shells against unarmoured targets. Each light tank will have a fully-stabilised 12.7 mm heavy machine gun and a co-axial 7.62 mm medium machine gun. In addition, the turret would have a retractable missile launcher that can fire anti-tank guided missiles to destroy targets out to 2.5 kilometres.

A major hurdle to the tank's design is that the army has not yet shared with the DRDO its notion of what design features and performance it would like. This is usually shared in a document called the "preliminary staff qualitative requirements", or PSQR. Without this, the DRDO's designers are groping in the dark.

https://www.business-standard.com/article/current-affairs/indian-army-soft-pedals-light-tank-of-drdo-l-t-for-china-border-121011200072_1.html



Tue, 12 Jan 2021

DRDO offers new heating devices to Indian Army soldiers deployed in eastern ladakh

By Ankit Sharma

India's Defence Research and Development Organisation (DRDO) has developed multiple products to help Indian troops survive the subzero temperatures in Eastern Ladakh where they are locked in a border stand-off with the Chinese PLA.

Chief of Defence Staff (CDS) General Bipin Rawat and Air Chief Marshal RKS Bhadauria on Monday visited the forward areas in Ladakh.

Sources said General Rawat would be briefed on the operational readiness of the Indian armed forces deployed there. The IAF chief also reviewed the status of deployments in the forward areas.

To fight the Himalayan winters, troops have been provided with advanced gears but now DRDO has come up with more products. One of them is 'Him Tapak' space heating device (Bukhari), which will substantially reduce the risk of back-blast and carbon monoxide poisoning. The Indian Army has placed an order of more than Rs 420 crore for this appliance.

DRDO's Defence Institute for Physiology and Allied Sciences (DIPAS) Director, Dr. Rajeev Varshney, told news agency ANI that the device would be supplied to all-new habitats of Army and Indo-Tibetan Border Police (ITBP), where the temperature is extremely low.

DIPAS conducts physiological and biomedical research to improve human performance in extreme and wartime environments.

The new device's oil consumption is almost half, which will save almost Rs 3,650 crore in a year, he explained. Varshney said the high wind speed in high-altitude areas creates the risk of back-blast but the new design has three horizontal double-layered plates that can cut the air.

Another benefit is that the device has a capacity of six liters, and combustion is 100 percent; hence there is no chance that it will produce carbon monoxide and other hazardous gas, he said.

In addition, DIPAS has developed 'Alocal cream' to prevent frostbite, chilblains, and other cold injuries to soldiers deployed in extreme environments. Varshney said Indian Army has ordered 3 to 3.5 lakh jars of this cream for troops in Eastern Ladakh, Siachen, and other areas.

Then, there are 'flexible water bottles' and 'solar snow melters' to address the issue of drinking water problems in freezing temperatures. The unique feature of these water bottles is that they can "withstand temperatures from -50 to -100 degrees".

DRDO scientist Satish Chouhan told the news agency 'solar snow melter' can provide 5-7 liters of drinking water every hour. It uses solar energy to melt the snow and water is stored up to minus 40-degree centigrade in a five-liter water tank attached with the device.

<https://eurasianimes.com/drdo-offers-new-heating-devices-to-indian-soldiers-deployed-in-eastern-ladakh/>

AirforceTechnology

Tue, 12 Jan 2021

India's DRDO delivers landing gear systems for Tapas and SWiFT UAVs

India's Defence Research and Development Organisation (DRDO) has delivered retractable landing gear (RLG) systems for two different class of unmanned aerial vehicles (UAVs), Tapas and SWiFT

India's Defence Research and Development Organisation (DRDO) has delivered retractable landing gear (RLG) systems for two different class of unmanned aerial vehicles (UAVs), Tapas and SWiFT.

The gears were handed over during a ceremony at DRDO laboratory Combat Vehicles Research and Development Establishment (CVRDE) in the Indian city of Chennai.

CVRDE has designed and developed the systems, which were delivered to Aeronautical Development Establishment (ADE) in Bengaluru.

The laboratory built a 3t RLG system for Tapas UAV and 1t RLG for SWiFT UAV.

Tapas' RLG is a tricycle nose wheel type multidisciplinary, hydro-electro-mechanical system.

It was designed, developed and evaluated for certification in coordination with the Centre for Military Airworthiness & Certification (CEMILAC) and the Indian Government's Directorate General of Aeronautical Quality Assurance (DGAQA).

This system is being produced at Coimbatore. Director CVRDE handed over the first RLG set to the Director, ADE Bengaluru.

SWiFT's RLG has been produced with the support of Indian industry and due inspection and certification of CEMILAC and DGAQA.

The system has been designed to house landing gears within the constrained bay volume.

In addition to the delivery of the RLGs, CVRDE developed 18 types of indigenously developed hydraulic, lubrication, seawater and fuel filters for the Indian Navy's P-75 Submarine.

Last month, DRO said it was set to build six aircraft for the Indian Air Force in a bid to enhance surveillance capabilities along borders with Pakistan and China.



In October, the Indian Ministry of Defence announced the flight test of the new generation anti-radiation missile. Called RUDRAM, it is India's first locally developed anti-radiation missile.

<https://www.airforce-technology.com/news/drdo-delivers-landing-gear-systems-for-tapas-and-swift-uavs/>



Tue, 12 Jan 2021

DRDO hands over 18 types of filters for P-75 submarines to Indian Navy

The aforementioned products have been designed and developed by Combat Vehicles Research and Development Establishment (CVRDE)

New Delhi: The CVRDE, a laboratory of the DRDO, on Sunday handed over retractable landing gears for Tapas and Swift unmanned aerial vehicles (UAVs) as well as 18 types of filters for P-75 submarines to its users, an official statement said.

While the retractable landing gears were handed over to the Aeronautical Development Establishment (ADE), another laboratory of the Defence Research and Development Organisation (DRDO), the filters were handed over to the Indian Navy, the defence ministry's statement noted.

The handing over ceremony took place in Chennai in the presence of Lok Sabha MP Kalanidhi Veeraswamy, member of Parliamentary Standing Committee on Defence, and G Satheesh Reddy, Chairman, DRDO, said the statement.



Representational Image. (Photo | PTI)

The aforementioned products have been designed and developed by Combat Vehicles Research and Development Establishment (CVRDE), the statement noted.

The CVRDE has developed three-ton and one retractable landing gear for Tapas and Swift, respectively, it mentioned.

"Eighteen types of indigenously developed hydraulic, lubrication, sea water and fuel filters for P-75 Submarine were designed and developed by CVRDE. These filters are now being manufactured with the help of Indian Industries based at Hyderabad and Chennai," it stated.

<https://www.newindianexpress.com/nation/2021/jan/11/drdo-hands-over-18-types-of-filters-for-p-75-submarines-to-indian-navy-2248550.html>

Indian Air Marshal explains why India needs to urgently & aggressively invest in unmanned technology

By Air Marshal Anil Chopra (Retd)

Indian Navy recently inducted two Sea Guardian drones (unarmed variants) on lease from General Atomics of USA. More could be inducted later.

These two drones are flying with the Indian Navy logo, and are under the full operational control of the service and India will have exclusive access to all the information that the drone will capture or relay.

The lease is reportedly under the emergency procurement, perhaps related to the stand-off in Ladakh. Officially, the MQ-9 Guardian/Predator-B has been leased for a year for surveillance in the Indian Ocean Region (IOR). The maintenance of the drones will be managed by the company technicians in India.



Inducted on 21 November, they are operating from

the Indian Navy airbase at INS Rajali, near Arakkonam in Tamil Nadu. In a similar fashion, earlier India had leased the Chakra nuclear submarine from Russia. The long endurance of the drones would supplement the Boeing P8-I maritime patrol aircraft.

Interestingly General Atomics Global Corporation recently appointed Indian-American defense industry veteran Vivek Lall as its new Chief Executive.

Recent Unmanned Combat Action

The just-concluded conflict between Armenia and Azerbaijan over the disputed Nagorno-Karabakh region included the heavy use of missiles, drones, and rocket artillery. The 44-day war featured drones of Russian, Turkish, Israeli, and indigenous designs performing both reconnaissance missions to support artillery use and strike missions.

Unmanned aerial vehicle (UAV) and loitering munitions attacks were able to destroy heavy ground units, including T-72 tanks and advanced S-300 air defenses.

On 3 January 2020, a United States drone strike near Baghdad International Airport targeted and killed Iranian major general Qasem Soleimani while purportedly on his way to meet Iraqi Prime Minister Adil Abdul-Mahdi in Baghdad.

Soleimani was commander of the Quds Force, one of five branches of Iran's Islamic Revolutionary Guard Corps (IRGC), and was considered the second most powerful person of Iran, subordinate to Supreme Leader Ali Khamenei.

On 14 September 2019, drones were used to attack the state-owned Saudi Aramco oil processing facilities at Abqaiq and Khurais in eastern Saudi Arabia.

The Houthi movement in Yemen claimed responsibility. U.S. military has carried out hundreds of drone strikes in Pakistan and Afghanistan between 2004 and 2017 targeting Taliban and individual leaders.

UAVs in Iraq

Between 1991 and 2003, the US used a variety of UAVs in combat operations during Operations Desert Storm. These included the Pioneer, the Pointer, the Hunter, the Predator, the Global Hawk, the Dragon Eye, the Desert Hawk, and the Shadow.

The combat roles undertaken by UAVs included reconnaissance, target designation, and air to ground strikes among others. UAVs have some advantages over manned aircraft.

These include no risk to human life, lower operational costs, continuous real-time sensor data flow, and reduced sensor to shooter time. UAVs are especially useful for extremely long reconnaissance missions and for missions in areas of extreme danger. The percentage of unmanned aircraft sorties should continue to grow as UAV capabilities increase.

Future is Unmanned

Unmanned aircraft technologies have now matured well beyond just reconnaissance, security, and targeting. Unmanned Aerial Systems (UAS) are now undertaking all missions including heavy-lift cargo.

World is at a transition. There are some who see the JSF F-35 Lightning II as the last dedicated manned fighter/bomber. Solar-powered UAS are already flying.

Currently, the solar-powered Airbus Zephyr holds the endurance record for UAVs, with 25 days in the air. Dual-use (optionally manned) aircraft are also flying. USAF has already modified F-4s and F-16s to fly them remotely.

