

Sept
2020

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

Volume: 45 Issue: 227 27-28 September 2020



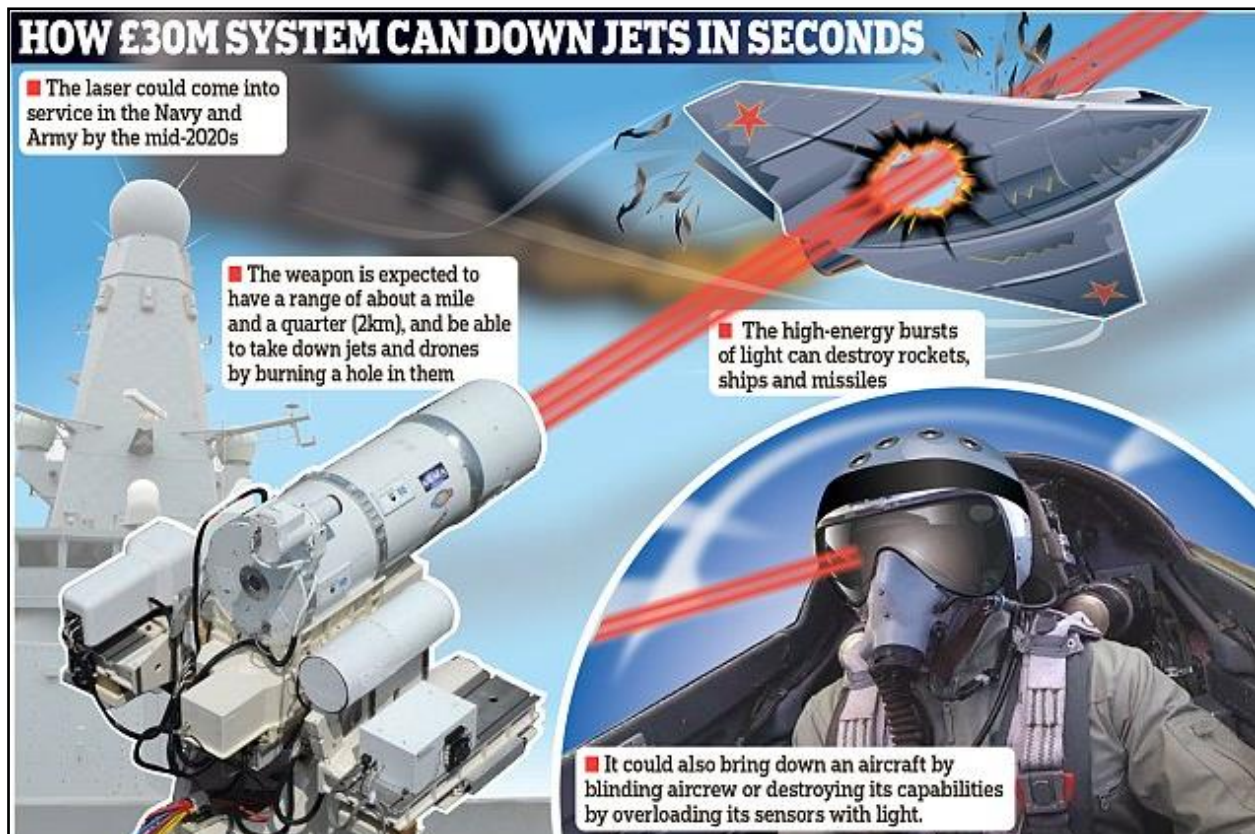
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DRDO Accelerates work on ‘Laser Weapons’; But where does India stand against China, Russia & the US?

There might be a possibility that future global conflicts including between India and China could be fought with Star Wars-type weapons like “lasers” or “blasters”, as New Delhi looks to begin developments on Directed Energy Weapons (DEWs) to stand an upper ground in future warfare.



India’s premier R&D agency, the Defence Research and Development Organisation (DRDO) announced earlier this month that it is planning a national programme to develop DEWs in the form of high-energy lasers and high-powered microwaves.

The two types of DEWs are anti-personnel as they can cause excessive burning of an area in the body and cause blindness. They are also anti-material as they possess the ability to destroy missiles, ships, UAVs and fries circuitry of equipment deployed on a battlefield.

Considered as a key factor in future contactless warfare, the potential applications of the technology would be possessing weapons which could target enemy fighter jets, personnel, vehicles, missiles and optical devices.

DRDO Chairman, Dr. G Satheesh Reddy, while delivering the 12th annual Air Chief Marshal LM Katre memorial lecture, had emphasised the importance of the weapons in the present scenario.

He said – “DEWs are extremely important today. The world is moving towards them. In the country too, we are doing a lot of experiments. We have been working in this area for the past three to four years to develop 10-kW and 20-kW (weapons).”

According to news reports, the national programme under DRDO will comprise short, medium and long-term goals aiming to develop different variants of DEW with up to 100-kilowatt power. However, the reports stated that the development will see the organisation collaborate with the nation’s domestic private sector.

One of the key reasons behind India’s decision to channelize efforts towards the development of DEWs is India’s current standing as a seismic zone for potential conflicts, as it finds itself sandwiched between “Iron Brothers” China and Pakistan.

Its deteriorating ties especially with Beijing ever since the Galwan Valley clash which resulted in a series of military confrontations have led experts to realize the need for more potent weapons to keep the Chinese at bay.

However, according to Rajeswari Pillai Rajagopalan, India’s efforts on the DEW programme has only been a response to China’s development of DEW technologies. “Beijing’s growing military power, including in space, cyber and electronic warfare domains, can inflict significant damage on its adversaries, including India. China is also developing DEW technologies. Indeed, India is probably developing its own DEWs as a response.” said Rajagopalan, while writing a piece for The Diplomat

Several DEW projects have been underway by DRDO, which range from ‘chemical oxygen-iodine’ and ‘high-power fibre’ lasers to a secretive ‘Kali’ particle-beam weapon for ‘soft-kills’ against incoming missiles and aircraft, however, none of them are close to being operational.

But one promising sign has been DRDO’s development of two anti-drone DEW systems, which have been successfully demonstrated to intelligence, defence and police officials.

One of them is a trailer-mounted DEW, with a 10-kilowatt laser able to engage aerial targets at a 2-kilometre range and the other is a compact tripod-mounted one with a 2-kilowatt laser capable of engaging targets at a kilometres range.

According to officials, both of them are capable of bringing down micro drones by either jamming their command and control links or damaging their electronics through the laser-based DEW. They are now being productionised in large numbers with the help of the industry.

According to the technological roadmap of the nation’s defence forces for the next decade, the Indian Army and the Indian Air Force (IAF) need at least 20 ‘tactical high-energy laser systems’ which are capable of destroying ‘small aerial targets’, electronic warfare and radars systems at a range of 6-8 km under Phase-I.

Whereas under Phase-II, the laser systems should possess the ability to take down ‘soft-skinned’ vehicles and troops from the ground and aerial platforms, while boasting a range of over 20 kilometres.

While India is amongst the countries investing in the development of the technology alongside China, Russia, Israel and the North African region, it is still far behind the United States, who are the current leading developers of DEWs.

The Pentagon has reportedly doubled its spending on the technology from \$535 million in the fiscal year 2017 to \$1.1 billion in 2019.

Captain Nurettin Sevi, of the Turkish Navy, who works as a defence analyst at GlobalData, says DEWs could be a game-changer in modern warfare and could be the factor in proving superiority over the other in the future.

“They have immense potential to be a game-changer in the near future, as well as revolutionary in the long term. However, armed forces and defence industries still need to address some technical challenges when developing these cutting-edge weapons. For example, laser weapons effectiveness decreases because of atmospheric absorption, scattering, turbulence and thermal blooming.”

Developing combat-capable DEWs will be a crucial differentiator between military forces in the 2020s.” said Sevi.

<https://eurasianimes.com/drdo-accelerates-work-on-laser-weapons-but-where-does-india-stand-against-china-russia-the-us/>



Sun, 27 Sept 2020

Kineco expects to be preferred manufacturing partner for critical defence equipment: Shekhar Sardessai

Panaji: Goa based Kineco Limited, one of India’s leading composite technology provider for defence, aerospace, railway and industrial sectors, recently flagged off India’s first ever commercial Sonar Dome, at the hands of State Chief Minister Pramod Sawant at its manufacturing facility situated at Pilerne Industrial Estate in the state.

Kineco’s Founder and Managing Director Shekhar Sardessai, in an exclusive interview to UNI, said Kineco as an industry partner along with R&DE Pune jointly developed India’s First Indigenous Sonar dome which was unveiled at the Def Expo 2016.

”This was first among the two sonar domes which were delivered to Research & Development Establishment (Engineers), Pune, as a part of the development program, with the second Sonar dome delivered in 2018. There after both Sonar domes were subjected to stringent testing and extensive validation trials on board P15A Indian navy warship. Post successful validation Kineco was awarded ‘Transfer of Technology’ for manufacture of sonar domes from R&DE E in 2018, which enabled it to become a qualified supplier to Indian Navy. In 2019 Kineco bagged sizable order for seven Sonar domes from Mazagon Dock Shipbuilders Ltd, the first of which was flagged Off by the Chief Minister on September 22, 2020,” he said, adding Kineco would be executing this order over the next three years, Mr Sardessai said.



When asked how does he see manufacturing of Sonar Domes by Kineco in the context of ‘Make In India’ initiative and ‘Aamirbhar Bharat’, Mr Sardessai said the initiative would significantly boost manufacturing sector particularly in strategic areas such as defence where there was a utmost need for self-reliance.

”Our company having successfully executed multiple PPP (Public Private Partnership) with the defence establishments, expects to be the preferred manufacturing partner for critical defence equipment in the composite field on board prestigious defence platforms. Due to the embargo on defence imports of value upto 200 crores, medium scale enterprises in the manufacturing sector such as ours will benefit from increased business,” he said.

Mr Sardesai said the sonar domes would be supplied to the major shipyards who were awarded Purchase orders for construction of War Ships for the Indian navy.

On exports potential, he said Kineco saw significant potential in the export market for sonar domes and had been approached by global Tier 1 defence bidders from Germany, France and UK for partnering in manufacturing of Sonar equipments.

