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India's anti-tank guided missile 'Dhruvastra' successfully test-fired

Developed by DRDO, the missile meant to be launched from a helicopter was flight-tested from a static launcher positioned at Integrated Test Range (ITR) under simulated conditions on July 15 and 16

By Hemant Kumar Rout

Bhubaneswar: Amid the COVID-19 pandemic, India successfully conducted two rounds of helicopter-launched Nag missile (HeliNa), renamed as Dhruvastra from a defence base off Odisha coast in compliance with coronavirus safety protocols.

Developed by Defence Research and Development Organisation (DRDO), the anti-tank guided missile meant to be launched from a helicopter was flight-tested from a static launcher positioned at Integrated Test Range (ITR) under simulated conditions on July 15 and 16.

HeliNa has been named after the Advanced Light Helicopter (ALH) Dhruv, which will be equipped with the missile. Fitted with imaging Infra-Red seeker, Dhruvastra operates in 'lock-on before launch mode'.

A defence official said the missile was test-fired from a ground-based launcher as a mandatory requirement with respect to safety. "The mission was successful. The test proved that the system has become more stable. The missile would soon be tested from the ALH after a couple of more trials from the ground-based launcher," he said.

Dhruvastra can be fired in two different modes - direct attack and top attack. Eight missiles can be integrated with the helicopter with four twin launchers specially designed for the weapon. Several trials of the third generation missile that operates on 'fire and forget' principle have been conducted from both the ITR and Pokhran firing ranges.

The missile can be launched from twin-tube stub wing-mounted launchers on board the armed light combat helicopters and advanced light helicopters. While Nag missile has a maximum range of 4 km, the HeliNa has an extended strike range of about 8 km.

ITR Director BK Das said since the tests were conducted amid the pandemic, extreme precautionary measures, including social distancing, sanitisation of all facilities, use of masks, shields and personal protective suits, were adopted.

"The activities were carried out in a noble method reinstating confidence among all that these kinds of activities can also be carried out under such testing conditions. All experts involved in the



Dhruvastra missile being test-fired at a defence base off Odisha coast (Photo | EPS)

mission were in isolation and the electronic medium was used to the full extent not to affect the review by maintaining all norms," he added.

<https://www.newindianexpress.com/nation/2020/jul/22/indias-anti-tank-guided-missile-dhruvastra-successfully-test-fired-2173337.html>

THE ECONOMIC TIMES

Thu, 23 July 2020

India's indigenously developed anti-tank guided missile 'Dhruvastra' test-fired

Synopsis

India has successfully conducted three flight tests of its indigenously developed anti-tank guided missile 'Dhruvastra' from the Integrated Test Range at Chandipur in Odisha, defence sources said on Wednesday.

India has successfully conducted three flight tests of its indigenously developed anti-tank guided missile 'Dhruvastra' from the Integrated Test Range at Chandipur in Odisha, defence sources said on Wednesday. Developed by the Defence Research and Development Organisation (DRDO), the helicopter-launched anti-tank guided missile (ATGM) is one of the most advanced anti-tank weapons in the world.

The sophisticated missile was test-fired twice on July 15 and once on July 16 from the Integrated Test Range (ITR) as part of the developmental trials conducted by DRDO, they said.

All the three developmental trials of the state-of-the-art anti-tank guided missile, carried out in a direct and top attack mode, were successful and the data was being analysed, they said. It was ground tested from a launcher to evaluate some of its major parameters, the sources said. Dhruvastra is the helicopter version of 'Nag Helina' with several new features and meant to be fired from air to destroy enemy bunkers, armoured vehicles and main battle tanks.

During the trial, the weapon system released smoothly from the ground launch platform at launch pad-3 of the ITR, and the missile successfully tracked the target all through its course before hitting it with high precision, they said.

The ATGM is guided by an infrared imaging seeker (IIS) operating in the lock-on before-launch mode and helps in further strengthening the defence capabilities of the country. All parameters of the flight test have been monitored by telemetry stations, tracking systems and helicopters deployed by the Army, the sources said.

Three round trials of Helina were conducted on July 13, 2015, at a firing range at Jaisalmer in Rajasthan. Again on August 19, 2018, Helina was successfully test-fired from a Rudra helicopter at Pokhran test range. The ground-based Nag missile was also successfully tested 12 times between July 7 and 18, 2019, under extreme weather conditions during day and night successfully, the DRDO sources said.

<https://economictimes.indiatimes.com/news/defence/indias-indigenously-developed-anti-tank-guided-missile-dhruvastra-test-fired/articleshow/77112971.cms>



Dhruvastra: DRDO test fires ‘made in India’ anti-tank guided Nag missile

*The trials were carried out in direct and top attack mode on July 15-16.
Trials were done without helicopter at Interim Test Range, Balasore, Odisha*

By Huma Siddiqui

In the wake of ongoing border tensions between India and China, Defence Research and Development Organisation conducts flight trials of the anti-tank guided Nag Missile (HELINA), which has been named now as Dhruvastra. The trials were carried out in direct and top attack mode on July 15-16. Trials were done without helicopter at Interim Test Range, Balasore, Odisha.

More about NAG

This is categorized as the third-generation, fire-and-forget, anti-tank guided missile. And is meant to support both the air borne forces of the Indian Army as well as the Mechanised infantry.

It has been designed such that it can be launched from land and air-based platforms.

According to informed sources the land version of this missile is already available for integration the Nag missile carrier (NAMICA). This has been derived from a BMP-2 infantry combat vehicle, which is currently deployed in Ladakh region.

The missile in the helicopter-launched configuration has been designated as Helicopter-launched NAG (HELINA). Once the trials are over successfully, this can be fired from the indigenous ‘Dhruv’ Advanced Light Helicopter (ALH), as well as Rudra (ALH WSI) attack helicopter. Both these helicopters are made in India by the Hindustan Aeronautics Limited (HAL).

What is there in this missile?

Possessing high single-shot hit probability, the missile has an advanced passive homing guidance system.

It has been designed such that it has the capability to destroy the new age Main Battle Tanks and other heavy armoured vehicles.

DRDO has developed this missile under the Integrated Guided Missile Development Programme (IGMDP). Under IGMDP other missiles which have been developed include — Agni, Akash, Trishul and Prithvi.

Bharat Dynamics (BDL) has produced imaging infrared seekers for the weapon.

When the NAG was first tested?

While the very first test of NAG was done in 1990, the launch of the missile from a tube in programmed control mode was performed at the ITR in 2001.

In 2015, tests on the HELINA were carried out at the Chandan Firing Range located in Rajasthan. This was followed up by a successful test with a modified seeker which destroyed a thermal target system (TTS) at a range of 4km, in 2016.

More about the design and other features

It has top attack capability and is immune to countermeasures and the airframe has been built with lightweight and high-strength composite materials.

It comes equipped with four wings which are foldable and have a length of 1.85m, with a diameter of 0.20m.

The wing span is 0.4m and weighs 43kg.

There is a real time image processor and has fast and efficient algorithms which provide automatic target detection and tracking capabilities.

While the range of the land version is 4km, the HELINA can reach up to 7km in Lock On Before Launch (LOBL) mode. Eight missiles can be attached to the Helicopter with the help of 4 twin launchers.

HELINA can be fired in two modes i.e. Direct and Top attack. With a warhead penetration capability of 800 mm, the missile can defeat futuristic armour as well, thereby inflicting maximum damage to the tank and crippling its crew. The fire and forget capability has been imparted by an indigenously developed Imaging Infra Red seeker.

The project is currently in advanced development stage. Safe separation, full range controllability & LOBL guidance performance have been successfully proven from ALH platform in standalone mode configuration.

Missile Specifications

Length : 1.9 m

Weight : 45 kg

Diameter : 0.16 m

Missile Speed : 240 m/s

Range : 500 m to 7 km

SSKP : >80%

<https://www.financialexpress.com/defence/dhruvastra-drdo-test-fires-made-in-india-anti-tank-guided-nag-missile/2031568/>

DESIDOC

INDIA TODAY celebrating 50 years

Thu, 23 July 2020

India test fires helicopter-launched anti-tank 'Nag' missile in Odisha

The flight trials of Dhruvastra were conducted on July 15 and 16 at Integrated Test Range (ITR) Balasore in Odisha

India conducted successful trials of the helicopter-launched Nag missile (Helina), now named Dhruvastra anti-tank guided missile, in direct and top attack mode.

The flight trials were conducted on July 15 and 16 at Integrated Test Range (ITR) Balasore in Odisha.

The Nag missile has been developed to engage highly fortified enemy tanks in all weather conditions with day and night capabilities and with a minimum range of 500m and maximum range of 4 km.

It is a third-generation fire-and-forget-class missile and uses an imaging infrared seeker in lock-on-before-launch mode.

The missile is launched from the Nag missile carrier which is capable of carrying up to six combat missiles.

The robust imaging algorithm has made the missile hit the target at a distance of 4 km even in severe summer desert conditions which is unique in its class.

<https://www.indiatoday.in/india/story/india-test-fires-helicopter-launched-anti-tank-nag-missile-in-odisha-watch-video-1703146-2020-07-22>



The NAG missile has been developed to engage highly fortified enemy tanks in all weather conditions. (Photo: Twitter)

Dhruvastra, India's anti-tank guided missile, test-fired successfully in Odisha

The flight trial of India's anti-tank guided missile 'Dhruvastra' were successfully conducted at the Interim Test Range (ITR) in Odisha recently. According to reports, the trials of the helicopter-launched Nag Missile (HELINA), which has now been named as Dhruvastra anti-tank guided missile, were conducted in direct and top attack mode on July 15 and 16

Edited By Ritesh Kumar Srivastava

Highlights

- *Dhruvastra is India's anti-tank guided missile*
- *It has been designed and developed by the DRDO*
- *It was test-fired successfully in Odisha recently*
- *The HELINA missile can engage targets both in the direct hit mode as well as top attack mode*

Balasore: The flight trials of India's anti-tank guided missile 'Dhruvastra' were successfully conducted at the Interim Test Range (ITR) in Odisha recently.

According to reports, the trials of the helicopter-launched Nag Missile (HELINA), which has now been named as 'Dhruvastra' anti-tank guided missile, were conducted in direct and top attack mode on July 15 and 16.