For long the Russians have been using unmanned MiG-21s as targets. In France, Dassault leads a multi-nation project for delta wingUCAV 'Neuron' of the size of Mirage 2000. 'Taranis' is the name of UK's future unmanned project.

Meanwhile, American UAVs like the Northrop Grumman X-47B are autonomously carrying out all operations from a moving aircraft carrier deck. Many UAVs are performing autonomous aerial refueling operations.

The Lockheed Martin "Sea Ghost" is a proposal for the United States Navy's qualification requirement for an Unmanned Carrier-Launched Airborne Surveillance and Strike aircraft. It will be a "flying-wing" design and inherent stealth.

The proposed new American bomber, the Northrop Grumman B-21 Raider is likely to be optionally manned. Uninhabited helicopter convoys will deliver supplies to troops deployed on combat front lines. Coordinated UAS swarms have been tested by both the US and China.

The US Army's dramatic shift to a nearly all-unmanned flight over the next three decades is embedded in the UAS roadmap. USAF's UAS vision document indicates that by the year 2047 every mission would be unmanned.

UAVs in India

All the three wings of Indian armed forces operate mostly Israeli UAVs. Israel Aerospace Industries (IAI) Heron is a medium-altitude long-endurance (MALE) UAV that can operate for 52 hours and up to 10.5 km (35,000 ft) altitude.

The advanced variant Heron TP is on offer. The IAI Searcher is a reconnaissance UAV. India has the Mk II which is a scaled-up variant. The new design features include updated avionics and sensor systems with greater flight endurance as well as increased redundancy for improved survivability.

With a maximum speed of 200 km/h, endurance of 18 hours, it can operate up to 6,100 m (20,000 ft). More than 100 Searcher IIs are being operated in India.

The IAF also acquired the IAI Harpy loitering munition designed to attack radar systems and is optimized for the suppression of enemy air defense (SEAD) role.

It carries a high explosive warhead. Later these were replaced by the advanced Harop (Harpy 2) that can either operate fully autonomously, using its anti-radar homing system, or it can take a human-in-the-loop mode.

If a target is not engaged, the drone will return and land itself back at base. Harop has loiter (flying) time of 6 hours and a range of 1,000 km both ways. It is designed to target enemy air-defense systems and its stealth helps evade SAMs. Indian Army also operates many small tactical UAVs.

India's current UAV Acquisition plans

While the Navy was keen on U.S. Sea Guardians, the Indian Air Force (IAF) wants the armed Predator B. India needs a dual-use UAV for both surveillance and attack. American drones are expensive considering the meager Capital budget of India.

There were reports that Americans had initially offered 22 Sea Guardians at around \$2 billion. These were mainly meant for Intelligence Surveillance and Reconnaissance (ISR). Indian Ministry of Defence had also floated the proposal. However, due to fund crunch, the numbers were reportedly reduced to 12 later. The new proposal seems to be for 30 MQ-9 UAVs, and these would cost around \$3 Billion USD.

Indigenous UAVs

India's DRDO first made the Pilotless Target Aircraft "Lakshya" as a cost-effective re-usable high subsonic aerial target system powered by a gas turbine engine and launched either from land or ship. It carried two targets towed behind at 1.5 km with radar, IR or visual signature augmentation.

Multi-mission "Nishant" is for battlefield surveillance and reconnaissance, target tracking & localization, and artillery fire correction. The 380 kg UAV requires rail-launching from a hydro-pneumatic launcher and is able to be recovered by a parachute system.

The DRDO Rustom is a MALE UAV. It has clearly been evolved from the Long-EZ designed by Burt Rutan, which this author has had a chance to fly. The project is being driven under the production agency cum development partner (PADP).

It would mean private participants would bid for it. Currently, negotiations are underway between these companies and the three Indian armed forces and Indian Government since the private majors are looking for support and commitment in terms of numbers and price. TAPAS-BH-201 (Rustom 2) has an endurance of 24 hours and at present is capable of reaching an altitude of 23000'.

Automatic take-off (ATO) flight was conducted on 07 Nov 2020 which is an indigenous development of an important operational feature. The range of operations touched 250 km on 03 Nov 2020 using satellite communication (SATCOM). The future of this project will decide the technological future of indigenous UAV development in the country.

DRDO is also developing autonomous stealth UCAV for IAF 'AURA', named 'Ghatak'. It will be similar in design to Northrop Grumman's 'B-2 Spirit' flying-wing and capable of releasing missiles and precision bombs.

ADE along with CSIR-NAL are also working on Micro & Mini UAVs vehicles have an endurance of 20 mts to 1 Hr. Three MAVs namely Black Kite, Golden Hawk and Pushpak have been designed and developed. These are fully autonomous air vehicles.

To Summarise

Artificial Intelligence enabled drone swarms are already flying exhibiting complex behavior, achieve mutual coordination and accomplish complex tasks. Drones are also flying as wingmen to fighters or are being launched from larger mother ship aircraft. Directed-energy and other weapons to counter drones and swarms are evolving. The US, China and Russia are in the lead.

Israel is doing great work. There are concerns for rogue governments and terrorists to misuse drones. There are also ethical, legal and regulatory issues. Chinese UCAV designs are aggressively taking shape.

WZ-2000 is a long endurance version of Global hawk class UAS. Shenyang's 'Dark Sword' is the stealth forward-swept wing UCAV of Boeing X-45 class. Developed in Pakistan, 'Burraq' (Chinese UCAV design) and 'Shahpar' surveillance UAS were inducted in late 2013.

Future is clearly unmanned and no one shares high-end UAS technologies. It is time for India to get its act right lest it gets left too far behind.

<https://eurasianimes.com/why-india-needs-to-urgently-aggressively-invest-in-unmanned-technology-if-delhi-wants-to-emerge-as-major-global-power/>

Defence Strategic: National/International



Press Information Bureau
Government of India

Ministry of Defence

Mon, 11 Jan 2021 4:18PM

Raksha Mantri Shri Rajnath Singh Inaugurates Webinar on Atal Tunnel; Says spirit of national pride is of paramount importance for building such great structures

Border Roads Organisation organized a Webinar on Atal Tunnel on 11 January, to disseminate the experiences gained on this tunnel, for the benefit of IITs, NITs and other technical institutions.

Inaugurating the day long Webinar, Raksha Mantri Shri Rajnath Singh appreciated BRO engineers for building this engineering marvel despite many technical challenges amid COVID-19 restrictions. He cited the example of Seri Nalla, a fault Zone, which posed a serious challenge to even engineers from foreign countries. “But our engineers succeeded in overcoming the Seri Nalla challenge,” Raksha Mantri said, adding that for building such a great structure like Atal Tunnel not just bricks and mortar but the spirit of the national pride is of paramount importance. Raksha Mantri recalled various past achievements of Indian scientists and engineers and said they have always shown their prowess in various streams.

Referring to the Atmanirbhar Bharat Abhiyan, Shri Rajnath Singh said, to overcome the COVID-19 challenges, “we were able to quickly mobilize our resources to produce PPE kits, masks, sanitizers etc. not only for our domestic requirements but also for supplying to other countries”. He said government has given high priority to the development of border areas and BRO deployed 67% of its workforce in Northern borders. Lauding the BRO’s efforts and achievements during 2020, amidst COVID-19 restrictions, Raksha Mantri said there had been no cut in BRO budget.

Raksha Mantri also released a Compendium documents listing the experiences and challenges encountered during the construction of the largest tunnel (9.020 km) in the World above 3000 mt elevation. Inaugurating the Atal Tunnel, Rohtang on 3 Oct 2020, Prime Minister Shri Narendra Modi had suggested that such a compendium be brought out for the benefit of students and professionals of Engineering Institutes.

This Webinar will enhance knowledge of all the faculty members and aspiring students, especially of final term students in tackling future challenges in tunnel construction. More than 1,000 people have participated in the Webinar.

Chief of Defence Staff General Bipin Rawat, Army Chief General MM Naravane, Defence Secretary Dr. Ajay Kumar and DG BRO Lt Gen Rajeev Chaudhry also attended the inaugural session.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1687644>





पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Mon, 11 Jan 2021 4:18PM

रक्षा मंत्री श्री राजनाथ सिंह ने अटल सुरंग पर वेबिनार का उद्घाटन करते हुए कहा कि ऐसी महान संरचनाओं के निर्माण के लिए राष्ट्रीय गौरव की भावना सबसे अधिक महत्वपूर्ण है

सीमा सड़क संगठन ने आज (11 जनवरी) आईआईटी, एनआईटी और अन्य तकनीकी संस्थानों के लाभ के लिए अटल सुरंग से प्राप्त अनुभवों के प्रसार के लिए अटल सुरंग पर एक वेबिनार का आयोजन किया।

पूरे दिन चलने वाले इस वेबिनार का उद्घाटन करते हुए रक्षा मंत्री श्री राजनाथ सिंह ने कोविड-19 के प्रतिबंधों के दौरान अनेक तकनीकी चुनौतियों के बावजूद इंजीनियरिंग के इस चमत्कार के निर्माण के लिए सीमा सड़क संगठन (बीआरओ) के इंजीनियरों की सराहना की। उन्होंने सेरी नाले के फाल्ट जोन का उदाहरण दिया, जिसने विदेशों के बड़े इंजीनियरों के सामने भी गंभीर चुनौती पेश की थी, लेकिन हमारे इंजीनियरों ने सेरी नाले की चुनौती से निपटने में सफलता प्राप्त की। उन्होंने कहा कि अटल सुरंग जैसी महान संरचना के निर्माण के लिए, न केवल ईंट और मोर्टार बल्कि राष्ट्रीय गौरव की भावना भी सबसे अधिक महत्वपूर्ण होती है। रक्षा मंत्री ने भारतीय वैज्ञानिकों और इंजीनियरों के अतीत की कई उपलब्धियों का स्मरण करते हुए कहा कि उन्होंने हमेशा विभिन्न क्षेत्रों में अपना कौशल दर्शाया है।