When asked had Defence Procurement Policy (DPP) announced by former Defence Minister Late Manohar Parrikar helped companies like Kineco to realise their dreams, Mr Sardesai said the development and commercialization of sonar dome through a PPP was one of the finest success stories of the Indigenously Designed Developed and Manufactured (IDDM) category of defence products as promoted under the strategic partnership model of DPP.

The Sonar Dome is a critical component of a Warship as it houses the Sonar (Sonar Navigation and Ranging) Array – which is considered as the eyes and ears of a Warship or Submarine, used for detection, navigation, and ranging. The Sonar Dome, manufactured by Kineco, was flagged off to its customer Mazagon Dock Shipbuilders Limited Mumbai (MDL), where it will be mounted on the Indian Navy's P15 Alpha Warship.

In 2012, Kineco was selected as an Industry Partner by Defence Research and Development Organisation (DRDO) on a competitive basis and was awarded a prestigious development contract for the development of its first indigenous 'Sonar Dome'. The first prototype was built by Kineco, after four years of rigorous R&D and the same was unveiled by the then Defence Minister Manohar Parrikar at Defence Expo 2016 held in Goa.

The Prototype was subject to stringent validation tests, followed by extensive sea trials onboard P15 Alpha Destroyer War Ship. The Sonar Dome, jointly developed by Kineco and DRDO successfully qualified for usage, not only on P15 Alpha but also P-15 Bravo warships.

Kineco was awarded a 'Transfer of Technology' (ToT) Agreement by DRDO at the hands of then Defence Minister Nirmala Sitharaman at DefExpo April 2018, that enabled it to become a qualified supplier to Indian Navy. Recently, the second ToT was handed over to Kineco by DRDO at the hands of Defence Minister Rajnath Singh at DefExpo 2020.

<https://goachronicle.com/kineco-expects-to-be-preferred-manufacturing-partner-for-critical-defence-equipment-shekhar-sardesai/>

Indian Army ready for winter endurance test at 5,800 metres on Finger 4 of Pangong Tso against PLA

While the winter is expected to take the turn for worse after Diwali this year, the situation on all friction points is a stalemate with PLA accusing the Indian Army of upping the ante south of Pangong Tso on August 29-30 as a result of which their claimed withdrawal plans were scuttled

By Shishir Gupta

New Delhi: At the height of 5,800 metres on Finger 4 mountainous spur a winter endurance test is set to take place this winter with both the Indian Army and Chinese People's Liberation Army (PLA) facing each other with first short snow already fallen on the Karakoram and Kailash ranges in the Ladakh region.

While the winter is expected to take the turn for worse after Diwali this year, the situation on all friction points is a stalemate with PLA accusing the Indian Army of upping the ante south of Pangong Tso on August 29-30 as a result of which their claimed withdrawal plans were scuttled.

The situation along the 1,597-km Line of Actual Control (LAC) in Ladakh continues to be tense but under control with a small detachment of Indian Army facing off a PLA detachment on Gogra Hot Springs or

patrolling point 17 A. The situation on the north bank of Pangong Tso is that a small number of troops on both sides are at the Finger 4 height with PLA stationed behind finger 6 and Indian Army on finger 3. There is no PLA presence on the ground level of PLA four or five but on the dominating height of finger four.

On the southern banks of Pangong Tso, the Indian Army is dominating the Rezang la-Rechin La ridgeline on Kailash ranges with strong positions to defend the LAC despite PLA's presence on Black Top and Helmet with the Indian troopers in between the two at the saddle. "The situation is that both sides are defending their positions but the ridgeline in the area is with the Indian Army," said a military commander familiar with the postures of the two armies.

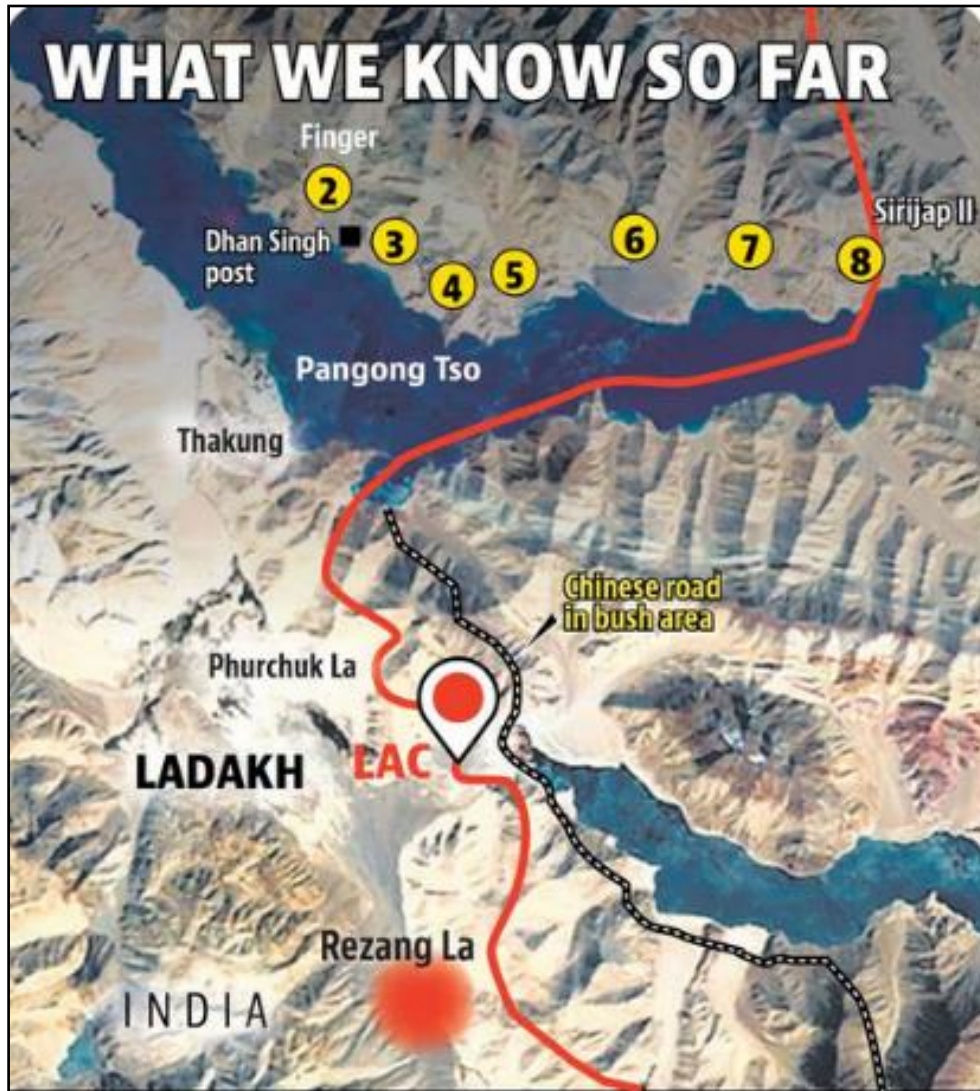
Although the Indian Army will have a new Ladakh Corps Commander in Lt Gen PG K Menon in place of Lt Gen Harinder Singh in October, the former is Colonel of the Sikh Regiment who dishes out the choicest Punjabi cuss words despite being from Kerala. He has a vast experience on the LAC as he was the brigade general staff (Operations) of the XIV Corps in Ladakh before commanding a division in Tawang in Arunachal Pradesh.



In this picture, Indian Army personnel set up camp at an unknown location in Siachen Glacier. (Twitter/@ADGPI)

While the PLA has deployed a brigade strength of mechanized infantry around Tien-Wien Dien across the Daulat Beg Oldi LAC, the Indian Army troops are patrolling the Depsang bulge area within the patrolling limits despite the Chinese efforts to block them. The PLA air activity in this area is more than in the south of the DBO sector due to the close proximity of the Hotan airbase in Tibet.

As another round of Indian and Chinese military-diplomatic dialogue for total Ladakh disengagement will soon take place, the Indian Army commanders are prepared for the long winter ahead. From November onwards, it will be the endurance powers of a voluntary army (India) against conscript (PLA) army that will be on display. Sitting on the glaciated heights of Saltoro ridge since 1984, the Indian Army will surely give a run for money to the adversary.



- Chinese soldiers attempted to reach Mukhpari peak near Rezang La
- The Chinese troops carried spears, machetes and automatic weapons
- The peak is held by Indian troops, who had laid down barbed wires to deter PLA soldiers
- The Indian soldiers issued stern warnings, forcing the PLA men to stop
- It was at this point that the Chinese side opened warning fire

<https://www.hindustantimes.com/india-news/indian-army-ready-for-winter-endurance-test-at-5-800-metres-on-finger-4-of-pangong-tso-against-pla/story-79mBhBrvFh0Zho9RU4dr9M.html>

Exclusive: First visuals of Indian Army's tanks battle-ready to take on China in Ladakh

India Today is the first channel to reach the frontline along the LAC in eastern Ladakh where Indian Army is engaged in a military standoff with the Chinese PLA

By Manjeet Singh Negi

India-China military standoff along the Line of Actual Control (LAC) in eastern Ladakh has been reported either from Leh or Delhi. Now, India Today is the first channel to reach the 'war zone' to bring you exclusive live visuals of the operational preparedness of Indian tank regiments.

Exclusive visuals from areas near the LAC where nobody has gone ever since the conflict started in May show us how the Indian Army tank and infantry combat vehicles are ready for battle at altitudes up to 16,000 feet.

India Today's visit to the frontline started from Leh through Chumathang, in the coldest part of Ladakh. The view was scintillating with different rivers moving in opposite directions along the road.

During the visit, we could see firsthand that Indian Army is battle-ready to face the Chinese Army. To counter the Chinese People's Liberation Army's deployment of armoured columns, India has its T-90 and T-72 tanks along with the BMP-2 Infantry Combat Vehicles which can operate at temperatures up to minus 40 degree Celsius.



Indian Army's Fire and Fury Corps (Photo Credits: Manjeet Singh Negi/India Today)

Eastern Ladakh witnesses the harshest winters where temperatures normally dip to minus 35 degrees in the night in the winter season coupled with high-speed freezing winds.