The trial was conducted without a helicopter.

HELINA is a third-generation fire and forget class anti-tank guided missile (ATGM) system mounted on the Advanced Light Helicopter (ALH). The system has all-weather day and night capability and can defeat battle tanks with conventional armour as well as explosive reactive armour.

The HELINA missile can engage targets both in the direct hit mode as well as top attack mode.

Defence Research and Development Organisation (DRDO) last year carried out three successful test firings of the NAG missiles in the Pokhran firing ranges.

It was done after the Defence Acquisition Council approved the procurement of DRDO-designed and developed NAG Missile System (NAMIS) at the cost of Rs 524 crore.

The system includes a third generation Anti-Tank Guided Missile, the NAG, along with the Missile Carrier Vehicle (NAMICA).

The successful induction of the NAG missile into the Indian Army is expected to give a quantum boost to the Army's capability against enemy armour.

<https://zeenews.india.com/india/dhruvastra-indias-anti-tank-guided-missile-test-fired-successfully-in-odisha-watch-2297483.html>



स्वदेशी 'ध्रुवास्त्र' मिसाइल जानिए क्यों है अन्य मिसाइलों से खास!

नई दिल्ली: भारतीय सेना को एक धमाकेदार मेक इन इंडिया मिसाइल मिली है। इस एंटी टैंक मिसाइल का नाम 'ध्रुवास्त्र' रखा गया है। सेना इसे ध्रुव हेलिकॉप्टर में इस्तेमाल करेगी। यह मिसाइल और हेलिकॉप्टर पूरी तरह से स्वदेशी हैं। अब इस काम के लिए भारत को किसी अन्य देश पर निर्भर रहने की आवश्यकता नहीं है।

ध्रुवास्त्र को किया विकसित

बता दें यह मिसाइल 4 कि.मी. दूर तक दुश्मन को सबक सिखा सकती है। जंग में इस मिसाइल का उपयोग दुश्मनों के टैंक को तबाह करने के लिए किया जा सकता है। बता दें इस मिसाइल का नाम नाग रखा गया था, जिसे बाद में बदलकर 'ध्रुवास्त्र' कर दिया गया।



ओडिशा में हुआ परीक्षण

इस मिसाइल का परीक्षण हाल में कुछ दिनों पहले ओडिशा के बालसोर इलाके में किया गया था। इस मिसाइल का अच्छी तरह परीक्षण के बाद अब निर्णय लिया गया है कि इसे सेना को सौंप दिया जाएगा। इस मिसाइल को डीआरडीओ और सेना ने मिलकर तैयार किया है।

DRDO स्वदेशी मिसाइल बनाने में लगा हुआ है

बता दें चीन के तनाव के दौरान इस मिसाइल को तैयार होना भारत के लिए अच्छी खबर है। DRDO अब स्वदेशी मिसाइलों को बनाने में लगा हुआ है। ताकि भारत को विषम परिस्थितियों में किसी अन्य देश पर निर्भर न होना पड़े।

<https://www.navodayatimes.in/news/khabre/anti-tank-missile-dhruvastra-drdo-helicopter-launched-nag-missile-sobhnt/152715/>

ज्ञान प्रसार एवम् विस्तार
के 50 वर्ष

Eyes in the sky: DRDO's Bharat drones to boost army's surveillance missions over Chinese activities along LAC

The drone 'Bharat' also provides real-time video transmission during the mission and can detect humans hidden under deep forest covers

The Defence Research and Development Organisation (DRDO) has provided indigenously-developed drones called 'Bharat' to the Indian Army amid the ongoing boundary tensions at LAC between India and China.

The drones are sent in order to conduct accurate surveillance along the Line of Actual Control in high altitude and mountainous terrains of Eastern Ladakh, ANI quoted defence sources as saying.

The unmanned aerial vehicle (UAV), Bharat, has been developed by Chandigarh-based laboratory of the DRDO.

Projected to be among 'world's most agile and lightest surveillance systems', the drone has been developed indigenously by the DRDO.

The "small yet powerful drone works autonomously at any location with great accuracy. The unibody biomimetic design with advance release technology is a potent combination for surveillance missions", according to DRDO sources.

The UAV was made in a way to ensure its survival in extreme cold weather temperatures.

With transgression by the Chinese troops along the LAC as the major challenge, the drone also provides real-time video transmission during the mission and can detect humans hidden under deep forest covers.

It has been equipped with advanced night vision capabilities and its stealthy design ensures that its signature remains undetected from enemy radars.

It is gaining a lot of popularity because it can operate in swarm operations, sources said.

"The drone is capable of providing real-time video feed as well as still images to its operators and its controlling software has built-in artificial intelligence tools for analysis and decision-making," *Tribune* quoted a senior DRDO as saying.

"Besides the armed forces, it also has the potential for being used by the Central Armed Police Forces and law enforcement agencies," he said.

Bharat has been designed entirely by DRDO's Terminal Ballistics Research Laboratory (TBRL), which is involved in development, production, processing and characterisation of different high-explosive compositions, fragmentation studies of warheads, captive flight testing of bombs, missiles and airborne systems and ballistics evaluation of protective systems like body armour, vehicle armour and helmets.

Meanwhile, as the tensions between the two countries grew, the Indian Army has deployed six T-90 Bhishma missile-firing tanks and top-of-the-line shoulder-fired anti-tank missile systems in the Galwan Valley sector in June.

Considered as the main battle tank for the Indian Army, it has a capability to deal with chemical and biological weapons and can fire 8 shells in 60 seconds. *With inputs from ANI*

<https://www.firstpost.com/india/eyes-in-the-sky-drdos-bharat-drones-to-boost-armys-surveillance-missions-over-chinese-activities-along-lac-8626321.html>





Thu, 23 July 2020

Indian Army's Made-In-India 'Bharat' Drones from DRDO for Ladakh Border Surveillance

By Sarthak Dogra

Highlights

- **Indian Army has acquired high-altitude drones named 'Bharat' from DRDO in order to increase its surveillance capabilities in mountainous terrain**
- **As per the DRDO sources, the drones are small in size yet powerful. "They can work autonomously at any location with great accuracy," the report says**
- **Bharat drone is even equipped with artificial intelligence (AI) to distinguish between friends and enemies and take action accordingly**

Indian Army has acquired high-altitude drones named 'Bharat' from DRDO in order to increase its surveillance capabilities in mountainous terrain.

The development comes amid an ongoing border dispute between India and China along the Line of Actual Control in Eastern Ladakh.

Citing defence sources, a recent report by ANI mentions that the drones are required by Indian Army for "accurate surveillance in the ongoing dispute in the Eastern Ladakh area."

The indigenously-developed drone by Defence Research and Development Organisation has been made by a Chandigarh-based DRDO laboratory. The Bharat series of drones have been defined to be "World's most agile and lightest Surveillance drone. Indigenously developed by the DRDO."

Bharat Drone: Features and abilities

As per the DRDO sources, the drones are small in size yet powerful. "They can work autonomously at any location with great accuracy," the report says.

The drones sport a unibody design and feature an "advance release technology" making it a "lethal combination for surveillance missions".

Bharat drone is even equipped with artificial intelligence (AI) to distinguish between friends and enemies and take action accordingly.

The drone has even been hailed for its capability to survive in extreme cold weather temperatures as well as operate in swarm operations. It is further being worked upon for surviving even harsher weather.

Once in the air, Bharat drone is able to provide real-time video transmission even during the night. Sources say that the drone is able to detect humans hidden in deep forests but conceals itself from any radar, making it undetectable.

Bharat drone for border protection

The acquisition of drones by the Indian Army is in wake of the recent Chinese aggression along the LAC. As a response measure, the defence ministry even enhanced the financial powers of military generals to ensure the quicker acquisition of critical military hardware, as per a report by TOI.

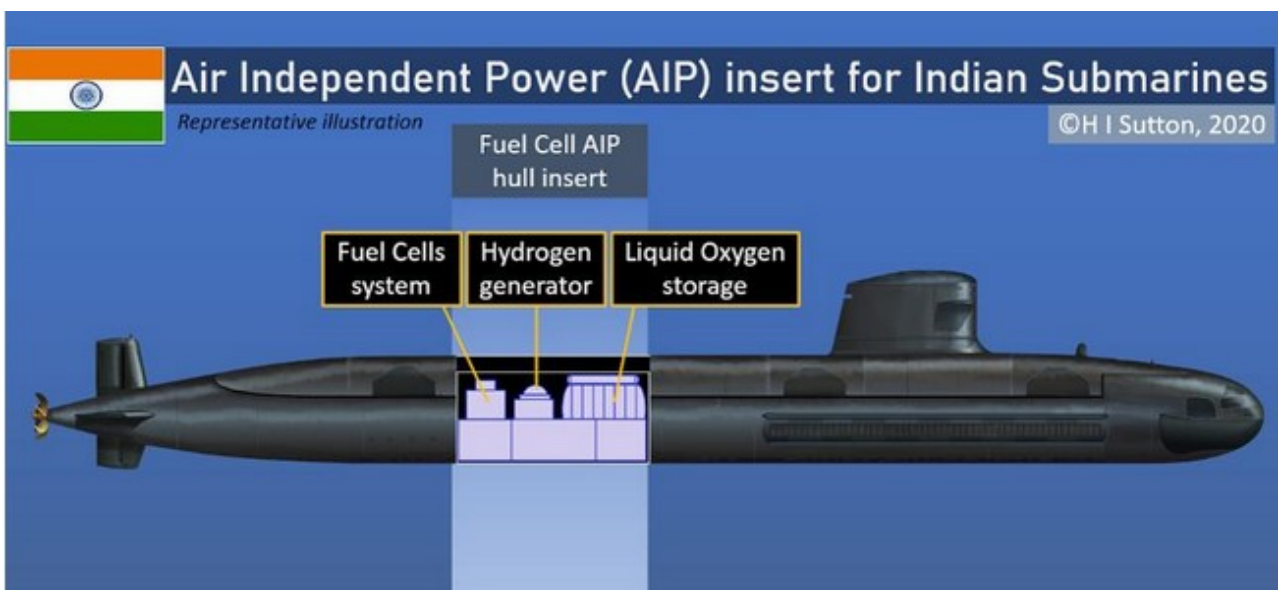
The acquisition of the drones are seen to be a part of the same, forming a crucial front on the face-off between the armies of the two neighbouring nations. *(With inputs from ANI)*

https://www.indiatimes.com/technology/news/indian-army-bharat-drone-drdo-518511.html#highlight_13192

AIP submarines will increase the lethality of the Indian Navy

By H I Sutton

Unlike its potential adversaries China and Pakistan, India has yet to adopt Air Independent Power (AIP) for its submarines. Also known as Air Independent *Propulsion*, this technology allows a non-nuclear submarine to operate for longer without having to surface. This makes it harder to detect and allows it to patrol in high-risk areas for longer.