कोविड-19 के कारण पैदा हुई चुनौतियों से निपटने के बारे में आत्मनिर्भर भारत अभियान का जिक्र करते हुए श्री राजनाथ सिंह ने कहा कि हम पीपीई किट, मास्क, सैनिटाइजर आदि का न केवल अपनी घरेलू आवश्यकताओं को पूरा करने के लिए, बल्कि दूसरे देशों में भी इसकी आपूर्ति करने के लिए अपने संसाधनों को तेजी से जुटाने में भी सफल रहे हैं। उन्होंने कहा कि सरकार ने सीमावर्ती क्षेत्रों के विकास को सबसे अधिक प्राथमिकता दी है और बीआरओ ने अपना लगभग 67 प्रतिशत कार्यबल उत्तरी सीमा पर तैनात किया है। वर्ष 2020 के दौरान बीआरओ के प्रयासों और उपलब्धियों की प्रशंसा करते हुए रक्षा मंत्री ने कहा कि कोविड-19 प्रतिबंधों के बावजूद बीआरओ के बजट में कोई कटौती नहीं की गई थी।

रक्षा मंत्री ने 3000 मीटर से भी अधिक ऊँचाई पर बनी दुनिया की सबसे लंबी सुरंग (9.020 किलोमीटर) के निर्माण के दौरान हुए अनुभवों और चुनौतियों को सूचीबद्ध करने वाला सार-संग्रह दस्तावेज़ भी जारी किया।

3 अक्टूबर 2020 को अटल सुरंग, रोहतांग का उद्घाटन करते हुए, प्रधानमंत्री श्री नरेन्द्र मोदी ने यह सुझाव दिया था कि इंजीनियरिंग संस्थानों के छात्रों और पेशेवरों के लाभ के लिए इस तरह के सार-संग्रह को प्रस्तुत किया जाना चाहिए।

इस वेबिनार से सुरंग निर्माण में भविष्य की चुनौतियों से निपटने के लिए सभी संकाय सदस्यों और इच्छुक छात्रों, विशेष रूप से अंतिम वर्ष के छात्रों का ज्ञान बढ़ाने में मदद मिलेगी। इस वेबिनार में 1,000 से अधिक लोगों ने भाग लिया।

चीफ ऑफ डिफेंस स्टाफ जनरल बिपिन रावत, सेना प्रमुख जनरल एम.एम. नरवणे, रक्षा सचिव डॉ. अजय कुमार और महानिदेशक बीआरओ लेफ्टिनेंट जनरल राजीव चौधरी भी उद्घाटन सत्र में शामिल हुए।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1687692>



Press Information Bureau
Government of India

Ministry of Defence

Mon, 11 Jan 2021 5:23PM

Indian Navy to coordinate second edition of largest Coastal Defence Exercise – Sea Vigil 21

The second edition of the biennial pan-India coastal defence exercise ‘Sea Vigil-21’ will be conducted on 12-13 January 2021. The exercise, inaugural edition of which was conducted in January 2019; will be undertaken along the entire 7516 km coastline and Exclusive Economic Zone of India and will involve all the 13 coastal States and Union Territories along with other maritime stakeholders, including the fishing and coastal communities. The exercise is being coordinated by the Indian Navy. The entire coastal security set up was reorganised after the 26/11 Terror attack at Mumbai which was launched via the sea route.

The scale and conceptual expanse of the exercise is unprecedented in terms of the geographical extent, the number of stakeholders involved, the number of units participating and in terms of the objectives to be met. The exercise is a build up towards the major Theatre level exercise TROPEX [Theatre-level Readiness Operational Exercise] which Indian Navy conducts every two years. SEA VIGIL and TROPEX together will cover the entire spectrum of maritime security challenges, including transition from peace to conflict. Assets of the Indian Navy, Coast Guard, Customs and other maritime agencies will participate in SEA VIGIL, the conduct of which is also being facilitated by the Ministries of Defence, Home Affairs, Shipping, Petroleum and Natural Gas, Fisheries, Customs, State Governments and other agencies of Centre/ State.

While smaller scale exercises are conducted in coastal states regularly, including combined exercises amongst adjoining states, the conduct of a security exercise at national-level is aimed to serve a larger purpose. It provides opportunity, at the apex level, to assess our preparedness in the domain of maritime security and coastal defence. Exercise ‘SEA VIGIL 21’ will provide a realistic assessment of our strengths and weaknesses and thus will help in further strengthening maritime and national security.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1687660>



Mon, 11 Jan 2021 5:23PM

भारतीय नौसेना, सबसे बड़े समुद्री रक्षा अभ्यास सी विजिल 21 के दूसरे संस्करण का समन्वय करेगी

हर दूसरे साल होने वाले समुद्री रक्षा अभ्यास सी-विजिल-21 के दूसरे संस्करण का आयोजन 12-13 जनवरी 2021 को किया जाएगा। समुद्री रक्षा अभ्यास के पहले संस्करण का आयोजन जनवरी 2019 में हुआ था। इस अभ्यास में समुद्र के तटवर्ती क्षेत्र में मौजूद देश के 13 राज्य और केंद्रशासित प्रदेश, मत्स्य पालन करने वाले और तटवर्ती इलाकों में रहने वाले समुदाय भी शामिल होंगे। करीब 7516 किलोमीटर वाले तटवर्ती और एक्सक्लूसिव आर्थिक क्षेत्र के दायरे में इस अभ्यास का आयोजन किया जाएगा। अभ्यास का समन्वय भारतीय नौसेना द्वारा किया जाएगा। पूरे क्षेत्र के लिए मुंबई में 26 नवंबर में हुए आतंकी हमले के बाद समुद्री क्षेत्र की सुरक्षा बढ़ाई गई है। गौरतलब है आतंकी हमला समुद्री रास्ते से ही हुआ था।

बड़े भौगोलिक क्षेत्र, संबंधित लोगों की ज्यादा संख्या, अभ्यास में शामिल होने वाले भागीदारी की संख्या को देखते हुए इस अभ्यास का दायरा काफी बड़ा है। इसके बड़े दायरे को देखते हुए क्या उद्देश्य हासिल हुए, यह अभ्यास खास हो जाता है। यह अभ्यास भारतीय नौसेना के थिएटर लेवल अभ्यास ट्रोपेक्स (थिएटर लेवल रेडिनेस ऑपरेशनल एक्सराइज) की दिशा में उठाया गया कदम है। जो कि हर दो साल में आयोजित किया जाता है। सी विजिल और ट्रोपेक्स अभ्यास मिलकर समुद्री इलाकों की चुनौती से निपटने के लिए पूरी तरह से सक्षम है। जो कि शांति से संघर्ष के बदलाव की परिस्थितियों में काम आएंगे। भारतीय नौसेना, कोस्ट गार्ड, कस्टम और अन्य समुद्री एजेंसियां सी-विजिल में भाग लेंगे। इस अभ्यास के मौके पर रक्षा, गृह, जहाजरानी, पेट्रोलियम और प्राकृतिक गैस, मत्स्य, कस्टम, राज्य सरकारें, केंद्र और राज्य सरकारों की अन्य एजेंसियां भी शामिल होंगी।

इसके अलावा छोटे पैमाने पर समुद्री इलाकों के राज्यों में नौसैनिक अभ्यास किए जाते हैं। जिसमें एक से ज्यादा राज्य मिलकर भी अभ्यास करते हैं। जिसका उद्देश्य राष्ट्रीय स्तर पर देश की सुरक्षा के उद्देश्य को पूरा करना है। यह अभ्यास उच्च स्तर पर समुद्री क्षेत्र में भारत की सुरक्षा तैयारियों का भी आकलन करने में मदद करता है। “सी विजिल 21” समुद्री इलाकों में सुरक्षा की स्थिति का वास्तविक आकलन करने के साथ आगे उसमें सुधार की संभावनाओं का अवसर देता है। जिससे हमारी समुद्री सुरक्षा और मजबूत हो सके।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1687696>

India-China Standoff: Defence Budget expected to be hiked to meet urgent requirements of the armed forces

Union Budget 2021 India: Amidst the continued standoff between India and China, along the Line of Actual Control (LAC) in eastern Ladakh, the defence budget for the FY 2021-22 is likely to witness unprecedented growth

By Huma Siddiqui

Indian Union Budget 2021-22: Amidst the continued standoff between India and China, along the Line of Actual Control (LAC) in eastern Ladakh, the defence budget for the FY 2021-22 is likely to witness unprecedented growth.

Previously

For the Year 2020 – 2021, the hike was but less than two per cent hike over the Revised Estimates (RE) for the Year 2019-2020. Allocation of Rs 3.37 Lakh Crores for 2020-21 constituted nearly 1.5 per cent of the projected GDP and therefore the Capital allocations were not enough for fulfilling the committed liabilities. And, if the pensions for the defence personnel are added then the budget outlay for 2020-21 stood at Rs 4.71 lakh crore.

And for the new FY, expectations are that there could be a decent hike and it could touch around Rs 6 lakh crore.

Why?

This will help in moving the large ticket projects which are now needed on urgent basis which will help in dealing with the increasing threats from China and Pakistan. Already, in view of the standoff with China, urgent procurements for the armed forces had to be made which touched around USD 2 billion.

The office of the CDS is additionally planning new commands and the focus is on the jointness of the services, and prioritization and financing. Therefore, the Ministry of Defence would keep these new changes in mind too.

Modernisation Fund

There could be special modernization fund too for the armed forces. This is something that the armed forces need.

Speaking to Financial Express Online, a senior officer who wished to stay anonymous says, “There are several modernization projects that require immediate implementation because of the conditions on the LAC and LOC. These include helicopters, fighter aircraft, drones, artillery guns amongst others.”

As reported earlier, the Ministry of Defence had recommended setting up of a non-lapsable fund. In the new budget, this request is expected to be fulfilled.

Various big-ticket items of the Indian Army, Air Force and the Navy were hit due to shortage of funds. The Indian Navy has cut out its number of the Mine Counter Measures Vessels and the helicopters; the IAF has been facing an acute budget crunch and has been forced to go slow on several acquisition plans.

For the Indian Air Force, the 114 fighter aircraft, transport aircraft which are meant to replace the ageing Avros have all been delayed due to lack of funds.



Budget 2021-22: With India's growing geopolitical and economics stature, enhancing defence budget allocations and reforming processes of multi-domain capability development is very important for the country's security.

Expert view

With India's growing geopolitical and economics stature, enhancing defence budget allocations and reforming processes of multi-domain capability development is very important for the country's security.

According to Air Marshal Nirdosh Tyagi, former Deputy Chief of Air Staff, "Despite the global pandemic of COVID-19, the strain on the Indian economy is less than earlier estimates. Therefore, cut in the Defence Budget is unlikely and the allocations could be based on the immediate priorities of the armed forces."