"The Fire and Fury Corps is the only formation of the Indian Army and also in the world to have actually deployed mechanised forces in such harsh terrain. The maintenance of the tanks, infantry combat vehicles and heavy guns is a challenge in this terrain," Major General Arvind Kapoor told India Today.

He added, "To ensure crew and equipment readiness, adequate arrangements are in place for both man and machine."

During the visit, India Today saw capabilities of Indian tank regiments, including their ability to cross rivers and other obstacles in the region where the Indus River flows along eastern Ladakh.

"Mechanised infantry is the advanced part of the Indian Army. It has experience of operating under harsh weather conditions and varied terrains. Due to features like high mobility ammunition and missile storage, it has the capability to fight for a longer duration. The gunner of mechanised infantry is a trained soldier who is capable of firing different kinds of armaments," a tank soldier deployed at an altitude of 15,500 feet said.

The Indian armoured regiments have the capability to reach the LAC within minutes if they are required and did so recently, when the Chinese activated their tanks after India occupied several heights near the southern bank of Pangong Lake following the incidents of August 29-30.

The entire territory spread from eastern Ladakh to the Tibetan plateau occupied by Chinese forces is suitable for the operations of tanks. Major General Arvind Kapoor is the chief of staff of the Fire and Fury Corps which looks after war preparedness along the LAC in Ladakh.

The army is logistically prepared in terms of tackling the harsh weather with special winter clothing and other facilities such as fuel, spares and assemblies in place, Major General Arvind Kapoor said.

"Adequate training with a provision of special winter clothing will ensure troops' morale remains high and they are ready to function at short notice. Along with this, training and honing of crew skills and drills will remain constant through the winters. The Indian Army in eastern Ladakh is logistically well prepared," he added.

The Army is also making habitation of soldiers on a war footing by placing prefabricated container shelters and barrel shelters that use minimum cement and sand. In these shelters, India Today witnessed proper insulation to protect soldiers from strong winds and winter, proper heating facilities along with basic needs like lavatory and kitchen.

As a part of recreational activities, Army companies are provided with a television along with a set-top box connection.

Talking about climatic challenges at an altitude of 15,000ft, Major General Arvind Kapoor said, "There is no doubt that winters in Ladakh are going to be harsh. We are absolutely in control as far as advanced winter stocking and forward winter stocking is concerned. High calorie and nutritious ration, fuel, oil and lubricants, special winter clothing, winter tentage and heating appliances are all available in adequate numbers."

Indian Army Engineer Corps, working on the erection of shelters, explained that they have used the latest technology to provide soldiers habitat, laboratory and heating arrangements at the earliest.

"These containerised shelters are custom-made and can be placed quickly. These shelters are prefabricated and hence, the use of cement and sand is a minimum," a junior officer commissioned in the Engineer Corps said.

Tensions at the India-China border increased after Chinese transgression in multiple areas in the Indian Territory. In response to the aggression shown by the Chinese, the Indian Army has deployed more than 50,000 troops along with heavy weaponry including artillery, and tank regiments to tackle the enemy forces.

<https://www.indiatoday.in/india/story/exclusive-deployed-along-lac-in-ladakh-indian-army-s-tanks-battle-ready-to-take-on-china-1725926-2020-09-27>

चीन से तनाव के बीच LAC पर सर्दियों के लिए भारतीय सेना तैयार, चला रही सबसे बड़ा 'लॉजिस्टिक ऑपरेशन'

Eastern Ladakh: थलसेना प्रमुख जनरल एम एम नरवणे (Army Chief General MM Narwane)

इस विशाल अभियान में निजी तौर से जुड़े हुए हैं। इसकी शुरुआत जुलाई के मध्य में हुयी थी और अब यह पूरा होने जा रहा है। सूत्रों ने कहा कि भारी संख्या में टी-90 और टी-72 टैंक (T-90 and T-72 Tanks), तोपों, अन्य सैन्य वाहनों को विभिन्न संवेदनशील इलाकों में पहुंचाया गया है।

नई दिल्ली: भारतीय सेना (Indian Army) कई दशकों के अपने सबसे बड़े सैन्य भंडारण अभियान (Military operations) के तहत पूर्वी लद्दाख (East Ladakh) में उंचाई वाले क्षेत्रों में लगभग चार महीनों की भीषण सर्दियों के मददेनजर टैंक (Tanks), भारी हथियार (Heavy Weapons), गोला-बारूद (arms and ammunition), ईंधन (fuel) के साथ ही खाद्य और आवश्यक वस्तुओं की आपूर्ति में लगी हुयी है। सैन्य सूत्रों ने रविवार को यह जानकारी दी। उन्होंने कहा कि शीर्ष कमांडरों (Top commanders) के एक समूह के साथ थलसेना प्रमुख जनरल एम एम नरवणे (Army Chief General MM Narwane) इस विशाल अभियान में निजी तौर से जुड़े हुए हैं। इसकी शुरुआत जुलाई के मध्य में हुयी थी और अब यह पूरा होने जा रहा है।

सूत्रों ने कहा कि भारी संख्या में टी-90 और टी-72 टैंक (T-90 and T-72 Tanks), तोपों, अन्य सैन्य वाहनों को विभिन्न संवेदनशील इलाकों में पहुंचाया गया है। इस अभियान के तहत सेना (Army) ने 16,000 फुट की उंचाई पर तैनात जवानों (Soldiers) के लिए बड़ी मात्रा में कपड़े, टेंट, खाद्य सामग्री, संचार उपकरण, ईंधन, हीटर (Heater) और अन्य वस्तुओं की भी ढुलाई की है। एक वरिष्ठ सैन्य अधिकारी (Senior military officer) ने नाम नहीं छापने की शर्त पर पीटीआई-भाषा को बताया, "अब तक का यह सबसे बड़ा साजो-सामान (logistic) अभियान है जो आजादी के बाद लद्दाख में पूरा किया गया है। यह विशाल स्तर पर है।"



सूत्रों ने कहा कि खासी संख्या में T-90 और T-72 टैंक, तोपों, अन्य सैन्य वाहनों को विभिन्न संवेदनशील इलाकों में पहुंचाया गया है (प्रतीकात्मक तस्वीर)

भारत ने चीनी दुस्साहस से निपटने के लिए पूर्वी लद्दाख में 3 अतिरिक्त सेना डिविजन तैनात की

भारत ने किसी भी चीनी दुस्साहस से निपटने के लिए पूर्वी लद्दाख में तीन अतिरिक्त सेना डिविजन की तैनाती की है। वहां अक्टूबर से जनवरी के बीच तापमान शून्य से नीचे पांच डिग्री सेल्सियस से शून्य से 25 डिग्री सेल्सियस नीचे के बीच रहता है। सूत्रों ने कहा कि भारत ने यूरोप के कुछ देशों से सर्दियों के कपड़े आदि आयात किए हैं और पूर्वी लद्दाख में सैनिकों को पहले ही उनकी आपूर्ति की जा चुकी है।

क्षेत्र में हजारों टन भोजन, ईंधन और अन्य उपकरणों के परिवहन के लिए सी -130 जे सुपर हरक्यूलिस और सी -17 ग्लोबमास्टर सहित भारतीय वायु सेना के लगभग सभी परिवहन विमानों और हेलीकॉप्टरों का उपयोग किया गया।

भारतीय वायु सेना ने वास्तविक नियंत्रण रेखा से लगे क्षेत्रों में हाई अलर्ट पर रहने का फैसला किया

भारतीय सेना ने सर्दियों के महीनों में पूर्वी लद्दाख में सभी प्रमुख क्षेत्रों में सैनिकों की अपनी मौजूदा संख्या को बनाए रखने का फैसला किया है क्योंकि चीन के साथ सीमा विवाद के जल्द समाधान का कोई संकेत नहीं है।

<https://hindi.news18.com/news/nation/army-in-eastern-ladakh-preparing-for-winter-big-campaign-for-logistics-stocking-3270745.html>

चीन से तनातनी के बीच चिन्यालीसौड़ एयरपोर्ट को अपना प्रमुख बेस कैंप बनाने में जुटी भारतीय सेना

सार

चीन से तनातनी के बीच कृषि विज्ञान केंद्र के पास किया दूरभाष केंद्र स्थापित
लाइन बिछाने का कार्य स्वयं कर रहे सेना के जवान

विस्तार

उत्तरकाशी: चीन के साथ चल रहे विवाद के बीच भारतीय सेना लगातार उत्तराखंड के चिन्यालीसौड़ एयरपोर्ट को अपना प्रमुख बेस कैंप बनाने में जुटी है। इसके लिए सेना ने पर्याप्त मात्रा में जवान व आधुनिक हथियार तैनात करने के साथ ही कृषि विज्ञान केंद्र के पास अपना दूरभाष केंद्र स्थापित करना भी शुरू कर दिया है। हालांकि सुरक्षा के दृष्टिगत सेना और प्रशासन के अधिकारियों ने इस संबंध में गोपनीयता बनाई हुई है।

भारतीय सेना ने चीन सीमा से सटे सभी क्षेत्रों में अपना संख्या बल बढ़ा दिया है। इसी क्रम में नेलांग बॉर्डर के निकटम चिन्यालीसौड़ एयरपोर्ट पर भी बीते कुछ दिनों में सेना के हथियारों, वाहनों व जवानों की तैनाती की गई है।

ताकि आपातकाल स्थिति में उन्हें तत्काल सीमा तक पहुंचाया जा सके। इन सभी तैयारियों के बीच सेना ने अब अपनी संचार सेवा को मजबूत करने के लिए कृषि विज्ञान केंद्र के पास दूरभाष केंद्र भी स्थापित करना शुरू कर दिया है।



चिन्यालीसौड़ हवाई अड्डा - फोटो : फाइल फोटो

केबल बिछाकर लाइन चालू की गई

नाम न बताने की शर्त पर विभागीय अधिकारियों ने बताया कि सेना ने 45 दिनों की दूरसंचार सेवा लेने के लिए बीएसएनएल कार्यालय देहरादून में धनराशि जमा कराई है। जिस पर बीएसएनएल द्वारा जलविद्युत निगम विश्राम गृह के पास तक केबल बिछाकर लाइन चालू की गई है।

जबकि कृषि विज्ञान केंद्र में दूरसंचार केंद्र स्थापित कर आगे की लाइन बिछाने का कार्य सेना के जवान स्वयं कर रहे हैं। उन्होंने बताया कि इस केंद्र के चालू होने के बाद सेना को सूचनाओं के आदान प्रदान, इंटरनेट, वाईफाई आदि की सुविधा मिल सकेगी।

<https://www.amarujala.com/dehradun/india-china-border-latest-news-indian-army-is-making-chinyalisaur-airport-its-main-base-camp?pageId=1>

An expert Explains: IAF role in Eastern Ladakh

All the air fields have enough stock of fuel, oil, and lubricants (FOL) for which detailed planning is done around the clock

By Manmohan Bahadur

With a resolution to the standoff on the LAC still elusive, the Indian Army is preparing for extended deployment of troops in the region through the winter months. This leaves the IAF with a key role in providing support to the troops. What are the challenges to meet in the harsh winter and tough terrain?