The fuel cell AIP (Air independent Power) system developed by DRDO and Larsen & Toubro would lengthen the hull of the submarine

But AIP is coming to Indian submarines. The current Kalvari class boats are expected to receive an Indian-made system. This should greatly increase the potency of India's non-nuclear submarines.

Indian engineers have been working on an indigenous AIP system. Engineering firm Larsen & Toubro has built and tested a prototype system that fits inside the Kalvari's hull. The company is also involved in India's indigenous nuclear-powered submarine.

According to people familiar with the situation, the plan is for each of the Kalvari class submarines to be retrofitted with the indigenous AIP. This should happen six to seven years after commissioning. It would be mounted in a hull extension that is inserted between the crew area and the engine space. The locally designed system is expected to extend the endurance of the submarines by two weeks.

India will operate six of the Kalvari class, which are the newest non-nuclear submarines in the Indian fleet. They are a version of the French-designed Scorpène type submarines. In the French lineage these are a generation newer than the Agosta Class boats in service with neighboring Pakistan.

Some of Pakistan's Agostas already have AIP, which for the moment may confer some advantages to them. Unlike the Indian subs, which will use fuel cells, the Pakistan Navy submarines use the MESMA (*Module d'Energie Sous-Marine Autonome*) system. This burns ethanol with stored oxygen to produce steam, which turns a turbine similar to a nuclear power plant.

Pakistan is buying eight Type 093B submarines from China that will come with another type of AIP called a Stirling generator, which uses a closed-cycle diesel engine. These are essentially the same as China's own AIP submarines, 17 of which are believed to be in service. The Stirling generator is famous because of the Swedish Navy's use, and it is also the type used by Japan.

Submarine warfare expert Aaron Amick, author of the Sub Brief podcast, believes that AIP will give the Indian Navy strategy advantages over the current non-nuclear submarines. He says that it will "force their closest rival, Pakistan, to be more vigilant over a wider area. Improving their Scorpene submarines with AIP will balance India with Pakistan's new Type 093B Chinese subs that are due in 2023."

In Amick's view AIP is "essential in the 21st century, open water battle space. Submarines only get one chance to attack from stealth and AIP gives them the best opportunity for success."

The Indian project will take years to put in place. For some time Pakistan's AIP submarines will continue to out-number India's. But the indigenous fuel cell technology will allow India to increase the usefulness of their conventional submarines. Add to this India's nuclear-powered submarines and the Indian Navy should be able to retain a competitive edge. And India's next generation Project-75I boats will get AIP from the get-go.

The big unknown is whether China will establish an Indian Ocean submarine squadron. That could further complicate the picture.

<https://www.forbes.com/sites/hisutton/2020/07/22/aip-submarines-will-increase-the-lethality-of-the-indian-navy/#52358e9641c7>

Defence News

Defence Strategic: National/International

ThePrint

Thu, 23 July 2020

India prepares for 'collusive' threat from China & Pakistan, Rajnath asks forces to be ready

Defence Minister Rajnath Singh has asked the armed forces to be prepared to respond at a short notice as well as build & sustain military capabilities to deter any adversary

By Snehash Alex Philip

New Delhi: The Indian armed forces have taken into account a possible collusive threat from China and Pakistan and, therefore, the Army, Navy and the Air Force have taken steps on both the fronts amid tensions at the Line of Actual Control (LAC) in Ladakh, ThePrint has learnt.

The efforts are being driven jointly by coordination between the three services, sources in the defence and security establishment said.

Defence Minister Rajnath Singh Wednesday addressed top IAF commanders at the Air Force Headquarters and alluded to the ongoing efforts for de-escalation at the LAC and urged the IAF to "stand ready to handle any eventuality", a statement from the IAF said.

Complimenting the IAF commanders for maintaining the highest levels of readiness and responding proactively to the "multitude" of challenges emanating from across the borders, Singh

said “rapid deployment of IAF assets at forward locations in response to the prevailing situation in Eastern Ladakh has sent a strong message to the adversaries”.

Meanwhile, sources told ThePrint that the defence minister has asked the armed forces to be prepared to respond at a short notice as well as build and sustain military capabilities to deter any adversary in the long run.

In his address to the IAF commanders, Singh also said that defence forces, in general, and the IAF, in particular, have displayed a high level of operational preparedness.

“I have no doubt in my mind that all collusive designs of the adversarial forces would be responded with full vigour and force,” a source quoted him as saying.

Sources explained that even as the LAC dispute in Ladakh has heated up, steps have been taken to counter any possible action by Pakistan along the Line of Control (LoC) or the International Border (IB).

They said that Pakistan’s silence has been particularly surprising because they have not heated up the LoC as expected and nor have any large-scale movements taken place.

ThePrint on 20 June reported that the reason why the Army is being cautious about the disengagement with China in Ladakh is because it feels Beijing could drag the whole process through the winter and use the distraction to make mischief elsewhere, possibly in the Northeast.

“The fear is that, while China will force us to stay engaged in Ladakh, it might do something in another sector, possibly along Arunachal Pradesh. This could be coupled with pressure along the Line of Control by Pakistan,” a source had said.

Steps taken by armed forces against collusive threat

Sources said the three services have taken a number of steps along the Western front with Pakistan, and Northern and Eastern fronts with China.

Refusing to get into specific details, the source pointed out that the IAF has brought its fighters from other bases to the ones near Ladakh to focus on the northern front.

They added that half a squadron of naval fighter jets — MiG29K — have been brought to some of the IAF bases from Goa, where they are otherwise located.

These aircraft have been based in such a manner that they can cater to any threat from Pakistan as well as support the ones deployed in Ladakh.

The IAF has also sent its maritime strike variant of Jaguar fighters to the Car Nicobar Air Base under the Andaman and Nicobar Command (ANC) as part of the preparedness.

From this Command, the Navy has the ability to dominate the Malacca Strait, which is heavily used by Chinese commercial vessels to move goods, including oil.

The Navy, too, has deployed a greater number of vessels and submarines in the Indian Ocean region, including the indigenous nuclear submarine Arihant and aircraft carrier Vikramaditya.

The Army, on its part, has been carrying out a detailed response to the threat along all the fronts.

“The steps taken by the forces take into account all possible scenarios and operational needs for defensive as well as offensive needs,” a second source said.

‘Prepared to counter short term & strategic threats’

Meanwhile, IAF chief Air Chief Marshal R.K.S. Bhaduria said the force is well prepared to counter short-term as well as strategic threats, and the units were evenly poised to counter any aggressive action by the adversary.

He noted that the response by all Commands in ensuring deployment and readiness of forces was prompt and laudable. He emphasised on the need to focus on the ability to handle situations at a short notice for ensuring a robust response.

<https://theprint.in/defence/india-prepares-for-collusive-threat-from-china-pakistan-rajnath-asks-forces-to-be-ready/466071/>



Defence Minister Rajnath Singh with special forces personnel in Ladakh last week (representational image) | By special arrangement

IAF airstrikes in Balakot, swift response in Ladakh sent strong message to India's adversaries: Rajnath Singh

In a strong message to China, IAF has been carrying out night time combat air patrols over the eastern Ladakh region

Key Highlights

- **Rajnath Singh complimented IAF for conducting the airstrikes in Balakot in a "professional manner"**
- **IAF well prepared to counter short term as well as strategic threats: Air Force Chief RKS Bhadauria**
- **IAF has deployed almost all its frontline fighter jets in key frontier air bases in eastern Ladakh and other areas**

New Delhi: Amid the disengagement process between India and China in Ladakh, Defence Minister Rajnath Singh on Wednesday addressed the top commanders of the Indian Air Force (IAF), and praised the IAF for the 'professional' airstrikes on Pakistan-based Jaish-e-Mohammed's terror launch pad in Balakot and rapid deployment of military assets at the forward locations in response to the prevailing situation in eastern Ladakh. Singh asserted that IAF's actions have sent a strong message to India's adversaries.

"He stated that the professional manner in which IAF conducted the airstrikes in Balakot as well as rapid deployment of IAF assets at forward locations in response to the prevailing situation in eastern Ladakh has sent a strong message to the adversaries," the defence ministry said in a release.

In the address to Air Force Commanders, Singh appreciated the proactive response by the IAF in bolstering its operational capabilities over the past few months.

While mentioning the disengagement process to de-escalate tension along the LAC, Singh 'urged the IAF to stand ready to handle any eventuality'.

Addressing the inaugural session of the Air Force Commander's Conference, Singh said, "IAF's role in some of the most challenging circumstances is well regarded by the nation. Their contribution during the nation's response to COVID-19 pandemic has been highly praiseworthy."

Meanwhile, addressing his commanders, Air Force Chief RKS Bhadauria said, the IAF was well prepared to counter short term as well as strategic threats, and the units were evenly poised to counter any aggressive action by the adversary.

The IAF chief said the response by all Commands in ensuring deployment and readiness of forces was prompt and laudable. He emphasised on the need to focus on the ability to handle situations at a short notice for ensuring a robust response.

In its 3-day meet, the IAF top brass is expected to deliberate on ways to enhance the air force's prowess along the de-facto border with China including in Arunachal Pradesh, Sikkim and Uttarakhand, sources said.

The high-level meeting is also expected to discuss the deployment of the first batch of Rafale fighter jets in the Ladakh sector. Notably, at least six of 36 Rafale fighter aircraft are likely to join the IAF by July-end.