Adding, "Since the future looks brighter, the budget should adequately cater for capital expenditure on modernization schemes. Also, prioritisation needs to be done on the basis of current and near term operational needs"

Is leasing an option?

Sharing his view with Financial Express Online, Air Marshal Nirdosh Tyagi said, "Leasing is suited for equipment readily available from global sources. It is a good option to try out something before making a large investment. Buying may be a better option for indigenous equipment."

"Focus should be on relevant technologies, which fulfil an operational requirement. New technology is better if there is an identifiable advantage within reasonable cost," he opines.

Meanwhile ...

What is in pipeline?

As reported earlier, 83 LCA Mk1A is awaiting final approval for the IAF.

114 MRFA is in pipeline.

LCA Mk II is in the Design & Development phase.

Naval helicopter case has been pending for long.

FICV, TCS and BMS are some of the large schemes of India Army which is being progressed through Make route. However, there has been no forward movement on these projects. And since Indian troops are deployed in the Galwan Valley, these are required on an urgent basis.

<https://www.financialexpress.com/budget/india-china-standoff-defence-budget-expected-to-be-hiked-to-meet-urgent-requirements-of-the-armed-forces/2168797/>



Tue, 12 Jan 2021

Days after Arunachal visit, CDS Gen Bipin Rawat heads to forward areas in Ladakh amid standoff

The India-China standoff has now entered its ninth month as both sides continue with heavy deployment of troops, artillery guns, tanks and armoured vehicles in close proximity

By Abhishek Bhalla

New Delhi: India's Chief of Defence Staff (CDS) General Bipin Rawat will visit forward areas in eastern Ladakh as the military standoff with China continues even in peak winter when temperatures have dipped to -30 degrees Celsius in some of the various friction points.

Sources said Gen Rawat is on a two-day visit to Ladakh and will be receiving a brief on the current situation from the 14 Corps (Fire and Fury Corps) Commander in Leh. He will also visit forward locations where commanders on the ground will brief him about the standoff.

The CDS completed one year in office on January 1. Earlier this month, Gen Rawat also visited forward areas in Arunachal Pradesh.

Despite the harsh winter, there are places along the Indo-China border in Ladakh where Indian and Chinese troops are engaged 'eyeball to eyeball' with no change on the ground in terms of a retreat by either side.

In the initial leg of his visit, CDS Gen Rawat complimented soldiers for adopting innovative measures for surveillance through locally developed technology and the defence preparedness to face any challenge. Stating that he was satisfied by the high morale and motivation among all ranks, Gen Rawat said this would ensure certain victory in the case of a challenge or given the opportunity.



File photo of CDS Gen Bipin Rawat (Photo Credits: PTI)

Indian Army chief Gen MM Naravane also visited forward areas along the Line of Actual Control (LAC) in eastern Ladakh. This is the same spot where Indian troops took over crucial unmanned heights ranging 44 km on the southern side of the Pangong Lake in September. This was in response to Chinese troops who refused to retreat from areas that had been under Indian control on the northern bank.

Gen Naravane inspected troops' housing along the forward line of defence at Rechin La.

The India-China standoff has now entered its ninth month as both sides continue with heavy deployment of troops, artillery guns, tanks and armoured vehicles in close proximity.

Tensions along the LAC started with skirmishes at Pangong Lake in May when troops came to blows on more than one occasion leaving several injured on both sides.

On June 15 of last year, 20 Indian soldiers died and the Chinese suffered an unknown number of casualties in Galwan Valley as the result of a violent face-off.

There has been little or no progress in finding a solution despite eight rounds of Corps Commander level talks- the highest level of military dialogue between the two countries. The last meeting at the Corps Commander level took place on November 6.

However, the stalemate continues despite a roadmap being agreed upon for easing tensions and ensuring disengagement.

<https://www.indiatoday.in/india/story/days-after-arunachal-visit-cds-gen-bipin-rawat-heads-to-forward-areas-in-ladakh-amid-standoff-1757988-2021-01-11>

 **The Indian EXPRESS**

Tue, 12 Jan 2021

CDS, Air Force Chief discuss operational issues in Ladakh

The visits come at a time when both sides have reduced a certain number of troops from the region

By Krishn Kaushik

Chief of Defence Staff General Bipin Rawat and Air Force Chief Air Chief Marshal RKS Bhadauria on Monday visited Ladakh and discussed operational issues with senior officers of the Air Force and the Army, amid the standoff between India and China in eastern Ladakh.

The visits come at a time when both sides have reduced a certain number of troops from the region. Top sources in the Army said that a slight thinning in deployment by both sides began in December, but it was only in the depth areas and not from the frontlines.

Both sides have around 50,000 troops each in the region, along with additional air defence assets, artillery and tanks.

However, sources said China is continuing to build infrastructure near several friction points along the Line of Actual Control, including Galwan Valley and Spanggur Gap. A senior Army officer said that China is “consolidating” and is “digging its heels” by building infrastructure.

Another senior Army officer said that India too is building infrastructure on its side of the LAC, as how the events will pan out around April, May, when the summer begins, is not known yet.

While Air Chief Marshal Bhadauria visited Advanced Landing Grounds, including the strategically important Daulat Beg Oldie (DBO), in the region on Monday, General Rawat is scheduled to visit the forward areas on Tuesday morning. The CDS received comprehensive briefings at the XV Corps Headquarters in Leh.

In a statement, the Air Force said that the Air Chief Marshal “undertook a visit to Air Force Stations and Advanced Landing Grounds in Ladakh” on Monday, and “interacted with field commanders and was briefed on the preparedness and status of deployed forces at air bases as well as in the forward areas. He also interacted with IAF and Indian Army personnel deployed at these locations”.

During his visit to Thoise, Air Force said, “he reviewed the ongoing logistic operations for support and sustenance of troops in the winter season” and visited “DBO and Nyoma ALGs where he was given a security overview in the respective sub-sectors”.

“Prior to his departure,” Air Force said that Air Chief Marshal Bhadauria “joined the CDS for a comprehensive discussion on operational matters with senior IAF and Indian Army Commanders at Air Force Station Leh”.

<https://indianexpress.com/article/india/cds-air-force-chief-discuss-operational-issues-in-ladakh-7142530/>

THE TIMES OF INDIA

Tue, 12 Jan 2021

US curbs loom, but India works to induct Russia S-400 systems

By Rajat Pandit

New Delhi: Undeterred by the threat of US sanctions, India is going full steam ahead with its induction plan for the advanced S-400 Triumf surface-to-air missile systems from Russia. Ahead of the deliveries beginning in September-October, a large IAF team will be leaving for Russia later this month.

All five mobile squadrons of the S-400 air defence systems, under the \$5.43 billion (Rs 40,000 crore) contract inked with Russia in October 2018, will be progressively delivered by April 2023.

The highly-automated S-400s, which can detect, track and destroy hostile strategic bombers, jets, spy planes, missiles and drones at a range of 380-km, will be “suitably positioned in the western, northern and eastern sectors” to cater for threats from both China and Pakistan, say defence ministry sources.

An initial team of almost 100 officers and airmen will leave for Russia in the last week of January for training in operations and maintenance of the “massive” S-400 systems. “A second IAF team will follow suit after a few months. With the deliveries beginning this September-October, the first S-400 squadron should become operational in India by end-2021 or early-2022,” said a source on Sunday.



The S-400, which will “revolutionize India’s air defence capabilities”, will have missiles with interception ranges of 120, 200, 250 and 380-km as well as battle-management systems of

command posts and launchers, long-range acquisition and engagement radars, and all-terrain transporter-erector vehicles. With 128 missiles in each battery, the S-400 system automatically picks up the “most suited” one to launch at an incoming aerial threat. Its radars, with the primary acquisition one with a 600-km range, can track hundreds of targets simultaneously.

Russia claims the S-400 can even intercept ballistic missiles with velocity of 4,800 meters per second as well as “radar lock and shoot down” 5th-generation stealth fighters like the American F-35 Lightning-II jets.

India has already paid “a substantial advance” in the \$5.43 billion contract to Russia, with the rest of the instalments being linked to deliveries, after working out a payment mechanism to get around the US sanctions regime, as was earlier reported by TOI.

India remains “very hopeful” it will get a “national security waiver” by the incoming Biden administration from the US law CAATSA (Countering America’s Adversaries through Sanctions Act), which was enacted in 2017 to prevent countries from buying Russian weapons or Iranian oil, from the incoming Biden administration.

The US has imposed financial sanctions on China and Turkey for inducting the S-400 systems from Russia. India had earlier mounted a major diplomatic-military campaign to convince the Trump administration, stressing the S-400 acquisition was a “urgent national security requirement” for it.

As reported by TOI earlier, India has assured it will “never compromise the operational secrecy” of the weapon systems it has bought or will buy from the US, while pointing to its unblemished record of not passing sensitive military information of a country to a third party.

One of the main reasons for the US to remove Turkey from its F-35 fighter programme was the fact that the S-400 systems are capable of “mapping or recording” data of other platforms like aircraft or radars.

The stealth characteristics, electronic warfare and other capabilities of the F-35 fighters, for instance, can be recorded and analyzed by the powerful acquisition and engagement radars of the S-400 systems if they are operated together. This would conceivably make F-35s more vulnerable to interception by the long-range missiles of the S-400s.

Having already bagged lucrative Indian defence deals worth \$21 billion just since 2007, the US is aggressing hawking its fighters -- like F/A-18, F-15EX or F-21 (upgraded version of F-16) – for mega “Make in India” projects to meet the requirements of the IAF and Navy.

<https://timesofindia.indiatimes.com/india/us-curbs-loom-but-india-works-to-induct-russia-s-400-systems/articleshow/80205183.cms>

India, Indonesia to soon hold joint Air Force drill to boost military ties — envoy Suryodipuro

Sidharto Reza Suryodipuro, outgoing Ambassador of Indonesia to India, says 'more needs to be done' when it comes to business and economic ties between both the countries

By Nayanima Vasu

New Delhi: India and Indonesia will soon hold a joint drill between their air forces as they seek to strengthen bilateral military ties amid the ongoing border tensions between New Delhi and Beijing.

“In terms of military cooperation, we have strengthened from coordinated patrol in the Andaman Sea, that has been going on at least for the past 17 years. We have army-to-army exercises, navy-to-navy, and soon we will start air force to air force” said Sidharto Reza Suryodipuro, outgoing Ambassador of Indonesia to India, in his address to the Ananta Aspen Centre Monday.