Can the IAF support the logistics of such a large force?

One part of the logistics for the Army requires land transportation, which would have been planned for before winter sets in and the passes close. The IAF will be doing very urgent missions, for which it is well prepared with a very good transport fleet consisting of C-17 Globemasters, Il-76s, and many An-32s. If it comes to the crunch, the C-130 Super Hercules can also be used for logistics support, although these are meant for special operations.



A C-17 Globemaster of the Indian Air Force flies over the Ladakh region. (PTI)

We also have Mi-17 helicopters and Cheetal light helicopters to cater to forward posts. In addition, the Chinook heavy-lift helicopters will be used for carrying bulky stores, either within the fuselage, or slung under it.

What are the topographical challenges of flying into Leh or other advanced landing grounds (ALGs) in Eastern Ladakh?

The biggest challenge is the altitude of the two airfields of Leh and Thoise, but since we have been flying there for decades, the air crew are well aware of the peculiarities of these fields.

The landing grounds at high altitude have their own challenges, which result in reduction of load-bearing capacity of the planes/choppers. Additionally, the air crew have to call upon their skills to navigate the hills and land on the small, matchbox-like helipads — there is just no place on these hills to make bigger ones!

What additional hazards will winter bring?

Bad weather that accompanies the western disturbances that strike northern India in the winter months is a challenge, as it reduces visibility and results in a low cloud base. So the crew have to be on the ball to make sure they can find a way to circumvent bad weather. This is not always possible, and we have long periods when flying has to be curtailed.

And what effect does extreme cold have on weight-carrying aircraft?

The lower the temperature, the better the payload because the higher air density increases the lift-carrying capability of flying machines. So the loads that can be carried during winter are higher than during summer.

This is a big advantage. For instance, an Il-76, which in summer can carry hardly any load from Leh, can fly out around 20 tonnes in the winter. It is the same with helicopters, whose load-carrying ability to extremely high helipads at altitudes of 17,000 to 20,000 feet increases substantially in winter. And it reduces drastically in summer.

Do the high altitude and topography pose a challenge to navigation and night flying?

The modern navigation equipment available now overcome most of the challenges. But mission accomplishment is not merely flying from place A to B. The aircraft has to land to complete a mission. That is where temperature and altitude plus weather become the final arbiters.

Navigation is not a problem, but take-offs and landings are tricky.

As for night flying, it has its own unique challenges because of the shadows cast by hills, as well as the state and position of the moon relative to the hills and the aircraft. A dark, moonless night poses its own challenges, and a full moon has its own. In the hills, air crew are specially cleared to carry out operations at night.

Do the airfields in Ladakh restrict operations to only certain aircraft or can all aircraft be used?

All air fields in the Ladakh area can be used by the transport aircraft we have, although weather requirements will vary from one aircraft to the other. It depends on the navigational aids on board the aircraft, and the competence of the crew. That is why air crews are detailed depending on the mission.

In a long haul, or in the eventuality of a kinetic war, the IAF will also have to transport back and forth mechanised weapons etc for repair, maintenance, etc. Can our aircraft profile cater to it?

Bringing back loads from the forward air fields is not a problem. However, that has to be prioritised vis-à-vis personnel, casualties, and vital equipment such as avionics.

What kind of logistics support in terms of fuel, repair, etc does the IAF require for such an operation?

All the air fields have enough stock of fuel, oil, and lubricants (FOL) for which detailed planning is done around the clock. There is a well-oiled logistics chain that has been fine-tuned by the IAF in the last six-seven decades of operation. The Army Service Corps (ASC) also plays an important part in ground positioning of fuel in forward posts. It places aviation turbine fuel in barrels in advanced fields, while Leh and Thoise have got fuel bowsers.

What is the threat to aircraft when the ground forces are eyeball to eyeball?

The airfields of Leh and Thoise that support fixed wing operations (helicopters are rotary wing aircraft) are relatively in the interiors, hence not vulnerable to any ground action. They can of course be attacked by the Air Force and other aerial assets of the adversary, but there are standard operating protocols in place to deal with such threats.

However, in ALGs such as Daulat Beg Oldie (DBO), where choppers fly close to the LAC, the air crew are well adept at taking tactical action to meet any threat from ground fire or shoulder-fired missiles. In this, the aids on board the helicopters also play an important role.

Are there any special challenges for fighter aircraft?

Fighters flying in those altitudes have special challenges of their own because of their high speeds, reduced air density, the closeness of the hill tops, and the fact that targets are very small comprising bunkers having limited numbers of troops.

Hitting those targets requires special weapons and air crew capability. Luckily, we have experienced this during Kargil, and I am sure the lessons would have been passed on to the present band of fighter pilots.

Where does Rafale fit in?

The Rafale comes with its unique flying characteristics and weapons delivery payload, but one must remember that present-day combat is between systems, and not generally between one aircraft and the other.

The Rafale would have been dovetailed into the air campaign plan made by the IAF to operate with other systems like Airborne Warning And Control System (AWACS) and electronic warfare (EW) assets. In the present day, an individual weapon system is only as good as the overall war fighting architecture that the force designs.

<https://indianexpress.com/article/explained/an-expert-explains-iaf-role-in-eastern-ladakh-6618417/>

India cuts steel for its first locally-built Project 11356 frigate

India's Goa Shipyard Limited (GSL) cut a steel plate for its first locally built Project 11356 frigate on September 21. The official ceremony of steel cutting was being live-streamed on the same day by the Ishwari Digital media platform

By Xavier Vavas seur

During the ceremony, the Vice Chief of the Indian Navy's (IN's) Staff Vice Admiral G Ashok Kumar cut the first plate of steel for the premier Indian-built Project 11356 frigate.

In his turn, a representative of GSL said the construction of the Project 11356 frigates would be the largest shipbuilding program to be conducted by the enterprise. "Thanks to the commencement of the project, the shipyard has entered the league of the Indian enterprises that are capable of building large surface combatants. Therefore, India's capabilities to construct this type of defense hardware will be dramatically reinforced," he said. "We are planning to fulfill the program in time. The enterprise rapidly adopted to the COVID-19 pandemic in order to minimize its impact on manufacturing processes," he added.

According to the representative of GSL, the new ships will incorporate "a large number" of indigenous subsystems.

India has designated the new ship 'Advanced Missile Frigate' (AMF). "GSL commences production of Advanced Missile Frigates, with 'First Steel Cutting' today at the hands of Vice Chief of Naval Staff Vice Admiral G Ashok Kumar — another landmark step in Defence Shipbuilding and a major boost to 'Make in India' and 'Atma Nirbhar Bharat' [projects]," said GSL in a tweet on September 21.

Russia and India previously contracted the delivery of four Project 11356 frigates to the Asian country. Under the deal, the Yantar Shipyard (a subsidiary of Russia's United Shipbuilding Corporation) and GSL are set to build two ships each.

The Project 11356 frigate is designed to strike surface/underwater combatants and aerial targets in both blue and green waters. The ships operate both in battle groups and as standalone naval platforms. The frigate is armed with an A-190 10 mm naval gun, strike missiles (including the Kalibr and Shtil missile weapons), and torpedoes. The ship can store a Kamov Ka-27 naval rotorcraft. The Project 11356 frigate is 124.8 m long and has a displacement of 3,620 t, a full speed of 30 kt, and a cruise range of 4,850 nm.

The naval platform has been designed with the use of stealth technologies; the acoustic signature of the ship has also been reduced, while the system's protection against high-precision weapons has been reinforced. The frigate's powerplant integrates four gas-turbine engines. The ship can employ only one gas-turbine engine to sail in order to increase the service life and cost-effectiveness ratio of the main powerplant.



Russian Navy Black Sea Fleet frigate Admiral Makarov Project 11356. Russian MoD picture.



Goa Shipyard Limited picture showing the keel laying ceremony for the first frigate

Another representative of GSL told TASS at the Army 2019 international military-technical forum that the Indian Project 11356 frigate would receive a number of locally built subsystems, including a 76 mm naval gun, the BRAHMOS cruise missiles, two 30 mm anti-aircraft guns, two torpedo launchers, and a rocket launcher. The source added that the sensor suite of the new ship would also comprise several Indian items, including a sonar, an information combat-management system, and an electronic warfare system. *TASS Russian news agency*

<https://www.navalnews.com/naval-news/2020/09/india-cuts-steel-for-its-first-locally-built-project-11356-frigate/>



Mon, 28 Sept 2020

India now focusing on constructing Shinku La Tunnel - The safest, shortest route for Indian Army to reach Ladakh

Amid the heightened border tension with both China and Pakistan in the Himalayas, road infrastructure projects have been given a push with completion of a marvel of engineering motorways -- the Rohtang Pass highway tunnel.

Officials say the focus now is on constructing the strategic 13.5-km-long Shinku La tunnel, the shortest, safer and the third alternative corridor for the armed forces for forward areas of Union Territory of Ladakh.

Experts told IANS the 9.2 km-long horseshoe-shaped single-tube, two-lane tunnel -- the world's longest motorable tunnel at over 3,000 metre above the sea level -- is a key step in the Defence Ministry's attempt to make the 475-km Manali-Keylong-Leh highway, used mainly by the armed forces to reach forward areas in Ladakh bordering China and Pakistan, motorable round-the-year.