The meet will discuss in detail the country's air defence system and also carry out an in-depth review of it.

"The commanders will also review the evolving security architecture in the region and ways to boost IAF's combat capability," PTI quoted a source as saying.

In a strong message to China, IAF has been carrying out night time combat air patrols over the eastern Ladakh region. IAF has deployed Sukhoi 30 MKI fighter jets, Jaguar and Mirage 2000 aircraft in key frontier air bases in the eastern region to challenge any Chinese aggression.

Besides deploying Apache attack choppers, the IAF has also pressed into service a fleet of Chinook heavy-lift helicopters C-17 Globemaster III transport aircraft and C-130J Super Hercules to ensure quick delivery of military equipment to forward bases.

Meanwhile, reports have emerged that Indian Navy's MiG-29K fighter jets will be deployed in the northern sectors along the LAC.

Indian and Chinese armies have been locked in a bitter border standoff in eastern Ladakh since early May this year. The tension between the two nuclear-powered nations escalated after the deadly Galwan clash in which the Indian Army lost its 20 brave soldiers.

In an attempt to mend the relations amid the heightened tension due to the border buildup along the LAC by both the countries, National Security Advisor Ajit Doval and Chinese State Councillor and Minister of Foreign Affairs Wang Yi had a telephonic conversation on July 5. Both the leaders agreed "maintenance of peace and tranquillity in the India-China border areas was essential for the further development of bilateral relations" between the two nations.

Following the talks, China and India started the disengagement process in the first step towards de-escalation of border tensions.

<https://www.timesnownews.com/india/article/indian-air-force-iaf-meet-rafale-fighter-jets-india-china-border-ladakh-rks-bhadauria/625214>



Thu, 23 July 2020

Air Force well prepared to counter short term and strategic threats: IAF Chief RKS Bhadauria

Air Force Chief RKS Bhadauria said that IAF was well prepared to counter short term as well as strategic threats, and the units were evenly poised to counter any aggressive action by the adversary

Edited By Arun Kumar Chaubey

Highlights

- *Air Force Chief said the units were evenly poised to counter any aggressive action by the adversary while addressing Air Force Commander's Conference*
- *He said the response by all Commands in ensuring deployment and readiness of forces was prompt and laudable*
- *Bhadauria, however, emphasized upon the need to focus on the ability to handle situations at a short notice for ensuring a robust response*

New Delhi: Air Force Chief RKS Bhadauria said that Indian Air Force (IAF) was well prepared to counter short term as well as strategic threats, and the units were evenly poised to counter any aggressive action by the adversary.

Addressing Air Force Commander's Conference at Air Headquarters (Vayu Bhawan), Air Force Chief said the response by all Commands in ensuring deployment and readiness of forces was prompt and laudable.

Bhadauria, however, emphasized upon the need to focus on the ability to handle situations at a short notice for ensuring a robust response.



Image courtesy: ANI

The Chief of the Air Staff earlier welcomed Defence Minister Rajnath and other senior officials from the MoD.

The Defence Minister appreciated the proactive response by Indian Air Force in bolstering its operational capabilities over the past few months while addressing the inaugural session of Air Force Commander's Conference.

He said, "IAF's role in some of the most challenging circumstances is well regarded by the nation. Their contribution during nation's response to COVID19 pandemic has been highly praiseworthy."

Rajnath Singh further said that the professional manner in which IAF conducted the airstrikes in Balakot as well as rapid deployment of IAF assets at forward locations in response to the prevailing situation in Eastern Ladakh has sent a strong message to the adversaries.

The Defence Minister also praised the IAF contribution in supporting the nation's response to COVID-19 pandemic and the role played during several HADR missions.

He highlighted the need to achieve self-reliance in defence production and noted that the theme is chosen for this AFCC – 'IAF in the Next Decade' - was very apt for enhancing efforts towards indigenisation in the days to come.

Rajnath Singh lauded the progress made towards enhancing synergy and integration within the three services since the appointment of CDS and creation of DMA.

<https://zeenews.india.com/india/air-force-well-prepared-to-counter-short-term-and-strategic-threats-iaf-chief-rks-bhadauria-2297563.html>



Thu, 23 July 2020

चीन से तनातनी के बीच, 0 से माइनस 50 डिग्री तक में तैनाती के लिए भारतीय वायुसेना की तैयारी

भारतीय वायुसेना ने खुद को लद्दाख के मोर्चे पर लंबे समय तक तैनाती के लिए तैयार करना शुरू कर दिया है। लद्दाख में लेह के अलावा थोड़स एक बड़ा एयरबेस है। इसके अलावा दौलतबेग ओल्डी, फक्चे, चुशूल में एडवांस लैंडिंग ग्राउंड हैं।

कृष्णमोहन मिश्रा

नई दिल्ली: भारतीय वायुसेना (Indian Air Force) ने खुद को लद्दाख के मोर्चे पर लंबे समय तक तैनाती के लिए तैयार करना शुरू कर दिया है। वायुसेना के सामने लद्दाख (Ladakh) की सर्दियों के लिए बहुत बड़े पैमाने पर रसद पहुंचाने की चुनौती के साथ-साथ अपने फाइटर जेट्स और हेलीकॉप्टर्स को तैनात रखने के लिए भी तैयारी करनी होगी। इस साल लाइन ऑफ कंट्रोल पर चीन (China) की तरफ से बड़ी तादाद में सेना तैनात करने के कारण भारतीय सेना ने भी अपनी तैनाती चार से पांच गुना बढ़ाई है। इतनी बड़ी तादाद में सैनिकों के लिए सर्दियों के जरूरी इंतजाम करने के लिए वायुसेना अपने परिवहन एयरक्राफ्ट की पूरी ताकत लगाने की तैयारी कर रही है।

हर साल लद्दाख में तैनात सैनिकों के लिए मई से लेकर सितंबर तक रसद, केरोसिन सहित दूसरी जरूरी चीजें सड़क और एयरक्राफ्ट के जरिए पहुंचाई जाती हैं। लेह स्थित 14 वीं कोर में कुल दो डिवीजन हैं जिनमें से एक पूर्वी लद्दाख की सुरक्षा में तैनात रहती है। लेकिन इस बार केवल पूर्वी लद्दाख में ही अब तक चार गुना सैनिक तैनात किए जा चुके हैं। चीन के रुख को देखते हुए सीमा



विवाद जल्द सुलझने की संभावना नहीं है इसलिए ये तैनाती सर्दियों तक खिंच सकती है। सर्दियों में इन सैनिकों को तैनात रख पाना बहुत मुश्किल होगा जब तापमान शून्य से 50 डिग्री तक नीचे गिर जाता है।

वायुसेना ने मई में चीन के साथ झड़प शुरू होने के साथ ही बड़े पैमाने पर कार्रवाई करते हुए टैंकों, बख्तरबंद गाड़ियों, गोला-बारूद और सैनिकों को लद्दाख पहुंचाया था। लेकिन अब एक नए ऑपरेशन की तैयारी है जिसमें अब तक के सबसे बड़े एयरलिफ्ट को अंजाम दिया जाएगा।

वायुसेना ने लद्दाख में अपने फाइटर जेट्स, लड़ाकू और परिवहन हेलीकॉप्टर्स को भी तैनात किया है। लद्दाख में लेह के अलावा थोइस एक बड़ा एयरबेस है। इसके अलावा दौलतबेग ओल्डी, फुक्चे, चुशूल में एडवांस लैंडिंग ग्राउंड हैं। अगर वायुसेना को सर्दियों में भी यहां अपने लड़ाकू हेलीकॉप्टर तैनात करने होंगे तो बड़े पैमाने पर इंफ्रास्ट्रक्चर का इंतजाम करना पड़ेगा। इसमें मशीन के साथ-साथ तैनात होने वाले वायुसैनिकों के लिए जरूरी सुविधाएं जुटानी पड़ेंगी। दिल्ली में 22 जुलाई से शुरू हुई तीन दिन की वायुसेना कमांडर्स कॉन्फ्रेंस में वायुसेना के टॉप कमांडर इन सारी योजनाओं पर विस्तार से चर्चा कर रहे हैं।

<https://zeenews.india.com/hindi/india/india-airforce-in-ladakh-lac-amid-stand-off-with-china/715995>

THE FINANCIAL EXPRESS

Thu, 23 July 2020

Long haul for Indian Army at the LAC and LOC : Here's why fuel cells are viable option for power, fuel needs

Once the glare of the media and many articulate strategic pundits shifts from the Galwan Valley in Ladakh, to more juicy topics, the Indian army would still be there in larger numbers doggedly doing their duty in harsh conditions, resolutely weathering the elements, in subzero temperatures with limited infrastructure

By Lt Gen Sudhir Sharma

Once the glare of the media and many articulate strategic pundits shifts from the Galwan Valley in Ladakh, to more juicy topics, the Indian army would still be there in larger numbers doggedly doing their duty in harsh conditions, resolutely weathering the elements, in subzero temperatures with limited infrastructure. The casualties suffered and many lessons learnt, and *re-learned* the hard way, has changed the deployment paradigm across the entire India China border for a long time! Henceforth a much higher level of year-round deployment and combat readiness will be the new normal. So, from Siachen, Kargil to Arunachal Pradesh things may have gotten even tougher for the Indian Army. But as the old saying goes, *'when the going gets tough the tough get going'*. However, it is imperative for us to ensure that our brave troops facing the odds are well fed, well-armed and ready in body and spirit and not wanting for anything which will stand in their way to victory. In this context I can with considerable experience of the region, confidently say that meeting the power and energy needs, including Fuel for the Army and allied forces like the ITBP and Border Roads in this rugged, icy cold and inhospitable terrain, is indeed the *sine qua non* for success.



A file photo of Zojila pass that is situated at an altitude of 11,578 feet on the Srinagar-Kargil-Leh National Highway |Photo Credit: PTI

Despite the ongoing negotiations with the Chinese which have made some progress with the commencement of gradual disengagement, India may not and should not pull back from its traditional and operationally relevant forward deployment posture along its Northern and Eastern borders. Pakistan in sync with

China can no doubt be expected to continue its mischief on the LOC to try and stretch the Indian Army on two fronts. Due to the extended borders the Indian Army has a very large number of posts running into hundreds which run the risk of being cutoff-in severe winter months along our Northern borders. It takes a colossal effort (by air, road, ponies & porters) to pre stock and maintain these positions for the winter at an extremely high cost to men, machines and the exchequer.