Sidharto Reza Suryodipuro, Ambassador of Indonesia to India | Twitter | @suryodipuro

This is expected to send a strong signal to China at a time when New Delhi and Beijing are engaged in a bitter border standoff at the Line of Actual Control in Ladakh.

The envoy said there has been considerable strengthening of ties between both the countries at the level of governments in the last six years and the relationship got elevated to the level of Comprehensive Strategic Partnership in 2018.

“India and Indonesia now have a shared vision of maritime cooperation in the Indo-Pacific,” the ambassador said.

On the issue of Quad countries — India, US, Japan and Australia — holding joint naval exercise, the envoy said, “I think countries would establish their layers of diplomacy based on how they look at their environment and each country’s perspective of the environment would be different.”

He also batted for the ongoing connectivity project between Aceh and Andaman, where joint patrolling has been going on, and said it needs strengthening.

“We would like to see cooperation in this and we hope it will materialise soon,” he added.

Suryodipuro also said Indonesia would like to enhance the trilateral cooperation between India, Australia and his country. He said soon the foreign ministers of these countries will meet to discuss this trilateral cooperation.

More needs to be done on trade ties

Suryodipuro said more needs to be done in order to boost trade and economic ties between both the countries.

He said before the onset of the Covid-19 pandemic the two-way trade between both countries reached \$20 billion, but out of this about \$10 billion consists of palm oil and coal exports from Indonesia to India, while the remaining \$10 billion is what is traded on both sides.

India has been also seeking access to Indonesian markets for its pharmaceutical produce, whereas Indonesia wanted larger investments in this sector.

“The (Indonesian) pharma companies produce enough for the Indonesia market, at the same time also seeks the competition to be limited to protect the market,” the envoy said.

However, he added, the situation has changed with the pandemic setting in. Now more and more Indian pharmaceutical firms are investing in Indonesia, he said.

Indonesia has also begun talking with Bharat Biotech to procure the Covid-19 vaccine from India.

Direct connectivity needed

Suryodipuro further said, “We are punching far below our weight in terms of the size of our countries... Indonesia is India’s largest neighbour after China. We need to build closer business-to-business relationships, universities-to-universities, think-thanks to think-tanks, people-to-people, we need to build this by setting up direct connectivity.”

He said this can be achieved not only by air-to-air connectivity, but by maritime connectivity.

“When it comes to maritime connectivity, we can have smaller ships. We are not talking about huge container vessels. But it can be direct between the coasts of India — Chennai or Kolkata — with the ports in Sumatra, Java, it does not have to be super cargo ships,” he stressed.

Suryodipuro said Indonesia would like to spearhead this effort between Aceh and Andaman.

“Now the situation in the region calls for greater Indian and Indonesian partnership, collaboration and will provide the basis for the region’s stability and prosperity, after all we are the largest and second-largest countries of the Indo-Pacific. So we’ll set the tone for that as well,” he added.

<https://theprint.in/diplomacy/india-indonesia-to-soon-hold-joint-air-force-drill-to-boost-military-ties-envoy-suryodipuro/583379/>

hindustantimes

Tue, 12 Jan 2021

China pulls back 10,000 troops from Ladakh theatre

The Indian army is closely monitoring the developments in the Ladakh theatre as a re-induction of troops by the PLA in the sector cannot be ruled out

By Rahul Singh

The Chinese People’s Liberation Army (PLA) has pulled back at least 10,000 soldiers from depth areas in the Ladakh theatre to rear positions in the midst of the ongoing border standoff between India and China, officials familiar with the development said on Monday.

But despite withdrawing around 10,000 troops, the PLA’s frontline deployments remain unchanged, said one of the officials cited above. The withdrawal of troops appears to be linked to extreme weather conditions in the sector, said a second official.

The Chinese troop withdrawal, experts said, has to be seen against the backdrop of the overall Indian and Chinese military deployments in the theatre --- both armies have deployed a total of 100,000 soldiers and weaponry in their forward and depth areas.

“In winters, large-scale or even limited military operations are ruled out. That’s possibly the reason why the PLA has withdrawn troops from depth areas,” said former Northern Army commander Lieutenant General (retd) DS Hooda.

The reduction of 10,000 troops has happened over the last week to 10 days, said a third official. The Indian army is closely monitoring the developments in the Ladakh theatre as a re-induction of troops by the PLA in the sector cannot be ruled out, said a fourth official.



The Indian Army is not only defending the Ladakh LAC but also keeping a close watch on PLA moves in Central, Sikkim and Eastern sectors with the Chinese army continuing to build military infrastructure in Tibet.(Twitter/@ADGPI)

The Ladakh standoff is in its ninth month, with soldiers holding forward positions at friction points in extreme weather conditions. The two armies have held eight rounds of military talks so far, with dates yet to be announced for the delayed ninth round of dialogue between corps commander-level officers.

Even as the ground situation remains unchanged in the Ladakh sector, chief of defence (CDS) staff General Bipin Rawat on Monday reached Leh for a security review of the sensitive area. Indian Air Force chief Air Chief Marshal RKS Bhadauria also visited forward areas in eastern Ladakh on Monday. General Rawat's two-day tour will also see him visit forward locations in Kashmir.

During the Ladakh leg of the tour, the CDS will be briefed by the local military leadership on the prevailing security situation, officials said. He will also visit forward areas in the sector and interact with troops deployed there. The air chief on Monday visited air force stations and advanced landing grounds (ALGs) in the Ladakh sector, the IAF said in a statement.

The air chief was briefed on the air force's operational readiness to deal with any contingency in the Ladakh theatre, amid the ongoing border row with China. He also interacted with IAF personnel deployed at forward locations.

"During his visit to Thoise, he reviewed the ongoing logistics operations for support and sustenance of troops in the winter season. He also visited DBO and Nyoma ALGs where he was given a security overview in the respective sub-sectors," the statement said.

The air chief also joined the CDS for a comprehensive discussion on operational matters with senior IAF and Indian Army commanders at the Leh airbase, it added.

In a year-end review of major developments published on January 1, the defence ministry said the Chinese People's Liberation Army (PLA) escalated the situation in the sensitive theatre by using unorthodox weapons against Indian soldiers and amassing a large number of troops during the ongoing border standoff along the contested Line of Actual Control (LAC).

The ministry said the PLA attempted to alter the status quo in the sector by force but the Indian Army was well-entrenched to counter any misadventure by the adversary.

In his first official engagement outside the Capital in the New Year, General Rawat visited India's forward air bases in the eastern sector on January 2-3 and interacted with frontline soldiers in Arunachal Pradesh.

"Nothing can deter the Indian armed forces from remaining steadfast in their call of duty," he said during that visit. While the current border row is confined to the Ladakh theatre, the Indian military is on high alert to deal with any misadventure by the Chinese forces all along the border -- stretching from Ladakh in the north to Arunachal Pradesh in the east.

While India has consistently pushed for comprehensive disengagement at all flashpoints and restoration of status quo ante of early April during the military talks, the Chinese side wants the Indian Army to first pull back troops deployed on strategic heights on the southern bank of Pangong Tso.

The Indian Army swiftly moved and occupied a series of key heights to prevent the PLA from grabbing Indian territory on the southern bank in a stealthy midnight move on August 29.

The Indian Army now controls ridgeline positions on the southern bank of Pangong Tso that allow it to completely dominate the sector and keep an eye on Chinese military activity, with the positions scattered across Rezung La, Rezin pass, Gurung Hill and Magar heights.

The Indian Army has also taken control of key heights overlooking the PLA's deployments on the Finger 4 ridgeline on the northern bank of Pangong Tso where rival soldiers are deployed barely a few hundred metres from each other. The developments on both banks of Pangong Tso have increased India's bargaining power during talks with the Chinese side, as previously reported by Hindustan Times.

<https://www.hindustantimes.com/india-news/china-pulls-back-10-000-troops-from-ladakh-theatre-101610382216148.html>

ISRO to adopt 100 Atal Tinkering Labs to promote scientific temperament among students

This decision was taken by ISRO and Atal Innovation Mission, NITI Aayog at a virtual meeting on Monday

Bengaluru: ISRO will adopt 100 Atal Tinkering Labs across the country to promote scientific temperament among students and encourage them for space education and space technology related innovations.

This decision was taken by ISRO and Atal Innovation Mission, NITI Aayog at a virtual meeting on Monday.

Through this collaboration, the Indian Space Research Organisation will facilitate coaching and mentoring of students in advanced 21st century cutting-edge technologies, including those related to space, an official statement said.

The students will not only gain theoretical, but also practical and application-based knowledge of STEM and Space Education related concepts such as Electronics, Physics, Optics, Space Technology, Material sciences and many more, it said.

Atal Innovation Mission and NITI Aayog have established over 7,000 ATLs across the country so far, enabling more than three million students between classes six to 12 acquire a problem solving, tinkering and innovative mindset, the statement said.

It said scientists and engineers from ISRO centres, in close coordination with the Capacity Building Programme Office at the space agency's headquarters, would actively mentor the children, as well as interact with teachers in these ATLs for encouraging experiments, brainstorming ideas and spreading awareness in space activities.

ISRO Chairman Dr K. Sivan invited students associated with these ATLs to witness the launch of one of its rockets from the Satish Dhawan Space Centre, a spaceport at Sriharikota in Andhra Pradesh.

In his address, NITI Aayog CEO Amitabh Kant expressed joy over collaborating with ISRO to make advancements in space technology via Atal Innovation Mission and its initiatives.

"I am glad that to nurture our future space scientists, ISRO, in collaboration with their regional research centers, are adopting 100 Atal Tinkering Labs where ISRO scientists and researchers will personally guide and mentor the young innovators in the field of STEM education and Space technology," Mr. Kant added.