The Rohtang tunnel -- a dream of former Prime Minister Atal Bihari Vajpayee and named after him posthumously -- is going to be inaugurated by Prime Minister Narendra Modi in his day-long visit on 3 October.

The tunnel has been completed after 10 years of sheer hard work by the Border Roads Organisation (BRO) with an outlay of over Rs 3,200 crore.

"The Rohtang tunnel alone is not enough to provide the Manali-Keylong-Leh axis an all-weather link as the tunnel is going to help only civilians of Keylong," an official of the BRO, which constructs roads along the international border, told IANS.

"Other three high-altitude mountain passes that lie between Keylong and Leh still remain snowbound for at least six months in a year that make the highway totally standstill," he said.

According to the official, the all-weather road to forward areas of requires more tunnels like Rohtang Pass, either at Shinku La or at least three passes located on the original 475-km Manali-Leh road for round-the-year connectivity.

From Keylong, the district headquarters of Lahaul-Spiti, the road travels further to Leh via Darcha, some 170 km from Manali.

From Darcha, where the BRO has just completed the 360-m long longest steel truss bridge, one road bifurcates towards Shinku La (pass), the shortest route that traversing the remote Zaskar region towards Padum, some 30 km from Leh, and another towards the windy Manali-Leh highway.

The 297-km long Darcha-Nimmu-Padum road has been identified as the third strategic alternative to Ladakh in wake of the threat from Pakistan and China. The double lane road is under construction and likely to be completed by 2023, officials said.

The BRO is also studying the feasibility of constructing a tunnel beneath the 13.5-km-long snow avalanche-prone Shinku La like the Rohtang tunnel to avoid the majestic pass.

"The tunnel beneath Shinku La will further drastically reduce the distance between Manali and Leh," an official told IANS.

The Manali-Leh route is 475 km, while the Manali-Darcha-Padum-Leh road is 444 km.

Currently, the National Highways and Infrastructure Development Corp Ltd is preparing the detailed project report of the Shinku La tunnel that will link Himachal Pradesh with Ladakh.

Officials admit with the completion of the Rohtang Pass tunnel, the focus of the Indian government now shifts towards the construction of the Shinku La tunnel owing to the strategic significance of the third route to Ladakh, a shorter one.

Currently, the troop movement towards Ladakh is by two routes -- the 434-km Srinagar-Kargil-Leh via Zojila Pass and the 475-km Manali-Leh that passes through the Rohtang Pass. But they remain cut off from the rest of the country for over six months due to heavy snowfall.

For Kargil, the troop movement from Manali is via Leh that is 700-km long.

With the construction of the Darcha-Nimmu-Padum road through the Shinku La tunnel, the distance between Manali and Kargil will be reduced to 522 km.

Officials admit the construction of the Shinku La tunnel alone is more viable in comparison to construction of at least tunnels beneath the Baralacha (16,020 feet), Lachlungla (16,620 feet) and Tanglangla (17,480 feet) passes that lie on the operational Manali-Leh link.

On completion of the Shinku La tunnel, the Manali-Kargil highway will remain open throughout the year, the Ministry of Road Transport and Highways said in a statement last week.

The strategic importance of the Manali-Leh link was realised by the government when Pakistan tried to cut off the Srinagar-Leh road during the 1999 Kargil conflict, in a bid to restrict road access to Ladakh.

However, the movement of armed forces to the forward areas in Ladakh from Manali side, that doesn't fall in the firing range of Pakistan forces, is feasible only from June to mid-December.

With a round-the-year road link to tribal areas, the region will witness a huge influx of tourists not only for nature-based activities but also for visiting ancient Buddhist monasteries, admit state officials.

(The story has been published via a syndicated feed, only the headline has been changed)

<https://swarajyamag.com/insta/india-now-focusing-on-constructing-shinku-la-tunnel-the-safest-shortest-route-for-indian-army-to-reach-ladakh>

JIMEX 2020: India, Japan 'non-contact' Naval drill aims at China

Japan and India have no formal alliance or treaty that requires one to come to the assistance of the other in the case of aggression by a third party

By Ajai Shukla

While Indian and Chinese troops continue their nearly five-month-long face-off in Ladakh, the Indian Navy is training with its Japanese counterpart for the eventuality of war with China's People's Liberation Army (Navy), or PLA(N).

From Saturday to Monday, the two navies are conducting the fourth edition of the Japan-India Maritime Exercise, or JIMEX 2020. Conducted in the Arabian Sea, this has involved three of the Indian Navy's most capable warships: the stealth destroyer Indian Navy Ship (INS) Chennai, frigate INS Tarkash and fleet tanker INS Deepak. The Japanese have fielded two warships of the Japanese Maritime Self-Defense Force (JMSDF): the helicopter carrier, Japanese Ship (JS) Kaga and guided missile destroyer, JS Ikazuchi.



Japanese helicopter carrier, JS Kaga with the destroyer, INS Chennai, at JIMEX 2020

Under its post-World War II pacifist constitution, Japan cannot have a military or spend more than 1 per cent of its national income on defence. Even so, Japan's large economy and technological capability ensures that the Kaga and Ikazuchi are amongst Asia's most advanced and powerful warships and that the low profile JMSDF is a match for its most likely adversaries, China and North Korea.

For example, JS Kaga currently carries only helicopters, but can be converted into an aircraft carrier, should Tokyo abandon its self-imposed restraints. Along with its sister ship, JS Izumo, that would give Japan navy a two-carrier navy. The JMSDF's 12 Soryu-class conventional submarines (the 12th is close to entering service) are amongst the quietest and most heavily armed in the world.

During JIMEX 2020, the three Indian and two Japanese warships, along with the highly capable Boeing P-8 Poseidon long-range maritime surveillance aircraft that both countries operate, will refine their drills for detecting and destroying Chinese submarines and surface warships.

India is concerned that, if war breaks out on the Sino-Indian boundary, the PLA(N) would try and sneak its submarines into the Indian Ocean through four narrow waterways that provide access from the South China Sea into the Indian Ocean – the Straits of Malacca, Sunda, Lombok and Ombai Wetar.

Meanwhile, Tokyo worries that the PLA(N) might try to use force to gain control of the Senkaku Island that Japan claims and controls in the East China Sea. Beijing also claims these islands, which it refers to as Diaoyu Islands.

Japan and India have no formal alliance or treaty that requires one to come to the assistance of the other in the case of aggression by a third party. However, JIMEX 2020 ensures that the two navies are operationally prepared to do so. They will rehearse the “interoperability” procedures, worked out in the trilateral Malabar exercises each year between the US, Japanese and Indian navies, to be prepared to operate together to defeat the PLA(N).

“Multi-faceted tactical exercises involving weapon firings, cross deck helicopter operations and complex surface, anti-submarine and air warfare drills will consolidate coordination developed by the two navies,” said the Indian Navy on Sunday.

The interoperability of the Japanese and Indian navies has been further boosted by an “acquisition and cross-servicing agreement” (ACSA) that was concluded on September 9. This

allows the two militaries to plug into each other's logistics capabilities, including those located in their respective military bases. Besides Japan India has similar logistics agreements with only five other countries: the US, France, Singapore, South Korea, and Australia.

Underlining the closeness of political ties between Tokyo and New Delhi, Japan's new prime minister, Yoshihide Suga, spoke on 25 September on the phone with Prime Minister Narendra Modi. They discussed, amongst other things, the importance of a "free and open Indo-Pacific".

Japan and India have actively promoted the concept of the "Indo-Pacific" region, geographically extending the traditional "Asia-Pacific" into the Indian Ocean littoral. Both countries have incorporated the Indo-Pacific concept into their strategic worldview and foreign policy lexicon.

In dealing with a resurgent and belligerent China, bilateral strategic ties and military exercises allow New Delhi and Tokyo to back the principle of a "free and open Indo-Pacific" (FOIP) and adherence to a "rules-based" order without being drawn into a framework like the "Quad", which Beijing dismisses as an American grouping that is motivated by great power geopolitical rivalry.

Initial attempts to curb Chinese aggression in the Western Pacific was based on the "Quad" – a dialogue group combining Australia, Japan, India and the US that also carried out a multilateral naval exercise in 2007-08. That was scaled down after Beijing complained about its motivations, but now seems likely to be back as a consequence of renewed Chinese belligerence against Taiwan, Hong Kong and Ladakh as well as in the South China Sea.

"Such exercises, and displays of cooperation at sea, sends a strong message to our friends and others of the joint resolve to keep the seas open and prevent hegemonic actions of any single nation," said a senior naval source without naming China.

The JIMEX series of bilateral naval exercises began in 2012. JIMEX is conducted every two years, increasing each time in scope and complexity. This year, due to COVID-19 restrictions, JIMEX 2020 is being conducted in a "non-contact, at-sea-only" format, without the customary "shore phase" of the exercise.

https://www.business-standard.com/article/current-affairs/amid-face-off-in-ladakh-india-japan-naval-drill-focuses-on-china-120092800029_1.html



Mon, 28 Sept 2020

India, Japan hold 3-day Naval exercise JIMEX in Arabian sea

The bilateral maritime exercise between the Indian and Japanese navies off the West Coast of India from September 26 to September 28 includes advanced exercises, tactical manoeuvres and a wide spectrum of maritime operations

Edited By Pushkar Tiwari

Highlights

- 1. This is the first military exercise after the two countries signed a landmark agreement on September 9 that will allow their militaries to access each other's bases for logistics support.*
- 2. It is reportedly being conducted in a 'non-contact at-sea-only format', in view of the COVID-19 restrictions.*
- 3. The JIMEX series of exercises commenced in January 2012 with a special focus on maritime security cooperation. The last edition of JIMEX was conducted in October 2018 off Visakhapatnam coast.*

New Delhi: The Indian and Japanese navies on Saturday (September 26, 2020) began their three-day-long maritime exercise that took place in the North Arabian Sea. The fourth edition of

the Japan India Maritime Exercise (JIMEX) between the Indian Navy and Japan Maritime Self-Defense Force (JMSDF) saw them carry out extensive Maritime Ops.

The JMSDF ships Ikazuchi and Kaga led by Rear Admiral Konno Yasushige and the Indian Navy ships Chennai Tarkash and Deepak led by Rear Admiral Krishna Swaminathan were also seen in a close formation.