This new challenge due to the enhanced deployment will also need additional habitat, winter clothing, rations, fuel and equipment to last the winters. This calls for a major logistical effort at a heavy additional cost not only in finances but also in the physical implementation of the complete supply chain and efficient inventory management.

Assured, autonomous, manpack, redeployable and reliable 'Power' is a major challenge high up in the mountains, which is further accentuated due to the extreme cold climate. My experience in dealing with this has been that we often give this a lower than desired priority, this impacts operational efficiency. In the modern and digital all-weather day and night battle field the energy needs are only going to increase. The Army, Border Roads and ITBP camps also need assured power for:

- Basic Field electrification of the military posts/ camps (for lighting, basic amenities, computing systems etc.)
- Battery Charging (of Surveillance Systems, Vehicles, Earth Moving Equipment, Communication Devices, Sensors etc.).
- Power for Special Forces Operations, Long Range Patrols, Observation Posts

Grid power is almost nonexistent at the forward military posts. Solar power cannot be depended upon due to frequent cloud cover and it requires large surface area to install. Small windmills have also not been found to be very effective or reliable. The only source of power that sustains the armed forces is the cheap and readily available diesel generator sets (DG SETS). A closer analysis of these devices brings to fore up some facts like an upto 70% drop in power output in High Altitude, very high pollution levels, freezing of Fuel in winters, frequent breakdowns necessitating repairs, very high fuel consumption and an extremely costly supply chain of transportation logistics (By Air, Vehicles, Ponies and Porters). The DG Sets are noisy and highly polluting devices. A large portion of the Himalayas in the higher reaches including the Siachen Glacier are turning into an environmental hotspots but these concerns are being addressed these days with alacrity.

Armies from different countries are adopting Fuel Cells as a source of power for their forces. It is believed that the Indian Army, DRDO and Para Military Forces have also been experimenting and trying out Fuel Cells as an alternate source of power for their remote, off grid, high altitude and winter cut off camps/ posts for a few years now. Multiple field validations carried out by forces over the four years have led to a conviction that the Fuel Cells can be extremely useful in all types of terrain.

Their application has come a very long way since their inception, today they are versatile and cost effective if you compare the life cycle costs objectively. Fuel Cells are of different types and typically use Methanol, Hydrogen, Reformulated Methanol, Solid Oxide as Fuel. The most common and widely used Fuel Cells are

Methanol and Hydrogen based systems and they have their pros & cons. A evaluation and research on Fuel Cells for the Armed & Security Forces suggest that they have the following advantages:-

- Fuel Cells are a 24X7 All Weather – All Terrain Assured Power Source. If needed, Fuel Cells can run non-stop from a few days to a few weeks or more.
- These are much lighter than DG Sets & have very low Fuel consumption rates.
- These are intelligent (provide need-based power with option for remote control cum diagnostics) and easy to use systems.
- Fuel Cells are a Clean Green Energy source.

- They are ideal as a backup power source and work the best in a Hybrid Mode with Solar & wind.
- The freezing point of Methanol is around minus 70 Degrees.
- Methanol is cheaper than Diesel.

In the high altitude mountains with the cold climates the Fuel Cells can be a game changer for the Army and the Para Military Forces due to their reliability, negligible maintenance, extremely low need for Fuel, easily transportable (being so light) thereby leading to substantially reduced need for Fuel (5 to 8 times less). In the same manner the effort and cost in terms of transportation and logistics also goes down leading to huge savings & reduced time for winter stocking.

With so much going for the Fuel Cell the slow pace of introducing them could be due to some of their perceived shortcomings, an incomplete understanding of how to mitigate these and seeing their overall life cycle benefits. Some aspects which need consideration and imaginative solutions are;

While Hydrogen Fuel Cells can belt out high power & are a very clean source of power, but probably what holds back the Defense organisations from taking a call on Hydrogen Fuel Cells is the complex Infrastructure related to Hydrogen Fuel & Its storage cylinders, the safety issues related to transporting, storing & handling Hydrogen and the comparatively higher running cost of Hydrogen. Hydrogen Fuel Cells can be a very good source of power at large static locations having good Infra.

Solid Oxide Fuel Cells generate very high power but they work at temperatures exceeding 800 degrees and need a very complex and elaborate infrastructure set up. They are ideally suited for large complexes that need high amounts of power (> 100 Kilowatts).

Methanol based Fuel Cells cost 8 to 10 times more than the conventional Generator sets. This disadvantage is offset by the low maintenance costs, extremely low operating costs (Methanol is cheaper than Diesel) and fuel consumption rate is 5 to 8 times lesser than similar use conventional generators sets and lastly all this leads to massive savings in the cost of fuel transportation and storage in remote places). Methanol Fuel Cells become cheaper than similar use generator sets in less than two years of a life time when used in high altitude areas, in places supplied by air, it can become cheaper in less than 8 months which is a massive advantage.

With the challenges for India along the Indo-Pak Border high up in the Himalayas increasing substantially this year, this is the right time for the Army, Border Roads, ITBP and SSB to consider Fuel Cells as an alternate source of back up power ensure 24X7 assured reliability and major logistical advantages including savings.

To be a modern, motivated, well armed and well trained army we need to ensure that our forces get the best possible assets to make it a winning war fighting machine. A robust logistical supply chain with a state of the art assured power supply in the form of Fuel Cells would be a step in the right direction as we need to find solutions for reliable power while cutting the massive recurring costs. Jai Hind

(A highly decorated 3 star veteran, the author is retired from the Indian Army as the Quarter Master General. He has commanded an infantry division in the Chamb Sector as also one of the world largest Corps along the LOC in J&K. The author has been India's Defence Advisor in London. He is currently the Chairman of MitKat Advisory Services, a premium international risk management consultancy. Views expressed are personal)

<https://www.financialexpress.com/defence/long-haul-for-indian-army-at-the-lac-and-loc-heres-why-fuel-cells-are-viable-option-for-power-fuel-needs/2031438/>

Thu, 23 July 2020

Disengagement between troops hit dead end in Ladakh; Indian Army prepares for long haul

While some of the troops have been removed by both armies, not much has changed since the initial disengagement. The remaining Indian and Chinese troops remain in close proximity. The Pangong lake and Hot Spring-Gogra area that is part of Patrol Point 17A still remain volatile
By Abhishek Bhalla

New Delhi: The disengagement planned between India and China has hit a roadblock as some of the friction areas still remain volatile with troops from both countries continue to be separated by a few kilometres, more than a week after the roadmap for a complete pullback was drawn out during the Corps Commander level meet on July 14.

While some of the troops have been removed by both armies, not much has changed since the initial disengagement. The remaining Indian and Chinese troops remain in close proximity. The Pangong lake and Hot Spring-Gogra area that is part of Patrol Point 17A still remain volatile.

At the Pangong lake — the biggest flashpoint — the Chinese army did move back from Finger 4 to Finger 5 on the bank, but still remain on the mountain spurs or the ridgeline. The Indian troops are positioned between Finger 3 and Finger 2 on the bank of the lake.

Sources said there are still no signs of the Chinese army dismantling the structures they had set up between Finger 8 and Finger 4.

“The distance between troops from both sides is 4-5 km on the bank of the river but on the mountain ridges of the lake the troops are separated by less than 1 km,” sources said. This situation has not changed for more than a week now.

This shows the disengagement is still not complete at the lake where the Chinese had camped at Finger 4 that was always under Indian control. The Chinese had come in 8km till Finger 4 from Finger 8. India maintains the Line of Actual Control runs through Finger 8.

The mountain spurs jutting into the lake are referred to as Fingers in military parlance.

Other than Pangong lake, the situation remains tense in the Hot Springs area (Patrol Point PP17A) despite thinning of troops. Around 40-50 soldiers are still in close proximity, separated only by 600-800 metres, sources said.

At PP14 in Galwan, where the bloody clash took place on June 15 when 20 Indian soldiers were killed in action, the Chinese have moved back 1.5 km from Line of Actual Control (LAC) and the distance between troops on each side is approximately 3 km.

A full disengagement has still not happened here but sources say there is at least enough distance between the two sides to avoid a physical brawl, similar to the ones that have taken place before.

At PP15, the fourth friction point, the disengagement seems to be complete with Indian and Chinese troops separated by 8-10 km.

The current disengagement was only focused on friction areas. There are no signs de-escalation in depth areas will be worked out as things are still far from normal in the friction areas.



In wake of the recent developments, the Indian Army is preparing for a long haul keeping in mind winter deployment and logistics. (Photo: AP/Representative image)

Planning for long haul

In the wake of the recent developments, the Indian Army is preparing for a long haul keeping in mind winter deployment and logistics.

“A long haul is an understatement. This could now go one for months or years. This is not like Doklam but more serious. Remember the Sumdromg Chu stand-off of 1986 in Arunachal Pradesh took 6-7 years,” said Lt Gen Vinod Bhatia (retd), a former director general military operations.

The Indian Army described the process of disengagement between troops of India and China in Ladakh along the Line of Actual Control as “intricate” that required “constant verification” indicating that the easing of tensions could still be a long way.

Defence Minister Rajnath Singh had indicated that last week when he visited Ladakh and addressed the troops in Lukung near Pangong Lake that the disengagement discussed has not completely transpired on the ground.