<https://www.thehindu.com/sci-tech/technology/isro-to-adopt-100-atal-tinkering-labs-to-promote-scientific-temperament-among-students/article33550422.ece>

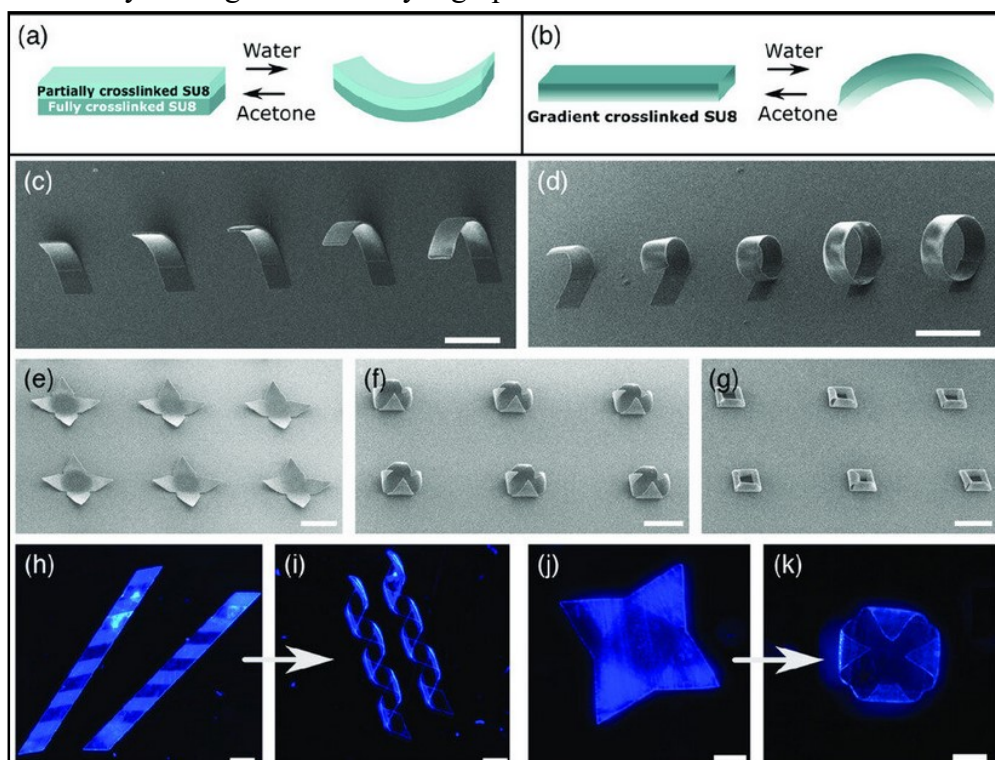


Through this collaboration, the Indian Space Research Organisation will facilitate coaching and mentoring of students in advanced 21st century cutting-edge technologies. File | Photo Credit: Reuters

Self-folding 3-D photosensitive graphene architectures

By Thamarasee Jeewandara

Stimuli-responsive, self-folding, two-dimensional (2-D) layered materials have interesting functions for flexible electronics, wearables, biosensors, and photonics applications. However, limits with scalability and a lack of design tools can prevent high integration and their reliable function. In a new report now published on *Advanced Intelligent Systems*, Qi Huang, and a team of scientists in chemical and biomolecular engineering and electrical and computer engineering at Johns Hopkins University, U.S., proposed a mass-production strategy to create monolayer graphene-based reversible self-folding structures. The material can be used in microfluidics and micromechanical systems. As proof of concept, they achieved complex and functional devices in the form of rings, polyhedra, flowers and origami birds. They then integrated gold electrodes to the constructs to improve their detection sensitivity. The experiments suggest a comprehensive framework to rationally design and fabricate scalable and complex, 3-D, self-folding optical and electronic devices by folding 2-D monolayer graphene.

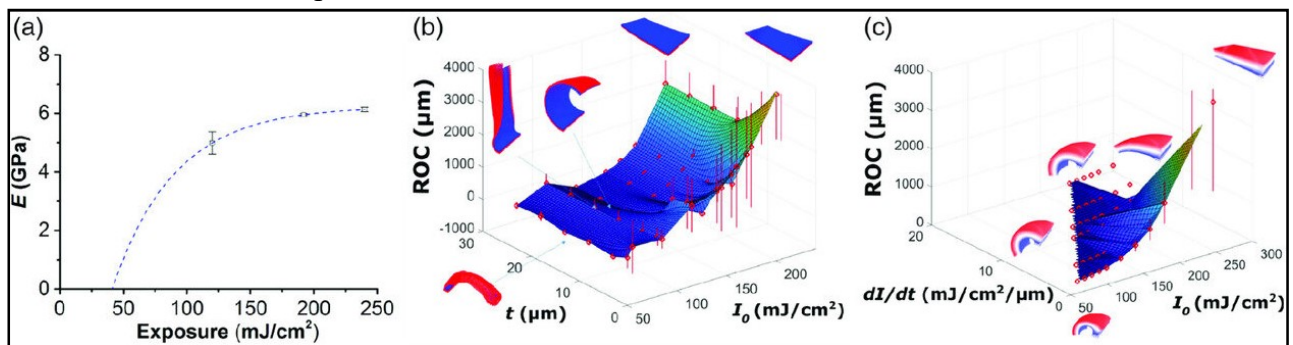


Mechanism and versatility of self-folding SU8 films. a) Self-folding SU8 bilayer where the SU8 bottom layer is fully cross-linked and the top SU8 layer is partially cross-linked. The SU8 bilayer film folds upward on the solvent exchange between acetone and water. b) Self-folding SU8 with low UV dose gradient cross-link density across the single SU8 film. The SU8 film folds downward on the solvent exchange between acetone and water. The bilayer SU8 beams' total thicknesses were, c) 20 μm , and d) 10 μm , and $UVr = 0.5$. Controlled folding of bilayer SU8 stars, e) $UVr = 0.8$, the thickness was 10 μm . f) $UVr = 0.5$, the thickness was 10 μm . g) $UVr = 0.5$, the thickness was 5 μm . h) SU8 ribbons folded into i) helices, and j) an SU8 star folded into k) a square pyramid using the gradient method. Scale bars are, c–g) 500 μm , h,i) 800 μm , and j,k) 300 μm . Credit: *Advanced Intelligent Systems*, doi: 10.1002/aisy.202000195

Developing 3-D microstructures from 2-D precursors

The development of 3-D integrated microstructures from wafer-scale, 2-D precursors can be useful across a variety of fields including optics, electronics, robotics and biomedical engineering.

However, it is yet difficult to realize wafer-scale on-chip or free-standing and reversible 2-D layered material-based hybrid devices. In this work, Huang et al. investigated the folding mechanics of differentially cross-linked SU8—i.e., an epoxy-based ultraviolet (UV) cross-linkable, negative photoresist based on a commercial resin, and the interaction of light with flexible graphene-gold (Au)-SU8 3-D microstructures. The team used experiments and simulations to introduce several new ideas and demonstrated the self-folding SU8 graphene microstructures. They varied the extent of SU8 crosslinking by tuning the UV dose to develop a physics-based, coarse-grained model that encompassed the effect of UV light for material mechanics and volume changes. They then used the approach to provide example 3-D shapes including origami birds. The method also included multilayer very-large-scale integration (VLSI) computational approaches. The method allowed simple connections with electrodes and other electronic, optical or microfluidic modules. The studies displayed 3-D graphene hybrid functional devices suitable for robotics, wearables and photonics.



Mechanics design framework for self-folding microstructures. a) Plot of the elastic modulus (E) versus exposure intensity (I_0) for SU8. Individual points are measured values and the straight line indicates a theoretical fit to these points and the modulus value at the threshold exposure from the SU8 datasheet. b) A plot of the averaged ROC for a bilayer rectangular SU8 beam with dimensions $250 \times 500 \mu\text{m}$, as a function of the thickness (t) and exposure intensity (I_0) of the top layer. The red indicates the bottom SU8 layer (fully exposed to UV with 240 mJ cm^{-2}), and the blue layer is the top SU8 layer (exposed to UV with I_0). c) A plot of the ROC for a gradient cross-linked rectangular SU8 beam with dimensions $250 \times 500 \mu\text{m}$, as a function of exposure intensity (I_0) of the top layer (color in red with energy of I_0) and gradient intensity decreasing along the thickness given by (

Rationally designing 3-D self-folding SU8 structures

Huang et al. tested two methods to allow reversible folding of differentially cross-linked SU8 films including bilayer and gradient methods. For both versions, they first deposited a 50 nm thick thermally evaporated copper sacrificial layer on a wafer or glass slide. During the bilayer method, they patterned SU8 bilayer films with a fully cross-linked bottom layer and a partially crosslinked top layer using photolithography to facilitate bending away from the wafer. They then spin-coated the SU8 layers on to the material and conditioned the bilayer patterns by immersing them in acetone to create self-folding precursors. The conditioned structures could reversibly fold and unfold on solvent transfer from acetone to water. By varying the thickness of the pattern, they assembled curved beams with different radii and a variety of 3-D shapes. The team also varied the dose of UV exposure ratio to increase the extent of pattern folding. They noted how different fold angles could be achieved by varying the thickness and extent of cross-linking. The work provided the design criteria required to achieve controlled bending and geometries for SU8 microstructures. The simulations were accurate reproductions of the experimental folding shapes.

Converting graphene into 3-D shapes based on the self-folding SU8 structures

The self-folding structures could importantly support the transformation of flat monolayer graphene into 3-D shapes. This integration process included a few key steps. At first, the team transferred the monolayer graphene grown using chemical vapor deposition from a copper-coated wafer to the sacrificial copper-coated silicon substrate by using the polymethyl methacrylate (PMMA) method. Then using Raman spectra, Huang et al. noted the peaks corresponding to monolayer graphene deposited on SU8 as expected. Thereafter, they patterned graphene via photolithography and plasma etching, and realized self-rolling of graphene-SU8 structures with reversible rolling/unrolling in water and acetone. This integration process of self-rolling graphene-

SU8 occurred on a wafer scale, facilitating the inclusion of other elements including gold lines or patterns, to form functional electronic or optical devices.

Developing ultrathin shape-changing smart materials.

Materials scientists typically study graphene for its electronic and optical applications based on unique physical characteristics, high mechanical strength, and stability of the material. Due to its characteristic properties of optoelectronics, the high charge carrier mobility of graphene at ambient temperatures revealed potential applications in high-frequency and high-speed devices. Nevertheless, light absorption and light-matter interaction of graphene is low for atomically thin planar graphene-based devices. Huang et al. therefore leveraged the optical transparency of SU8 to develop 3-D self-folding graphene-based optical devices to form flexible optical devices and wearables. They created multi-rolled 3-D graphene structures to overcome the limits of poor absorptivity of single-layer graphene. The scientists then used a flat graphene-gold-SU8 photodetector and tested the substrate by illuminating each gold electrode with a 488 nm laser. The photovoltage was larger when the laser illumination was directly incident on the graphene side compared to the SU8 side. The reduced illumination resulted from absorption of light in the SU8 film. The photovoltage generated in the work mainly resulted from the gold and graphene overlapping area.