Photo: Twitter/@indiannavy

The bilateral maritime exercise between the Indian and Japanese navies off the West Coast of India from September 26 to September 28 includes advanced exercises, tactical manoeuvres and a wide spectrum of maritime operations that will further enhance the naval cooperation and maritime interoperability.

Notably, this is the first military exercise after the two countries signed a landmark agreement on September 9 that will allow their militaries to access each other's bases for logistics support.

It is reportedly being conducted in a 'non-contact at-sea-only format', in view of the COVID-19 restrictions.

The JIMEX series of exercises commenced in January 2012 with a special focus on maritime security cooperation. The last edition of JIMEX was conducted in October 2018 off Visakhapatnam coast.

Earlier on September 23 and September 24, the Indian Navy also undertook a Passage Exercise (PASSEX) with the Royal Australian Navy (RAN) in the East Indian Ocean Region. The exercise involved the participation of the HMAS Hobart from the Australian side and the Indian Naval Ships Sahyadri and Karmuk. In addition, an Indian MPA and helicopters from both sides also participated in the exercise.

The exercise was aimed at enhancing interoperability, improving understanding and imbibing best practices from each other, and involved advanced surface and anti-air exercises including weapon firings, seamanship exercises, naval manoeuvres and Cross Deck Flying Operations.

PASSEXs are regularly conducted by the Indian Navy with units of friendly foreign navies, whilst visiting each other's ports or during a rendezvous at sea.

Meanwhile, the senior officials from India's Ministry of External Affairs, Department of Foreign Affairs & Trade of Australia, Ministry of Foreign Affairs of Japan and Department of State of the United States of America held a video conference on September 25 for consultations on regional and global issues of common interest.

The officials reportedly exchanged views on ongoing and proposed practical cooperation in the areas of connectivity and infrastructure development, and security matters, including counter-terrorism, cyber and maritime security, with the objective of promoting peace, security, stability and prosperity in the Indo-Pacific region.

The officials reaffirmed their commitment towards a free, open, prosperous and inclusive Indo-Pacific region based on shared values and principles and respect for international law.

This comes in the backdrop of growing concerns over China's military activity in the Indian Ocean region as well as in the Indo-Pacific.

<https://zeenews.india.com/india/india-japan-hold-3-day-naval-exercise-jimex-in-arabian-sea-watch-2312795.html>

India to support Sri Lanka boost its defence, security

Kicking off the first virtual bilateral summit in the neighbourhood, India and Sri Lanka sought to advance defence and security cooperation, while India promised to consider Colombo's request for delayed debt repayment and a \$1 billion currency swap arrangement.

PM Modi met his Lankan counterpart Mahinda Rajapaksa virtually on Saturday morning. According to an official readout of the summit by MEA joint secretary (Indian Ocean Region) Amit Narang, PM Modi emphasised that implementation of the 13th amendment to the Sri Lankan Constitution is essential for carrying forward the process of peace and reconciliation.

"PM Modi called on the new government in Sri Lanka to work towards realising the expectations of Tamils for equality, justice, peace and dignity within a united Sri Lanka by achieving reconciliation nurtured by implementation of the constitutional provisions," he said.

Narang added India's focus areas with Sri Lanka are defence and security, Buddhism and economic development. "The outcomes of the Summit are substantial, forward looking and also help to set an ambitious agenda for bilateral ties," he said.

"Under neighbourhood first policy and SAGAR Doctrine, we will give priority to Sri Lanka," Modi told his counterpart in his opening remarks. Sri Lanka has requested for a \$1 billion currency swap arrangement with India (India had, earlier this year, done a \$400 million swap) and a delayed debt repayment schedule. India agreed to support Sri Lanka in defence and security, "strengthen the mutual cooperation on personnel exchange and training, maritime security cooperation." Indian Coast Guard and Indian Navy recently helped to douse a major fire on a tanker MT Diamond off the Lankan coast.

However, there was no word on whether the Eastern Container Terminal (ECT) deal, which Rajapaksa had promised to review, would go to India and Japan as originally agreed. There was also no meeting point on the impasse regarding the Trincomalee container terminals, which has been hanging fire. Questioned, Narang stuck to generalities about the discussions being "positive and constructive."

Modi also announced a grant assistance of \$15 million for the promotion of Buddhist ties between the two countries. Rajapaksa invited Modi to inaugurate the Jaffa Cultural Centre, set up with Indian assistance. Narang indicated that India shared its assessments of the Ladakh crisis with the Lankan leadership.

<https://timesofindia.indiatimes.com/india/india-to-support-sri-lanka-boost-its-defence-security/articleshow/78342188.cms>



Sat, 26 Sept 2020

Scientists capture light in a polymeric quasicrystal

ITMO University scientists have conducted several experiments to investigate polymeric quasicrystals that ultimately confirmed their initial theory. In the future, the use of quasicrystals may open up new possibilities for laser and sensor design. This paper was published in *Advanced Optical Materials*.

Crystals are solids with a periodic structure, i.e., when atoms are displaced, they take the exact places of other atoms, the latter occupied before the shift. This fact was scientifically proved at the beginning of the 20th century. It gave rise to modern solid-state physics and also laid the foundation for the development of semiconductor technologies.

Mikhail Rybin, associate professor at ITMO's Department of Physics and Engineering, says, "Computers, smartphones, LED bulbs, lasers—everything we can't imagine our day-to-day lives without was designed thanks to the fact that we understand the nature of the crystalline structure of semiconductor materials. The theory of periodic structures allows us to conclude that waves—be it light, electrons, or sound—can only move in two ways. Either the wave propagates forward in the crystal, or it rapidly fades at the frequencies of the so-called band gap. There are no other options and it greatly simplifies the laws of particle propagation while facilitating engineering tasks."

However, some devices require a crystal that neither transmits nor extinguishes the wave, but instead, retains it for some time—something like a light "trap" is needed.

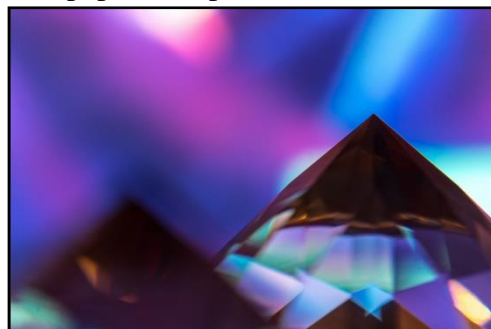
Ideally, the entire material should take on the role of a trap, because the more light is captured, the more efficient the interaction of the wave with the active substance will be. However, in the case of a crystal, it is not possible. Random structures like powders may be used, but the chaotic arrangement of particles is very difficult to reproduce. An alternative can be the use of quasicrystals: Their structure does not form periodic lattices, as happens in crystals, but at the same time, express a mathematically strict ordering. In 2017, researchers predicted that it would be possible to localize light within such a structure.

ITMO University scientists succeeded in creating samples of polymer quasicrystals using three-dimensional nano-printing. They conducted research to study the quality of their surface. "After that, we did an experiment," explains the co-author of the work, Artem Sinelnik. "A short light pulse was sent to the quasicrystal, and the so-called afterglow was measured. As it turned out, light exits our samples with a delay, that is, the wave is held inside for quite a long time. Thus, we have confirmed the ability to capture light in a three-dimensional polymer quasicrystal."

More information: Artem D. Sinelnik et al. Experimental Observation of Intrinsic Light Localization in Photonic Icosahedral Quasicrystals, *Advanced Optical Materials* (2020). DOI: [10.1002/adom.202001170](https://doi.org/10.1002/adom.202001170)

Journal information: [Advanced Optical Materials](#)

<https://phys.org/news/2020-09-scientists-capture-polymeric-quasicrystal.html>



Credit: Ant Rozetsky

Materials scientists learn how to make liquid crystal shape-shift

A new 3-D-printing method will make it easier to manufacture and control the shape of soft robots, artificial muscles and wearable devices. Researchers at UC San Diego show that by controlling the printing temperature of liquid crystal elastomer, or LCE, they can control the material's degree of stiffness and ability to contract—also known as degree of actuation. What's more, they are able to change the stiffness of different areas in the same material by exposing it to heat.

As a proof of concept, the researchers 3-D-printed in a single print, with a single ink, structures whose stiffness and actuation varies by orders of magnitude, from zero to 30 percent. For example, one area of the LCE structure can contract like muscles; and another can be flexible, like tendons. The breakthrough was possible because the team studied LCE closely to better understand its material properties.

The team, led by Shengqiang Cai, a professor in the Department of Mechanical and Aerospace Engineering at the UC San Diego Jacobs School of Engineering, details their work in the Sept. 25 issue of *Science Advances*.

Researchers were inspired to create this material with different degrees of actuation by examples in biology and nature. In addition to the combination of muscle and tendon, researchers took cues from the beak of the squid, which is extremely stiff at the tip but much softer and malleable where it is connected to the mouth of the squid.

"3-D-printing is a great tool to make so many different things—and it's even better now that we can print structures that can contract and stiffen as desired under a certain stimuli, in this case, heat," said Zijun Wang, the paper's first author and a Ph.D. student in Cai's research group.

Understanding material properties

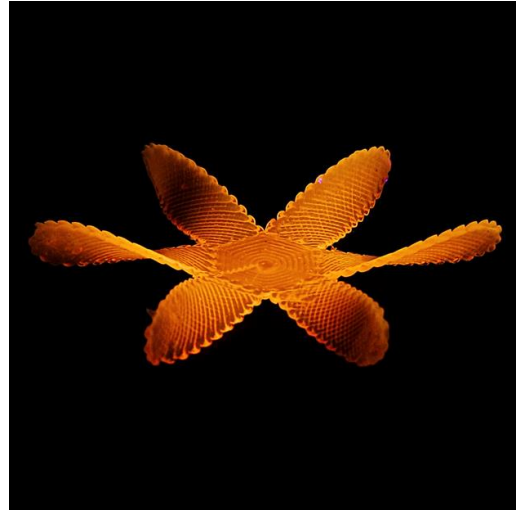
To understand how to tune the material properties of LCE, researchers first studied the material very closely. They determined that printed LCE filament is made of a shell and a core. While the shell cools off quickly after printing, becoming stiffer, the core cools more slowly, remaining more malleable.