<https://www.indiatoday.in/india/story/india-china-disengagement-dead-end-army-prepares-for-long-haul-1703214-2020-07-22>



Thu, 23 July 2020

Defence Ministry signs Rs 557 crore contract with BEML for 1512 mine ploughs for T-90 tanks

In an apparent effort to boost ‘Make in India’ initiative of the Government, the Acquisition Wing of Union Ministry of Defence has signed a contract with Bharat Earth Movers Limited (BEML) for procurement of 1,512 Mine Plough (MP) for Tank T-90 S/SK at an approximate cost of Rs 557 crore

Edited By Tanweer Azam

Highlights

- *The Acquisition Wing of Union Ministry of Defence has signed a contract with BEML for procurement of 1,512 Mine Plough (MP) for Tank T-90 S/SK at an approximate cost of Rs 557 crore.*
- *The contract has Buy and Make (Indian) categorisation with a minimum of 50 per cent indigenous content in make portion of the contract.*
- *These mine ploughs manufactured by BEML will be fitted on T-90 Tanks of Indian Armoured Corps which will facilitate individual mobility to T-90 tanks while negotiating mine field.*

In an apparent effort to boost ‘Make in India’ initiative of the Government, the Acquisition Wing of Union Ministry of Defence has signed a contract with Bharat Earth Movers Limited (BEML) for procurement of 1,512 Mine Plough (MP) for Tank T-90 S/SK at an approximate cost of Rs 557 crore.

The contract, signed after the approval of Union Defence Minister Rajnath Singh, has Buy and Make (Indian) categorisation with a minimum of 50 per cent indigenous content in make portion of the contract.

These mine ploughs manufactured by BEML will be fitted on T-90 Tanks of Indian Armoured Corps which will facilitate individual mobility to T-90 tanks while negotiating mine field. The mine ploughs will also enhance the mobility of tank fleet and it would ultimately extend the reach of Armoured Formation deep into enemy territory without becoming mine causality.



With the induction of these 1,512 mine ploughs, planned to be completed by 2027, the combat capability of the Indian Army will be further enhanced.

It is to be noted that the Russian-origin T-90 main battle tanks were recently deployed by Indian Army in the Galwan Valley sector of Ladakh amid the border dispute with China.

BEML is an Indian Public Sector Undertaking with headquarters in Bengaluru, Karnataka. The company manufactures a variety of heavy equipment, such as that used for earth moving, transport and mining. BEML has manufacturing plants in Kolar Gold Fields, Bengaluru, Mysore and Palakkad.

<https://zeenews.india.com/india/defence-ministry-signs-rs-557-crore-contract-with-beml-for-1512-mine-ploughs-for-t-90-tanks-2297466.html>

THE TIMES OF INDIA

Thu, 23 July 2020

Indian Navy's 2MW solar power plant launched in Mumbai: All you need to know

NEW DELHI: The first 2-MW capacity solar power plant of Indian Navy's Western Naval Command was e- inaugurated at a naval station in Navi Mumbai on Tuesday. Vice Admiral Ajit Kumar, Flag Officer Commanding-in-Chief, Western Naval Command, inaugurated the advanced plant set up on a sprawling area within the station.

Here is all you need to know:

- * Costing around Rs 14 crore, it is 100% indigenous and installed with the help of Indian companies.

- * Vice Admiral Kumar said that the project is a significant step by the Navy towards harnessing solar energy and use of renewable energy for meeting the power requirement of the Naval Station.

- * The 2MW solar plant consists of indigenously developed solar panels, tracking tables and inverters.

- * It is the first 2 MW solar plant of the western command of the Indian Navy and also the largest in the region.

- * With this captive power plant, the Navy hopes to make significant savings of around Rs 3.65 crore per annum in power bills.

- * The solar power plant will cater to nearly one-third of the Karanja Station's annual power needs.

- * Besides the indigenous solar panels and tracking tables & inverters, the plant is also grid-interconnected by a state-of-art single-axis sun-tracking technology with computerised monitoring and control.

(With inputs from agencies)

<https://timesofindia.indiatimes.com/india/indian-navys-2mw-solar-power-plant-launched-in-mumbai-all-you-need-to-know/articleshowprint/77100088.cms>



Twin naval exercises with US supercarriers signal QUAD has arrived

US supercarriers carried out a joint exercise with Indian Navy in the Indian Ocean, and a second one with the other two QUAD members - Australia and Japan - in the Philippine Sea

By Shishir Gupta

New Delhi: As four Indian naval ships participated in a two-day joint exercise with the American supercarrier USS Nimitz off the Andaman coast this week, another supercarrier USS Ronald Regan teamed up with navies of Australia and Japan to carry out a similar exercise 4,000 km away on the mouth of the contested South China Sea.

The official statements on the exercises did not name China that has been trying to throw its weight around its neighbours. It didn't have to as the danger is clear and present with Chinese Foreign Minister Wang Yi clearly stating this week that Beijing was moving to the centre of the globe - in effect expounding the Middle Kingdom concept.

The United States has emerged as the bulwark against China in the South China Sea and beyond, deepening partnerships with countries in Asia, Europe and Australia to secure Indo-Pacific from a bellicose China. The two exercises make it evident that India will be the principal ally to US in securing Indian Ocean Region while Japan and Australia will be key to protecting Pacific region.

The message that put China at the centre of the United States' focus was reinforced by US defence secretary Mark Esper late on Tuesday. Esper explained the presence of the US supercarriers in and around the South China Sea, which irks Beijing, "to back up the sovereignty of friends and partners and to reassure them that we will be there to defend those things" in the face of 'China's bad behaviour'.

The four navies that participated in this week's two exercises - US, India, Japan and Australia -- would be in the Indian Ocean later in November as part of the expanded Malabar naval exercise led by India. Australia is expected to be formally invited soon to the exercise.

"This would be a QUAD exercise by default," a military commander said, referring to the four-country Quadrilateral security dialogue or QUAD.

The US, which plays the lead role in QUAD, has become a pivot against China; exercising with the Indian Navy in the Indian Ocean and Japan and Australia in the Philippine Sea near the mouth of the South China Sea.

Mark Esper said the exercise in the Indian Ocean reflects the shared commitment of the US and India to boost naval cooperation in support of a free and open Indo-Pacific.

The exercise with the Indian Navy was conducted beyond the Six Degree channel which separates Great Nicobar from Banda Ache in Indonesia's Sumatra. The USS Nimitz, which reaches more than 23 stories high from the keel to the top of the mast, was coming down from the South China Sea into the Strait of Malacca.

Simultaneously, USS Ronald Regan conducted the trilateral military exercise as a show of naval might in the Philippine Sea on the doorstep of the disputed South China Sea.

"Throughout the cooperative exercise period, participants will operate and train together, exercising integrated maritime operations in an all-domain warfighting environment," the US Navy said in a statement, pointing that the exercise would help their response "to any situation".



The USS Ronald Reagan Carrier Strike Group and units from Japan's Maritime Self-Defense Force and Australian Defence Force participate in trilateral military exercises in the Philippine Sea (US Navy)

China claims much of the neighbouring South China Sea, though the Philippines, Vietnam, Malaysia, Taiwan and Brunei also have overlapping claims in the waters. The US, in a marked change in stance on China's disputes in the South China Sea, had described Beijing's pursuit of offshore resources "completely unlawful" and condemned its "campaign of bullying to control" the disputed waters.

<https://www.hindustantimes.com/india-news/twin-naval-exercises-with-us-supercarriers-signal-quad-has-arrived/story-8J11B7NURit4ZqpVBMP4VO.html>



Thu, 23 July 2020

India's nuclear strategy shifts focus from Pakistan to China, Beijing now in range of New Delhi's missiles: Report

The report said that this posture has likely been reinforced after the 2017 Doklam standoff, during which Chinese and Indian troops were placed on high alert over a dispute near the Bhutanese border

Edited By Ananya Das

Highlights

- **India's nuclear strategy, which has traditionally focused on Pakistan, has now increased emphasis on China.**
- **Beijing is now in the range of Indian missiles, according to a report.**
- **The report said that this posture has likely been reinforced after the 2017 Doklam standoff.**

India's nuclear strategy, which has traditionally focused on Pakistan, has now increased emphasis on China, and Beijing is now in the range of Indian missiles, according to a report. The report said that this posture has likely been reinforced after the 2017 Doklam standoff, during which Chinese and Indian troops were placed on high alert over a dispute near the Bhutanese border.

An analysis of India's nuclear forces published in the Bulletin of Atomic Scientists on July 20 by Hans M. Kristensen and Matt Korda makes this observation. The authors said, "While India's primary deterrence relationship is with Pakistan, its nuclear modernization indicates that it is putting increased emphasis on its future strategic relationship with China. All the new Agni missiles have ranges that indicate their primary target is China. This posture is likely to be reinforced after the 2017 Doklam standoff, during which Chinese and Indian troops were placed on high alert over a dispute near the Bhutanese border. Tension remained high in 2019, with troop injuries on both sides of the border."



"The expansion of India's nuclear posture to take a conventionally and nuclear superior China into account will result in significantly new capabilities being deployed over the next decade, which could potentially also influence how India views the role of its nuclear weapons against Pakistan," they said.

"According to one scholar, "we may be witnessing what I call a 'decoupling' of Indian nuclear strategy between China and Pakistan. The force requirements India needs in order to credibly threaten assured retaliation against China may allow it to pursue more aggressive strategies – such as escalation dominance or a 'splendid first strike' – against Pakistan", the report said.

"India has long adhered to a nuclear no-first-use policy, even though the policy was weakened by India's 2003 declaration that it could potentially use nuclear weapons in response to chemical or biological attacks (which would, therefore, constitute nuclear first use, even if it were in retaliation). Yet amid the 2016 dispute with Pakistan, then-Indian defence minister Manohar Parrikar indicated that India should not "bind" itself to that policy. Although the Indian government later explained that the minister's remarks represented his personal opinion, the debate highlighted the conditions under which India would consider using nuclear weapons," the report added.

"Current defence minister Rajnath Singh has also publicly questioned India's future commitment to its no-first-use policy, tweeting in August 2019 that "India has strictly adhered to this doctrine. What happens in the future depends on the circumstances". Recent scholarship has further called India's commitment to its no-first-use policy into question, with some analysts asserting that "India's NFU policy is neither a stable nor a reliable predictor of how the Indian military and political leadership might actually use nuclear weapons"," it added.

" Even so, India's NFU policy might have served to limit somewhat the scope and strategy of Indian nuclear forces for the first two decades of its nuclear era. Additionally, although India has long been thought to store its nuclear warheads separate from deployed launchers, there is growing speculation that India may have increased the readiness of its arsenal significantly over the past decade by "pre-mating" warheads with missiles in canisters for a subsection of the ballistic missile launchers, and possibly also storing some bombs at airbases. There is still some uncertainty about how ready those missiles are on a day-to-day basis, since only the Agni-V, which is not yet deployed, is reported to be carried in a canister. But this trend will likely strengthen with India's development of a sea-based leg of its nuclear triad, which, at least in the way the United States and Russia operate ballistic missile submarines, has typically involved mating warheads with missiles," it further added.