Forming chip-integrated 3-D graphene-SU8 structures and photodetectors

As proof of concept, Huang et al. developed complex origami-inspired designs and chip-integrated structures. To assemble them, they patterned the copper sacrificial layer and graphene and controlled the UV exposure in specific regions to selectively fold the SU8 microstructure, while other parts remained pinned down flat. Such complex structures will be important for soft robotics with a graphene-gold interface for remote optical energy harvesting applications. The on-chip assembled designs are also important in optoelectronics, which Huang et al. illustrated using angle-resolved photodetectors with a self-folded SU8 graphene photodetector array. Using light illumination, they showed different photoresponses based on the angle of the laser and the material's architecture. The team also used simulations to determine the angle-resolved response.

Outlook

In this way, Qi Huang and colleagues developed a highly parallel process to assemble 3-D flexible graphene microstructures. The method has three key advantages to offer,

1. Free-standing materials and chip-integration
2. Highly parallel integration of flexible and transparent 3-D graphene devices, and
3. Reversible reconfiguration.

The optically transparent photoresist can be spin-coated and maintained with relative flexibility. The structures were stable in air and can form better lightweight alternatives to silicon-based modules for integration in flying and swimming robots. The primary basis of the self-folding mechanism relied on chemical-solvent driven differential swelling to facilitate folding/unfolding motions. The team expect to use this approach to create a range of 3-D microstructures for wearables, moving robots, in biosensors and in energy harvesting devices.

More information: Huang Q. et al. Solvent Responsive Self-Folding of 3D Photosensitive Graphene Architectures, *Advanced Intelligent Systems*, doi: doi.org/10.1002/aisy.202000195

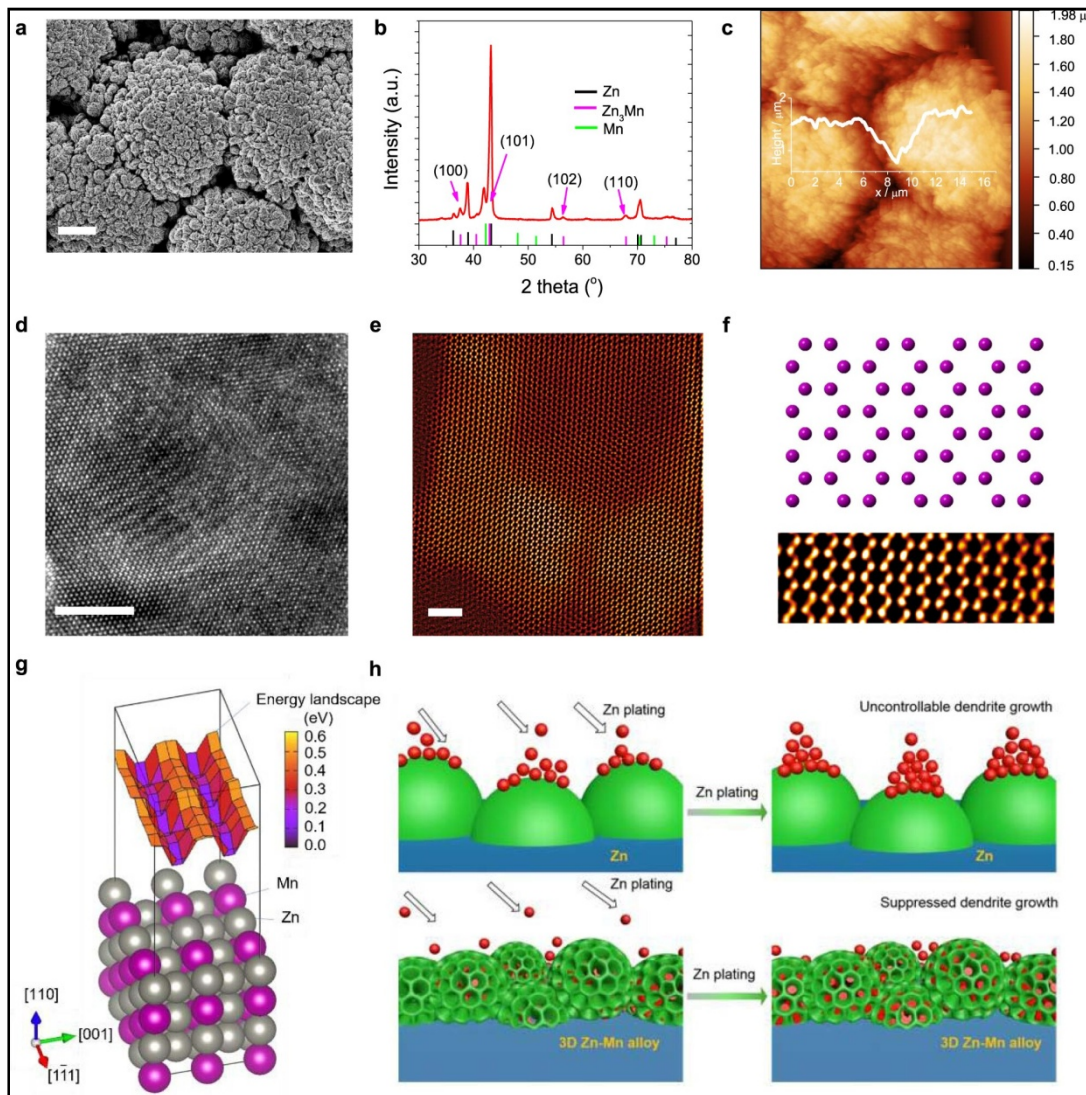
Freitag M. et al. Photoconductivity of biased graphene, *Nature Photonics*, doi: doi.org/10.1038/nphoton.2012.314

Koppens F. H. L. et al. Photodetectors based on graphene, other two-dimensional materials and hybrid systems, *Nature Nanotechnology*, doi.org/10.1038/nnano.2014.215

Journal information: *Nature Photonics*, *Nature Nanotechnology*
<https://phys.org/news/2021-01-selffolding-d-photosensitive-graphene-architectures.html>

New nanostructured alloy for anode is a big step toward revolutionizing energy storage

Researchers in the Oregon State University College of Engineering have developed a battery anode based on a new nanostructured alloy that could revolutionize the way energy storage devices are designed and manufactured.



a SEM image. The scale bar: 10 μm. b XRD pattern. c AFM image. d HRTEM image of Zn₃Mn viewed along [001] direction. The scale bar: 10 nm. e, f HAADF-STEM image and the corresponding atomic crystal structure. The scale bars: 2 nm. The purple balls in the crystal structure model represent the co-occupied Zn/Mn atoms. g Atomic structure and the surface ad-atom energy landscape of Zn₃Mn. h Schematic illustration of Zn plating processes on Zn anode (top) and Zn-Mn anode (bottom). From: Stable, high-performance, dendrite-free, seawater-based aqueous batteries

The zinc- and manganese-based alloy further opens the door to replacing solvents commonly used in battery electrolytes with something much safer and inexpensive, as well as abundant: seawater.

Findings were published in *Nature Communications*.

"The world's energy needs are increasing, but the development of next-generation electrochemical energy storage systems with high energy density and long cycling life remains technically challenging," said Zhenxing Feng, a chemical engineering researcher at OSU.

"Aqueous batteries, which use water-based conducting solutions as the electrolytes, are an emerging and much safer alternative to lithium-ion batteries. But the energy density of aqueous systems has been comparatively low, and also the water will react with the lithium, which has further hindered aqueous batteries' widespread use."

A battery stores power in the form of chemical energy and through reactions converts it to the electrical energy needed to power vehicles, cellphones, laptops and many other devices and machines. A battery consists of two terminals—the anode and cathode, typically made of different materials—as well as a separator and electrolyte, a chemical medium that allows for the flow of electrical charge.

In a lithium-ion battery, as its name suggests, a charge is carried via lithium ions as they move through the electrolyte from the anode to the cathode during discharge, and back again during recharging.

"Electrolytes in lithium-ion batteries are commonly dissolved in organic solvents, which are flammable and often decompose at high operation voltages," Feng said. "Thus there are obviously safety concerns, including with lithium dendrite growth at the electrode-electrolyte interface; that can cause a short between the electrodes."

Dendrites resemble tiny trees growing inside a lithium-ion battery and can pierce the separator like thistles growing through cracks in a driveway; the result is unwanted and sometimes unsafe chemical reactions.

Combustion incidents involving lithium-ion batteries in recent years include a blaze on a parked Boeing 787 jet in 2013, explosions in Galaxy Note 7 smartphones in 2016 and Tesla Model S fires in 2019.

Aqueous batteries are a promising alternative for safe and scalable energy storage, Feng said. Aqueous electrolytes are cost-competitive, environmentally benign, capable of fast charging and high power densities and highly tolerant of mishandling.

Their large-scale use, however, has been hindered by a limited output voltage and low energy density (batteries with a higher energy density can store larger amounts of energy, while batteries with a higher power density can release large amounts of energy more quickly).

But researchers at Oregon State, the University of Central Florida and the University of Houston have designed an anode made up of a three-dimensional "zinc-M alloy" as the battery anode—where M refers to manganese and other metals.

"The use of the alloy with its special nanostructure not only suppresses dendrite formation by controlling the surface reaction thermodynamics and the reaction kinetics, it also demonstrates super-high stability over thousands of cycles under harsh electrochemical conditions," Feng said. "The use of zinc can transfer twice as many charges than lithium, thus improving the energy density of the battery."

"We also tested our aqueous battery using seawater, instead of high purity deionized water, as the electrolyte," he added. "Our work shows the commercial potential for large-scale manufacturing of these batteries."

Feng and Ph.D. student Maoyu Wang used X-ray absorption spectroscopy and imaging to track the atomic and chemical changes of the anode in different operation stages, which confirmed how the 3-D alloy was functioning in the battery.

"Our theoretical and experimental studies proved that the 3-D alloy anode has unprecedented interfacial stability, achieved by a favorable diffusion channel of zinc on the alloy surface," Feng said. "The concept demonstrated in this collaborative work is likely to bring a paradigm shift in the design of high-performance alloy anodes for aqueous and non-aqueous batteries, revolutionizing the battery industry."