As a result, researchers were able to determine how to vary several parameters in the printing process, especially temperature, to tune the mechanical properties of LCE. In a nutshell, the higher the printing temperature, the more flexible and malleable the material. While the preparation of the LCE ink takes a few days, the actual 3-D print can be done in just 1 to 2 hours, depending on the geometry of the structure being printed.

"Based on the relationship between the properties of LCE filament and printing parameters, it's easy to construct structures with graded material properties," said Cai.

Varying temperature to 3-D-printing structures

For example, researchers printed an LCE disk at 40 degrees C (104 F) and heated it up to 90 degrees C (194 F) in hot water. The disk deformed into a conical shape. But an LCE disk



Researchers also 3D-printed structures made of two layers of LCE with different properties and showed that this gave the material even more degrees of freedom to actuate. Researchers also printed lattice structures with the material, which could be used in medical applications. Credit: University of California San Diego

composed of areas that are printed at different temperatures (40, then 80 then 120 degrees Celsius, for example), deformed in a completely different shape when heated up.

Researchers also 3-D-printed structures made of two layers of LCE with different properties and showed that this gave the material even more degrees of freedom to actuate. Researchers also printed lattice structures with the material, which could be used in medical applications.

Finally, as a proof of concept, the team 3-D printed an LCE tube that they had tuned during 3-D printing and showed that it could adhere to a rigid glass plate much longer when actuated at high temperatures, about 94 C (201 F), than a regular LCE tube with homogenous properties. This could lead to the manufacture of better robotic feet and grippers.

The actuation of the material could be activated not just in hot water but also by infusing LCE with heat-sensitive particles or particles that absorb light and convert it to heat—anything from black ink powder to graphene. Another mechanism would be to 3-D print the structures with electric wires that generate heat embedded in LCE.

Next steps include finding a way to tune the material's properties more precisely and efficiently. Researchers also are working on modifying the ink so the printed structures can be self-repairable, reprogrammable, and recyclable.

More information: "Three-dimensional printing of functionally graded liquid crystal elastomer" *Science Advances* (2020). advances.sciencemag.org/lookup...1126/sciadv.abc0034

Journal information: [Science Advances](https://phys.org/news/2020-09-materials-scientists-liquid-crystal-shape-shift.html)
<https://phys.org/news/2020-09-materials-scientists-liquid-crystal-shape-shift.html>



Sat, 26 Sept 2020

Columbia leads effort to develop a quantum simulator

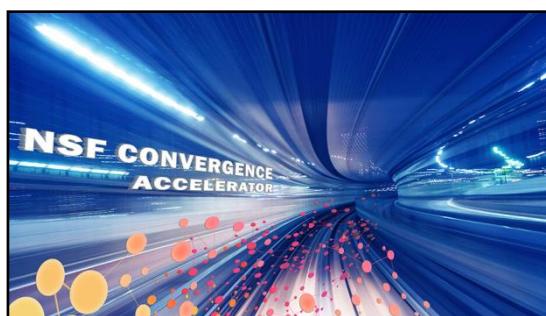
By Carla Cantor

Quantum technologies—simulators and computers specifically—have the potential to revolutionize the 21st century, from improved national defense systems to drug discovery to more powerful sensors and communication networks.

But the field still needs to make major advances before quantum computing can surpass existing tools to process information and live up to its promise.

A multidisciplinary research team led by Columbia University is in a position to bring quantum technology out of the lab into real-world applications.

The team has received a \$1 million National Science Foundation (NSF) Convergence Accelerator award to build a quantum simulator, a device that can solve problems that are difficult to simulate on classical computers. The project includes physicists, engineers, computer scientists, mathematicians, and educators from academia, national labs, and industry.



Columbia is one of 11 institutions nationwide to receive a Phase One National Science Foundation Convergence Accelerator award for quantum technology. The program is designed to foster multidisciplinary, cross-sector research in emerging areas of critical societal importance. Credit: NSF

"This funding will enable us to develop the concept for a quantum simulator that can help tackle real-world challenges," said Sebastian Will, assistant professor of physics at Columbia and principal investigator on the project. "For this we brought a diverse team together that includes experts in atomic physics, photonics, electronics, and software, as well as future users of the platform."

The National Science Foundation launched its Convergence Accelerator program, a new structure unique for NSF and the federal government, in 2019 to help quickly transition research and discovery aligning with NSF's "Big Ideas" into practice. In 2020, the NSF continues to invest in two transformative research areas of national importance: quantum technology and artificial intelligence.

Columbia is one of 11 institutions nationwide to receive a Phase One Convergence Accelerator award for quantum technology. These awards support the National Quantum Initiative Act passed in 2018 to accelerate the development of quantum science and information technology applications. The U.S. Congress has authorized up to \$1.2 billion of research funding for quantum information science, including computing.

The hope of building a quantum computer with the potential to resolve seemingly intractable problems across many different industries and applications relies on controlling microscopic quantum systems with higher and higher precision in order to put them to work for computing tasks.

With this grant, the Columbia team will develop hardware and software concepts to build a versatile quantum simulator based on ordered arrays of atoms. The group will store quantum information in individual atoms and program them to perform quantum simulations. Besides developing the device, the plan is to make it accessible to a broad user base via cloud-computing.

Over the next nine months, the 2020 cohort Convergence Accelerator teams will work to develop their initial concept, identify new team members, and participate in a curriculum focusing on design, team science, pitch preparation, and presentation coaching. After developing a prototype, the teams will participate in a pitch competition and proposal evaluation. Teams selected for phase two will be eligible for additional funding: up to \$5 million over 24 months.

By the end of phase two, teams are expected to deliver solutions that impact societal needs at scale.

"The quantum technology and AI-driven data and model-sharing topics were chosen based on community input and identified federal research and development priorities," said Douglas Maughan, head of the NSF Convergence Accelerator program. "This is the program's second cohort, and we are excited for these teams to use convergence research and innovation-centric fundamentals to accelerate solutions that have a positive societal impact."

The simulator project team includes collaborators from Columbia University, principal investigator Sebastian Will, co-principal investigators Alex Gaeta and Nanfang Yu, and others; Brookhaven National Lab, co-principal investigators Layla Hormozi and Gabriella Carini, and others; City University of New York; Flatiron Institute; and industry partners from Atom Computing, QuEra, IBM, and Bloomberg.

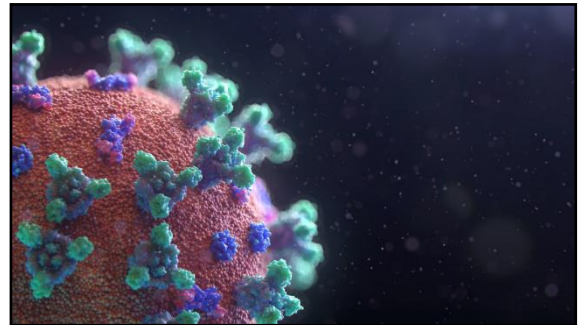
Provided by [Columbia University](#)

<https://phys.org/news/2020-09-columbia-effort-quantum-simulator.html>

How to better understand what makes a virus win during transmission?

Estimating fitness variation among microorganisms, meaning their aptitude to survive and reproduce in given conditions, allows researchers to predict their infection trajectories in single hosts and transmission in host populations. Among two viral strains, which will be the one to win against the host's immune response, or upon administration of drugs and vaccines? In virus dynamics, understanding such scenarios in detail is crucial, given the increase in resistance to antivirals and other evolutionary changes. Today, this understanding is enhanced via mathematical models, but the majority of current approaches describe limited scenarios, focusing on competitive exclusion, where one strain of the virus always wins over another because it has higher fitness.

The Mathematical Modelling of Biological Processes research group from Instituto Gulbenkian de Ciência developed a mathematical framework that enables extension beyond such limitation. Based on the Lotka-Volterra model, widely used in ecology, the researchers propose a framework that allows, in addition, verification of scenarios of frequency-dependent competition between microbial strains in a host leading up to transmission.



Credit: Unsplash/CC0 Public Domain

"We applied this framework to a dataset obtained from previous studies, where they estimated different parameters related to differences in transmission fitness between two influenza virus strains in ferrets," explains Erida Gjini, lead author of the study. "We went further and, by considering more complex interactions between viruses and the role of stochasticity in transmission, we showed that for the same dataset our model predicts a scenario of coexistence between strains and reveals a higher transmitted viral load," concludes the researcher.

The advantage of this framework lies in its simplicity and generality: the model can be applied to other ecological scenarios of microbial competition, while allowing exploration of more outcomes from the competitive dynamics between two strains.

More information: Afonso Dimas Martins et al. Modeling Competitive Mixtures With the Lotka-Volterra Framework for More Complex Fitness Assessment Between Strains, *Frontiers in Microbiology* (2020). DOI: [10.3389/fmicb.2020.572487](https://doi.org/10.3389/fmicb.2020.572487)
<https://phys.org/news/2020-09-virus-transmission.html>

Carriers of two genetic mutations at greater risk for illness and death from COVID-19

Researchers recommend population-wide screening for detecting mutation carriers

Summary:

Researchers suggest that carriers of the genetic mutations PiZ and PiS are at high risk for severe illness and even death from COVID-19. These mutations lead to deficiency in the alpha1-antitrypsin protein, which protects lung tissues from damage in case of severe infections. Other studies have already associated deficiency in this protein with inflammatory damage to lung function in other diseases.

Tel Aviv University researchers suggest that carriers of the genetic mutations PiZ and PiS are at high risk for severe illness and even death from COVID-19. These mutations lead to deficiency in the alpha1-antitrypsin protein, which protects lung tissues from damage in case of severe infections. Other studies have already associated deficiency in this protein with inflammatory damage to lung function in other diseases.

The study was led by Prof. David Gurwitz, Prof. Noam Shomron, and MSc candidate Guy Shapira of TAU's Sackler Faculty of Medicine, and published in *The FASEB Journal* on September 22, 2020.