"Fighter-bombers were India's first and only nuclear strike force until 2003 when the Prithvi-II nuclear-capable ballistic missile was fielded. Despite considerable progress since then in building a diverse arsenal of land- and sea-based ballistic missiles, bombers continue to serve a prominent role as a flexible strike force in India's nuclear posture. We estimate that three or four squadrons of Mirage 2000H and Jaguar IS aircraft at three bases are assigned nuclear strike missions against Pakistan and China," the report said.

It said, "The Mirage 2000H Vajra ("divine thunder") fighter-bombers are deployed with the 1st, 7th, and possibly the 9th squadrons of the 40th Wing at Maharajpur (Gwalior) Air Force Station in northern Madhya Pradesh. We estimate that one or two of these squadrons has a secondary nuclear mission. Indian Mirage aircraft also occasionally operate from the Nal (Bikaner) Air Force Station in western Rajasthan, and other bases might potentially function as nuclear dispersal bases as well."

"The Indian Mirage 2000H was originally supplied by France, which used its domestic version (Mirage 2000N) in a nuclear strike role for 30 years, until its retirement in the summer of 2018. The Indian Mirage 2000H is undergoing upgrades to extend its service life and enhance its capabilities; the modernized version is called Mirage 2000I. The Indian Air Force also operates four squadrons of Jaguar IS/IB Shamsheer ("sword of justice") aircraft at three bases (a fifth squadron flies the naval IM version). These include the 5th and 14th squadrons of the 7th Wing at Ambala Air Force Station in northwestern Haryana, the 16th and 27th squadrons of the 17th Wing at Gorakhpur Air Force Station in northeastern Uttar Pradesh, and the 6th and 224th squadrons of the 33rd Wing at Jamnagar Air Force Station in southwestern Gujarat. We estimate that one or two of the squadrons at Ambala and Gorakhpur (one at each base) are assigned a secondary nuclear strike mission. Jaguar aircraft also occasionally operate from the Nal (Bikaner) Air Force Station in western Rajasthan," it added.

"India is searching for a modern fighter-bomber that will probably take over the air-based nuclear strike role in the future. On September 23, 2016, India and France signed an agreement for delivery of 36 Rafale aircraft. The order was considerably reduced from initial plans to buy 126

Rafales. The Rafale is used for the nuclear mission in the French Air Force, and India could potentially convert it to serve a similar role in the Indian Air Force," it said.

"The Rafales will be deployed in two equally-sized squadrons of 18 fighters and four dual-seat trainers: one squadron (17th "Golden Arrows" Squadron) at Ambala Air Base Station, located only 220 kilometers from the Pakistani border, and the other squadron (101st "Falcons" Squadron) at Hasimara Air Force Station in West Bengal. New infrastructure developments to accommodate the planes are being constructed at both bases, and the Indian Air Force is reinstating the squadrons to active duty after they had both been decommissioned years earlier," the report said.

The report also said:

Land-based ballistic missiles: India has four types of land-based, nuclear-capable ballistic missiles that appear to be operational: the short-range Prithvi-II and Agni-I, the medium-range Agni-II, and the intermediate-range Agni-III. At least two other longer-range Agni missiles are in development and nearing completion: the Agni-IV and Agni-V. It remains to be seen how many of these missile types India plans to keep in its arsenal. Some may serve as technology development programs toward longer-range missiles. Although the Indian government has made no statements about the future size or composition of its land-based missile force, short-range and redundant missile types could potentially be discontinued, with only medium- and long-range missiles deployed in the future to provide a mix of strike options against Pakistan and China. Otherwise, the government appears to be planning to field a diverse missile force that will be expensive to maintain and operate.

Despite widespread speculation in news media articles and on social media that the Agni-V will be equipped with multiple warheads – or even multiple independently targetable reentry vehicles (MIRVs) – there is good reason to doubt that India can or will add MIRVs to its missiles in the near future. There are no official reports that the Indian government has approved a MIRV program, and loading multiple warheads on the Agni-V would reduce its extra range, a key purpose of developing the missile in the first place.

The Agni-V is estimated to be capable of delivering a payload of 1.5 tons (the same as the Agni-III and -IV), and India's first- and second-generation warheads, even modified versions, are thought to be relatively heavy compared with warheads developed by other nuclear-armed states that deploy MIRVs. It took the Soviet Union and the United States hundreds of nuclear tests and 25 years of effort to develop reentry vehicles small enough to equip a ballistic missile with MIRVs. Moreover, deploying missiles with multiple warheads would invite serious questions about the credibility of India's minimum deterrent doctrine; using MIRVs would reflect a strategy to quickly strike multiple targets and would also run the risk of triggering a warhead race with adversaries. Unless China develops an efficient missile defense system with capability against intermediate-range ballistic missiles, there seems to be no military need for MIRVs on Indian missiles.

It seems likely, though, that China's recent decision to equip some of its ICBMs with MIRVs, and Pakistan's announcement in January 2017 that it had test-launched a new Ababeel medium-range ballistic missile with MIRVs, will strengthen the hand of those in the Indian military-industrial complex who favor development of a MIRV capability, if for no other reason than to avoid falling behind in MIRV technology.

Although Ministry of Defence officials have recently indicated that India's strategic missile force will be "capped for the present with the Agni-V, with no successor or next series on the horizon or even on the drawing board", India apparently has also begun development of a true ICBM, known as Agni-VI. Official data is scarce, but an article posted on the government's Press Information Bureau website in December 2016 claimed the Agni-VI "will have a strike-range of 8,000–10,000 kilometers" and will "be capable of being launched from submarines as well as from land" (Ghosh 2016). Whether these claims are accurate remains to be seen; a range improvement of roughly 50 percent to nearly 100 percent of that of the Agni-V seems exaggerated. The US Air Force, National Air and Space Intelligence Center estimates the range is closer to 6,000 kilometers (3,730 miles).

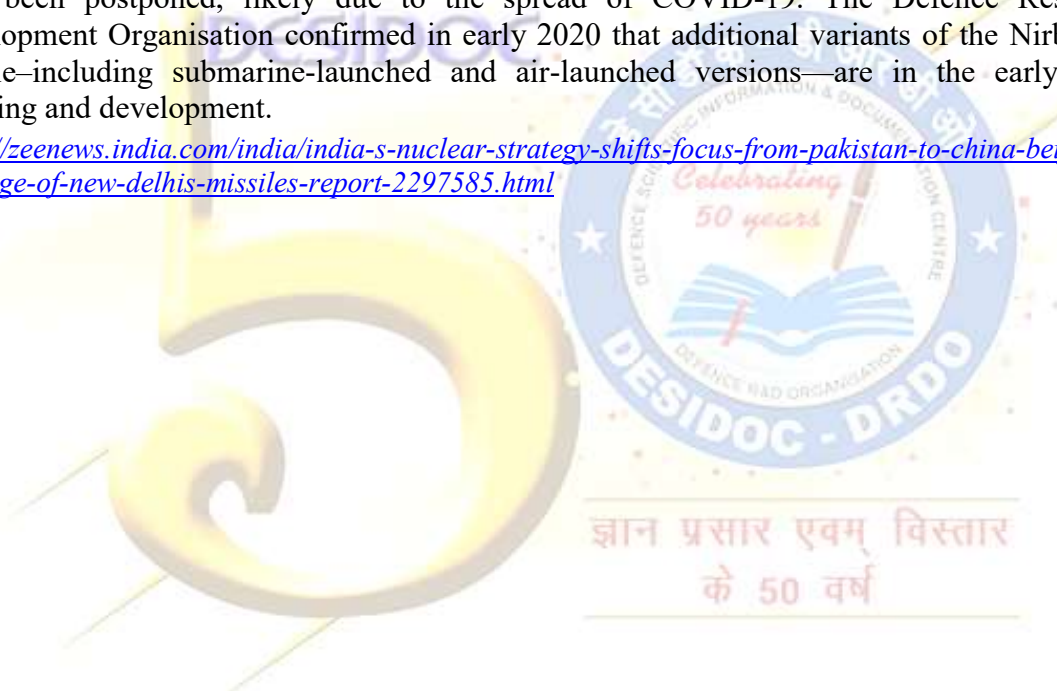
India has also converted some of its ballistic missile technology into an anti-satellite interceptor. In March 2019, the Defence Research and Development Organisation completed its first successful anti-satellite test (“Mission Shakti”) against one of its own satellites.

Sea-based ballistic missiles: India operates a ship-launched and a submarine-launched, nuclear-capable ballistic missile and is developing a second submarine-launched ballistic missile for eventual deployment on a small fleet of nuclear-powered ballistic missile submarines. India also appears to be developing its next generation of SSBNs—the S-5 class. To arm the SSBNs, India has developed one nuclear-capable sea-launched ballistic missile, and is working on another: the current K-15 (also known as Sagarika or B-05) submarine-launched ballistic missile (SLBM) with a range of 700 kilometers, and the future K-4 SLBM with a range of about 3,500 kilometers.

Cruise missiles: India is developing a ground-launched cruise missile, the Nirbhay. The missile looks similar to the American Tomahawk or the Pakistani Babur and might also be intended for air- and sea-based deployment. The Indian Ministry of Defence describes the Nirbhay as “India’s first indigenously designed and developed long-range subsonic cruise missile having 1,000 kilometer range and capable of carrying up to 300-kilogram warheads”.

Although there are many rumors that the Nirbhay is dual-capable, neither the Indian government nor the US intelligence community has publicly stated such. A test of the Nirbhay cruise missile fitted with an indigenous propulsion system was scheduled for April 2020; however, it appears to have been postponed, likely due to the spread of COVID-19. The Defence Research and Development Organisation confirmed in early 2020 that additional variants of the Nirbhay cruise missile—including submarine-launched and air-launched versions—are in the early stages of planning and development.