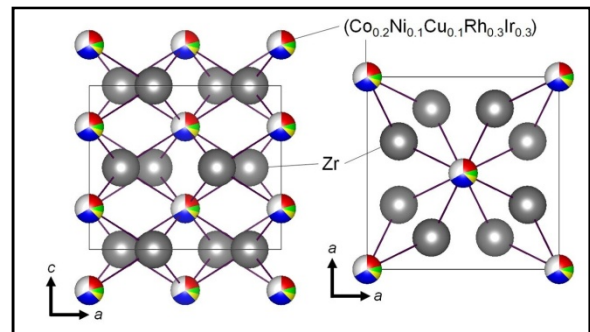
More information: Huajun Tian et al. Stable, high-performance, dendrite-free, seawater-based aqueous batteries, *Nature Communications* (2021). DOI: [10.1038/s41467-020-20334-6](https://doi.org/10.1038/s41467-020-20334-6)

Journal information: [Nature Communications](https://www.nature.com)
<https://phys.org/news/2021-01-nanostructured-alloy-anode-big-revolutionizing.html>

Transition metal 'cocktail' helps make brand new superconductors

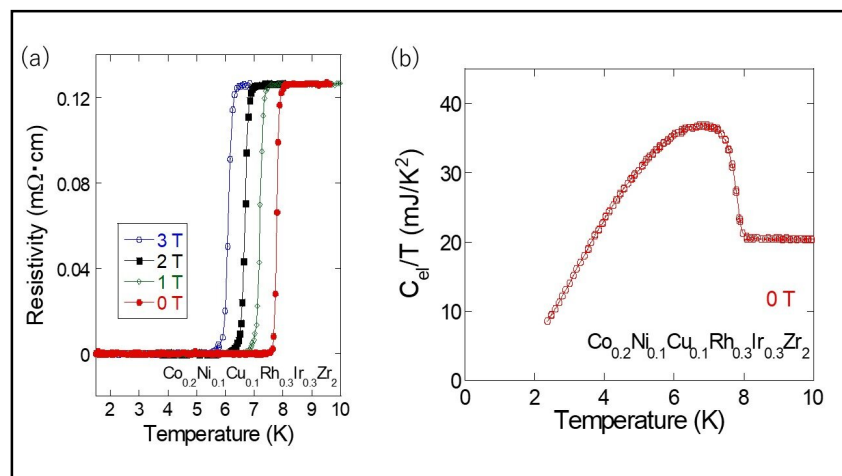
Researchers from Tokyo Metropolitan University mixed and designed a new, high-entropy alloy (HEA) superconductor, using extensive data on simple superconducting substances with a specific crystal structure. HEAs are known to preserve superconducting characteristics up to extremely high pressures. The new superconductor, $\text{Co}_{0.2}\text{Ni}_{0.1}\text{Cu}_{0.1}\text{Rh}_{0.3}\text{Ir}_{0.3}\text{Zr}_2$, has a superconducting transition at 8K, a relatively high temperature for an HEA. The team's approach may be applied to discovering new superconducting materials with specific desirable properties.

It's been over a hundred years since the discovery of superconductivity, where certain materials were found to suddenly show minimal resistance to electrical currents below a transition temperature. As we explore ways to eliminate power waste, a way to dramatically reduce losses in power transmission is a fascinating prospect. But the widespread use of superconductivity is held back by the demands of existing superconductors, particularly the low temperatures required. Scientists need a way to discover new superconducting materials without brute-force trial and error, and tune key properties.



Schematic of the CuAl₂-type crystal structure of the newly created superconducting $\text{Co}_{0.2}\text{Ni}_{0.1}\text{Cu}_{0.1}\text{Rh}_{0.3}\text{Ir}_{0.3}\text{Zr}_2$ compound, with an HEA-type Tr site. Credit: Tokyo Metropolitan University

A team led by Associate Professor Yoshikazu Mizuguchi at Tokyo Metropolitan University have been pioneering a "discovery platform" that has already led to the design of many new superconducting substances. Their method is based on high entropy alloys (HEAs), where certain sites in simple crystal structures can be occupied by five or more elements. After being applied to heat resistant materials and medical devices, certain HEAs were found to have superconducting



(a) Temperature dependence of resistivity of the new CuAl₂-type $\text{Co}_{0.2}\text{Ni}_{0.1}\text{Cu}_{0.1}\text{Rh}_{0.3}\text{Ir}_{0.3}\text{Zr}_2$ in magnetic fields of different strengths. (b) Temperature dependence of electronic specific heat C_{el}/T . Credit: Tokyo Metropolitan University

properties with some exceptional characteristics, particularly a retention of zero resistivity under extreme pressures. The team surveys material databases and cutting-edge research and finds a range of superconducting materials with a common crystal structure but different elements on specific sites. They then mix and engineer a structure that contains many of those elements; throughout the crystal, those "HEA sites" are occupied by one of the elements mixed (see Figure 1). They have already succeeded in creating high entropy variants of layered bismuth-sulfide superconductors and telluride compounds with a sodium chloride crystal structure.

In their latest work, they focused on the copper aluminide (CuAl_2) structure. Compounds combining a transition metal element (Tr) and zirconium (Zr) into TrZr_2 with this structure are

known to be superconducting, where Tr could be Sc, Fe, Co, Ni, Cu, Ga, Rh, Pd, Ta, or Ir. The team combined a "cocktail" of these elements using arc melting to create a new HEA-type compound, $\text{Co}_{0.2}\text{Ni}_{0.1}\text{Cu}_{0.1}\text{Rh}_{0.3}\text{Ir}_{0.3}\text{Zr}_2$, which showed superconducting properties. They looked at both resistivity and electronic specific heat, the amount of energy used by the electrons in the material to raise the temperature, and identified a transition temperature of 8.0K. Not only is this relatively high for an HEA-type superconductor, they confirmed that the material had the hallmarks of "bulk" superconductivity.

The most exciting aspect of this is the vast range of other transition metals and ratios that can be tried and tuned to aim for higher transition temperatures and other desirable properties, all without changing the underlying crystal structure. The team hopes their success will lead to more discoveries of new HEA-type superconductors in the near future.

More information: Yoshikazu Mizuguchi et al, Superconductivity in CuAl_2 -type $\text{Co}_{0.2}\text{Ni}_{0.1}\text{Cu}_{0.1}\text{Rh}_{0.3}\text{Ir}_{0.3}\text{Zr}_2$ with a high-entropy-alloy transition metal site, *Materials Research Letters* (2020). DOI: [10.1080/21663831.2020.1860147](https://doi.org/10.1080/21663831.2020.1860147)

<https://phys.org/news/2021-01-transition-metal-cocktail-brand-superconductors.html>

COVID-19 Research News

mint

Tue, 12 Jan 2021

Sputnik V Covid vaccine meets primary endpoint of safety in Phase 2 trials: Dr Reddy's

Edited By Aparna Banerjee

- *The company has submitted the mid-stage trial safety data to India's drug regulator for review and approval to continue late-stage trials, Dr Reddy's said in a regulatory filing*
- *Data and safety monitoring board recommended phase 3 recruitment and continue Sputnik V clinical trial without any modifications*

Sputnik V meets the primary endpoint of safety in the phase-2 clinical trials in India, said Dr Reddy's Laboratories Ltd

The company has submitted the mid-stage trial safety data to India's drug regulator for review and approval to continue late-stage trials, Dr Reddy's said in a regulatory filing.

Dr Reddy's in a statement said that it has submitted the phase-2 safety data for Drugs Controller General of India's approval to continue phase-3 clinical trials.

Data and safety monitoring board recommended phase 3 recruitment and continue Sputnik V clinical trial without any modifications, the statement further added.

G V Prasad, Co-chairman and Managing Director, Dr. Reddy's Laboratories said, "The Indian clinical trial being conducted by Dr. Reddy's and RDIF is an adaptive design phase 2/3 trial. It is a bridging study to the larger global phase 3 study on 31,000 subjects. The phase 2 study in India showed a very good safety profile. This further reinforces our confidence in the safety of Sputnik



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V, which has now been administered to more than 1 million people in Russia and more than 300,000 people in Argentina. We are working closely towards fast-tracking the launch of the Sputnik V vaccine in India."

Kirill Dmitriev, CEO of the Russian Direct Investment Fund, said, "The safety data from the phase 2 clinical trial from India is very positive, and confirms the safety profile of Sputnik V in the international markets. The Sputnik V consistently shows safety and high efficacy in international clinical trials as it is based on safe human adenoviral vector platform."

The clinical trials are being conducted by JSS Medical Research as the clinical research partner in India. Dr. Reddy's has partnered with the Biotechnology Industry Research Assistance Council (BIRAC), Department of Biotechnology (DBT) for advisory support, THSTI (Translational Health Science and Technology Institute) for further immunogenicity data characterisation, and to use BIRAC's clinical trial centres for the vaccine.

In September 2020, Dr. Reddy's and Russian Direct Investment Fund (RDIF) entered into a partnership to conduct the clinical trials of the Sputnik V vaccine and the rights for distribution in India. Sputnik V developed by the Gamaleya National Research Institute of Epidemiology and Microbiology was registered by the Ministry of Health of Russia and became the world's first registered vaccine against COVID-19 based on the established human adenoviral vector platform. It currently ranks among top 10 candidate vaccines approaching the end of clinical trials and the start of mass production on the World Health Organization's (WHO) list.

The vaccine's efficacy is confirmed at 91.4% based on data analysis of the final control point of clinical trials in Russia. Currently, the vaccine's clinical trials are underway in the UAE, Egypt, Venezuela and Belarus while it has been registered in Algeria, Argentina, Belarus, Bolivia and Serbia for inoculation.

Meanwhile, India's drugs regulator on Sunday approved Oxford COVID-19 vaccine Covishield, manufactured by the Serum Institute, and indigenously developed Covaxin of Bharat Biotech for restricted emergency use in the country, paving the way for a massive inoculation drive.

The Drugs Controller General of India (DCGI) granted the approval on the basis of recommendations by a COVID-19 Subject Expert Committee (SEC) of the Central Drugs Standard Control Organisation (CDSCO).

The vaccination drive in the country is set to start from 16 January, 2021.

<https://www.livemint.com/news/india/sputnik-v-covid-vaccine-meets-primary-endpoint-of-safety-in-phase-2-trials-dr-reddys-11610375483163.html>