The researchers analyzed data from 67 countries on all continents. Comparisons revealed a highly significant positive correlation between the prevalence of the two mutations in the population and COVID-19 mortality rates (adjusted to size of the population) in many countries, such as the USA, the UK, Belgium, Spain, Italy, and more.

Consequently, the researchers suggest that these mutations may be additional risk factors for severe COVID-19. They now propose that their findings should be corroborated by clinical trials, and if validated should lead to population-wide screening for identifying carriers of the PiS and/or PiZ mutations. Such individuals should then be advised to take extra measures of social distancing and later be prioritized for vaccination once vaccines are available. According to the researchers, these steps can be effective in reducing COVID-19 morbidity and fatality rates.

Analysis of databases reveals that in Belgium, where 17 of every 1,000 people carry the PiZ mutation (the more dominant of the two mutations discussed in this study), the COVID-19 mortality rate was 860 per million according to figures for September 2020. In Spain the picture is similar: 17 of every 1,000 citizens carry the PiZ mutation, and the COVID-19 fatality rate is 640 per million. In the USA, where 15 per 1,000 are carriers, 590 of every million died of the coronavirus.

The numbers in the UK are in line with the overall trend: 14 per 1,000 carry the mutation and 60 per million have died of COVID-19. In Italy, where 13 per 1,000 are carriers, the mortality rate is 620 per million. In Sweden, where 13 per 1,000 are carriers, the fatality rate is 570 per million.

On the other hand, the researchers found that in many countries in Africa and South East Asia, where these mutations are relatively rare, COVID-19 mortality rates are correspondingly low as of September 2020. In Japan, where 9 of every million died in the pandemic, the mutations' prevalence is negligible. Similar numbers were also found in China, South Korea, Taiwan, Thailand, Vietnam, and Cambodia.

Prof. Gurwitz, Prof. Shomron, and Shapira conclude, "Our data analysis reveals a strong correlation between these mutations and severe illness and death from COVID-19. We call upon the research community to test our hypothesis against clinical data, and also call upon decision makers in every country to conduct population-wide screening for identifying mutation carriers and prioritize them for vaccination once COVID-19 vaccines have been approved. In the meantime,

carriers should be notified that they may belong to a high-risk group and advised to maintain strict social isolation."

Story Source:

[Materials](#) provided by [American Friends of Tel Aviv University](#). *Note: Content may be edited for style and length.*

Journal Reference:

1. Guy Shapira, Noam Shomron, David Gurwitz. **Ethnic differences in alpha-1 antitrypsin deficiency allele frequencies may partially explain national differences in COVID-19 fatality rates.** *The FASEB Journal*, 2020; DOI: [10.1096/fj.202002097](https://doi.org/10.1096/fj.202002097)
<https://www.sciencedaily.com/releases/2020/09/200926145205.htm>

Business Today

Sun, 27 Sept 2020

COVID-19 research: Talc, petroleum jelly best lubricants for people wearing PPE

Imperial College London scientists added that many typical moisturisers do not last long as they are designed to be absorbed into the skin for a 'non-greasy feel'

Scientists have found that petroleum jelly and talcum powder are most likely to provide long-lasting skin protection to those wearing personal protective equipment (PPE), an advance that may help healthcare workers prevent injury from prolonged use of masks and visors amidst the COVID-19 pandemic.

According to study, published in the journal PLOS ONE, the best lubricants to use are those that don't absorb into the skin, creating a long-lasting layer of protection between skin and PPE.

The scientists, including those from Imperial College London in the UK, noted that wearing PPE like face visors, goggles, and respiratory protective equipment have become an essential part of working life for frontline healthcare workers during the COVID-19 pandemic,

They said more workers are wearing facial PPE now than ever before, often for extended periods of time, to protect them against the SARS-CoV-2 virus. However, the researchers said extended PPE use, particularly on the delicate skin of the face, can cause friction and shear injuries like skin tears, blistering, ulcers, and hives.

In order to reduce the effects of friction and shear, workers are advised to apply lubricants every half hour, which they said can be impractical during shift work and may expose workers to the virus. The scientists added that many typical moisturisers do not last long as they are designed to be absorbed into the skin for a 'non-greasy feel'.

"We think of moisturisers as good for our skin, but commercial skin creams are often designed to absorb into the skin without leaving any residue," said study lead author Marc Masen from Imperial College London. "While this is fine for everyday moisturising, our study shows that a greasy residue is precisely what's needed to protect skin from PPE friction," Masen said.

In the research, the scientists custom-built a tribometer -- an instrument that assesses friction between two surfaces -- and used it to test the friction between the skin and polydimethylsiloxane (PDMS), which is a common component of PPE. They tested commercially available products to measure how they changed the friction between PDMS and the inner forearm skin of a healthy 44-year-old male participant, testing friction upon application.



According to study, published in the journal PLOS ONE, the best lubricants to use are those that don't absorb into the skin, creating a long-lasting layer of protection between skin and PPE

The researchers repeated the testing process one, two, and four hours after application. The study found that while most products initially reduced friction by 20 per cent, some silicone-based and water-and-glycerin based lubricants increased friction levels over time by up to 29 per cent compared to dry skin.

However, the scientists said two products reduced friction as time went on. According to the study, talcum powder reduced friction by 49 per cent on application and 59 per cent at four hours, and a commercially available product comprising coconut oil, cocoa butter, and beeswax reduced friction by 31 per cent on application and 53 per cent at four hours.

The scientists said a mixture of petrolatum and lanolin reduced friction by 30 per cent throughout testing. They found that when applying commercial moisturisers, the friction on application was low, but increased drastically within ten minutes of application.

The researchers explained that this is because the active ingredients, known as humectants, attract water like magnets from the lower layers of skin to the upper ones, leaving it soft, unlubricated, and breakable. "The products that don't absorb easily into the skin are the ones that provide a protective layer. In fact, for PPE wearers, it's best to actively avoid creams and moisturisers which advertise a 'non-greasy feel'," said study co-author Zhengchu Tan.

"Friction can be incredibly damaging for the skin, particularly when applied for an extended period. We hope our study will save healthcare workers and other frontline PPE wearers from suffering with the painful and damaging effects of skin friction," Masen said. The researchers believe the findings may help PPE wearers seek the best skin-saving products.

<https://www.businesstoday.in/current/economy-politics/covid-19-research-talc-petroleum-jelly-best-lubricants-for-people-wearing-ppe/story/417079.html>



Sun, 27 Sept 2020

New research: Statins found associated with severity of Covid-19 disease

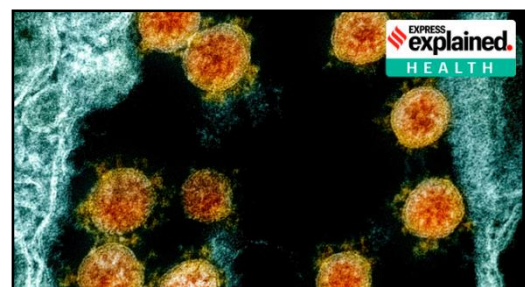
In short, statins remove cholesterol from cell membranes, which in turn prevents the coronavirus from getting in

New Delhi: Statins are a widely used medication for lowering cholesterol. Recent research from US San Diego (University of California at San Diego) School of Medicine associated statins with reduced risk of developing severe Covid-19 disease, as well as faster recovery times.

Now another research team, also from UC San Diego School of Medicine, has explained why this happens. The first study is published in The EMBO Journal, and the new one in the American Journal of Cardiology.

In short, statins remove cholesterol from cell membranes, which in turn prevents the coronavirus from getting in.

We know that SARS-CoV-2, the virus that causes Covid-19, enters the human cell by using a protein known as ACE2 on the cell surface. ACE2 can be affected by prescription statins.



This electron microscope image shows novel coronavirus SARS-CoV-2 virus particles, orange, isolated from a patient. (NIAID/National Institutes of Health via AP)

Researchers retrospectively analysed the electronic medical records of 170 patients with Covid-19 and 5,281 Covid-negative control patients hospitalised at UC San Diego Health between February and June 2020. Among the patients with Covid-19, 27 per cent were taking statins on admission.

Statin use was associated with a more than 50 per cent lower risk of developing severe Covid-19. Patients taking statins also recovered faster than those not taking statins.

<https://indianexpress.com/article/explained/statins-found-associated-with-severity-of-covid-19-disease-6616951/>



Sun, 27 Sept 2020

Can Covid-19 affect the heart? Likely, says study

Editd By Poulomi Ghosh

Nigerian-American basketball player Michael Ojo, who had recovered from Covid-19, collapsed during training and died of heart attack. Ojo was 27 years old and did not have any heart ailment earlier. Instances like these raise questions whether Covid-19 can affect the heart. Shedding some light on this topic, a paper by American cardiologist Eric Topol, published on sciencemag.org, claimed cardiac complications have occurred even in cases where Covid-19 symptoms were minimum or not present at all.

“The most recent coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has marked tropism for the heart and can lead to myocarditis (inflammation of the heart), necrosis of its cells, mimicking of a heart attack, arrhythmias, and acute or protracted heart failure (muscle dysfunction),” the paper said.

“These complications, which at times are the only features of coronavirus disease 2019 (Covid-19) clinical presentation, have occurred even in cases with mild symptoms and in people who did not experience any symptoms. Recent findings of heart involvement in young athletes, including sudden death, have raised concerns about the current limits of our knowledge and potentially high risk and occult prevalence of Covid-19 heart manifestations,” it said.

The paper said in contrast to people without symptoms, there is a substantial proportion of people who suffer a longstanding, often debilitating illness, called long-Covid. Typical symptoms include fatigue, difficulty in breathing, chest pain, and abnormal heart rhythm. .

“Once recognised a few months into the pandemic, the expectation was that cardiac involvement would chiefly occur in patients with severe Covid-19. Clearly, it is more common than anticipated, but the true incidence is unknown. It is vital to determine what drives this pathogenesis. Whether it represents an individual’s inflammatory response, an autoimmune phenomenon, or some other explanation needs to be clarified,” the paper said.

<https://www.hindustantimes.com/world-news/can-covid-19-affect-the-heart-likely-says-study/story-A8FHB5NJPd0r0L8CPmhZrN.html>



Medical technicians work at a drive-through coronavirus disease (COVID-19) testing facility in New York. (REUTERS)