<https://zeenews.india.com/india/india-s-nuclear-strategy-shifts-focus-from-pakistan-to-china-beijing-now-in-range-of-new-delhis-missiles-report-2297585.html>





Thu, 23 July 2020

Chandrayaan-2 mapping lunar surface as per mission plan: ISRO

Story highlights

The Chandrayaan-2 entered the Lunar orbit on August 20, 2019

New Delhi: India's Chandrayaan-2 mission has marked one year of its launch by GSLV MkIII-M1 and the Indian Space Research Organisation (ISRO) has said that all of its payloads are performing well.

Images from the Orbiter High Resolution Camera
CHANDRAYAAN 2

Orbiter High Resolution Camera (OHRC) onboard Chandrayaan-2 provides very high spatial resolution images of the Moon. This operates in the visible Panchromatic band (450 – 800 nm). With a spatial resolution of 25 cm from a 100 km orbit and a swath of 3 km, it provides the sharpest images ever from a lunar orbiter platform. OHRC is an important new tool for lunar topographic studies of select regions.

OHRC Payload **Image location** **Overview of the acquired image**

This OHRC image was acquired at 04:38 IST on 05-09-2019 from 100km altitude. The image covered a part of BOGUSLAWSKY E Crater (14 km diameter and 3km depth) and surroundings, which lies in the southern polar area of Moon (Palon H. Ludwig von Boguslawsky was a German astronomer).

center coordinates
lat = 74.623 S
long = 54.087E

Boguslawsky E

On July 22, 2019, ISRO launched the GSLV MkIII-M1 carrying Chandrayaan-2 from the Satish Dhawan Space Centre in Sriharikota. It kept revolving around the Earth's orbit for 23 days and on August 14 that craft commenced its journey to the moon.

The Chandrayaan-2 entered the Lunar orbit on August 20, 2019.

On Tuesday, India's space agency confirmed that all eight payloads on Chandrayaan-2 were performing well and global mapping of the lunar surface and polar coverage are being carried out as per the mission plan.

Chandrayaan-2 payloads and parameters are being derived for (i) presence of water-ice in the polar regions, (ii) X-ray based and Infrared spectroscopic mineral information and (iii) mid and high latitude presence of Argon-40, a condensable gas on the Moon which gets released internally by the radioactive decay of ⁴⁰K."

Initially, ISRO was planning to release the major findings from Chandrayaan-2 science experiments at the Annual Lunar Planetary Science Conference in March 2020 but it was called off due to coronavirus. Now, the data will be released in October wherein details for accessing the data will be provided, it said.

The Orbiter carrying Orbiter High-Resolution Camera (OHRC) has clicked 22 orbit images of lunar surface consisting of nearly 1056 sq. km area and is also used to characterise landing sites for future missions.

<https://www.wionews.com/india-news/chandrayaan-2-mapping-lunar-surface-as-per-mission-plan-isro-315205>

THE HINDU

Thu, 23 July 2020

All 8 Chandrayaan-2 payloads performing well: ISRO

India's second lunar mission marks one year of completion of launch

Bengaluru: As India's second lunar mission Chandrayaan-2 marked one year of completion of launch by GSLV MkIII M1 on Wednesday, the Indian Space Research Organisation (ISRO) said all its eight payloads were performing well.

The global mapping of the lunar surface and polar coverage were being carried out as per the mission plan, while public release of science data from Chandrayaan-2 for global use would begin in October, the space agency said.

"Extensive data have been acquired from Chandrayaan-2 payloads and parameters are being derived for presence of water-ice in the polar regions, X-ray based and Infrared spectroscopic mineral information and mid and high latitude presence of Argon-40, a condensable gas on the Moon which gets released internally by radio-active decay of ⁴⁰K," ISRO said.

The report on the major findings from Chandrayaan-2 science experiments was planned to be released at the Annual Lunar Planetary Science Conference in March 2020, but it was, however, cancelled due to the COVID-19 pandemic, it said.

Public release of science data from Chandrayaan-2 for global use would begin in October 2020, wherein details for accessing the data would be provided, ISRO added.

Chandrayaan-2, aimed at landing a rover on uncharted Lunar South Pole, was launched on July 22, 2019 on board the country's most powerful geosynchronous launch vehicle.

The spacecraft was inserted into lunar orbit on August 20, 2019. The Chandrayaan-2 mission was India's first attempt to land on the lunar surface. ISRO had planned the landing on the South Pole of the lunar surface. However, the lander Vikram hard-landed in September last year. Its orbiter, which is still in the lunar orbit, has a mission life of seven years.

ISRO officials had earlier said it would be used for the third lunar mission as well.

<https://www.thehindu.com/news/national/all-8-chandrayaan-2-payloads-performing-well-isro/article32166304.ece>

Technion-developed method accelerates blood test analysis by about 98%

Newswise — Researchers at the Technion have developed a new method for rapid and inexpensive analysis of the chemical composition of blood samples, which may hasten the early diagnosis of diseases. The first application to be tested will be the early detection of various cancerous tumors based on blood tests.

The innovative technology, which was published in *Nature Communications*, was developed by Professor Tomer Shlomi and doctoral students Shoval Lagziel and Boris Sarvin. It is based on a unique combination of mass spectrometry and computational methods developed by the research group. A mass spectrometer is a common device used to determine the concentrations of molecules in biological samples. Testing using this device typically requires a preliminary process called chromatography that entails the separation of the materials in the sample according to chemical properties.

Chromatography, which increases the sensitivity of the spectrometric measurement, is time-consuming and therefore makes the process expensive. One sample typically costs hundreds of dollars. As a result, it is desirable to find a way to skip the chromatographic step without compromising the sensitivity of the analysis, that is, the ability to identify many molecules and quantify their concentrations.

In the current study, Prof. Shlomi's research group presents a method that skips the chromatography step and makes it possible to directly use mass spectrometry without significantly impairing the quality of the analysis. The test is completed in just 30 seconds, thus shortening the process by about 98% and reducing its cost by a similar rate.

According to Prof. Shlomi, the novelty lies in the use of a computational method developed by the research group. They employ a method that identifies optimal working configurations in the mass spectrometer, which allows for a high-sensitivity analysis for specific types of biological samples. The computational analysis also corrects the measured raw information and accurately quantifies concentrations of thousands of molecules in blood samples.

Prof. Tomer Shlomi is a faculty member in the Faculties of Computer Science and Biology and a member of the Lorry I. Lokey Center for Life Sciences and Engineering. The research was funded by an ERC grant and by the Israel Science Foundation.

For more than a century, the Technion - Israel Institute of Technology has pioneered in science and technology education and delivered world-changing impact. Proudly a global university, the Technion has long leveraged boundary-crossing collaborations to advance breakthrough research and technologies. Now with a presence in three countries, the Technion will prepare the next generation of global innovators. Technion people, ideas and inventions make immeasurable contributions to the world, innovating in fields from cancer research and sustainable energy to quantum computing and computer science to do good around the world.

The American Technion Society supports visionary education and world-changing impact through the Technion - Israel Institute of Technology. Based in New York City, we represent thousands of US donors, alumni and stakeholders who invest in the Technion's growth and innovation to advance critical research and technologies that serve the State of Israel and the global good. Over more than 75 years, our nationwide supporter network has funded new Technion scholarships, research, labs, and facilities that have helped deliver world-changing contributions and extend Technion education to campuses in three countries.

<https://www.newswise.com/articles/technion-developed-method-accelerates-blood-test-analysis-by-about-98?ta=home>

Researchers discover that mouth bacterium may cause colon cancer to spread

A diverse array of bacteria live in the human mouth as part of a vital ecosystem known as the oral microbiome. Virginia Tech researchers have discovered that one of these common bacteria can leave the mouth and potentially cause existing cancer cells in other parts of the body to spread.

These bacteria are believed to predominantly travel through the blood to different sites in the body where they are associated with serious infections of the brain, liver, and heart; preterm birth in pregnant women; and are present in high levels in colon tumors. Poor oral hygiene could cause the bacteria to migrate to other parts of the body where cancers exist. Also, evidence exists for a link between severe gum disease and colorectal cancer.

"Our team's discovery shows that infection with these bacteria initiates cancer cell migration," said Daniel Slade, who is an assistant professor in the Department of Biochemistry in the College of Agriculture and Life Sciences, and an affiliated researcher in the Fralin Life Sciences Institute. "This is vital information because 90 percent of cancer-related deaths result from nonprimary tumors or sites that have metastasized to somewhere else in the body."

The findings were published July 21 as the cover story in *Science Signaling*, which is produced by the American Association for the Advancement of Science.

Since 2012, multiple studies have shown this bacterium, *Fusobacterium nucleatum*, directly invades colon tumors, but questions remained as to how this bacterium is contributing to cancer.

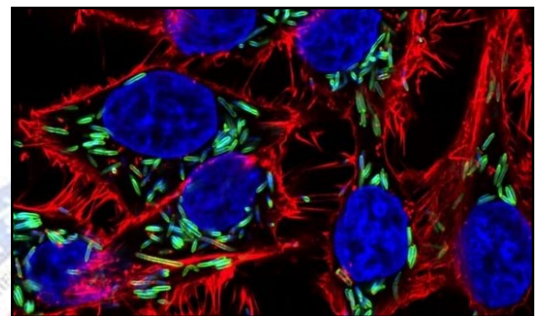
A 2017 study showed that when human colon tumors containing *F. nucleatum* are put into a mouse, cancer cells containing live bacteria will break off and reattach in the liver, providing the first evidence that *F. nucleatum* could be directly involved in causing the spread of cancer cells throughout the body.

To address the potential of *F. nucleatum* driving metastasis, Virginia Tech researchers asked the broad question: How do human cells respond when colon cancer cells are infected with *F. nucleatum*? Their findings provide a deeper understanding of the critical role bacteria can play in cancer.

The relatively benign nature of *F. nucleatum* initially intrigued Slade and his team of researchers. At first glance, *Fusobacterium nucleatum* appears quite unremarkable and lives in harmony with other bacteria under the gums in the oral microbiome. Despite its role as a common bacterium in the mouth, the correlations with colon cancer were too strong to ignore.

"Dan convinced me that this bacterium was a viable research direction as a bacterium that could directly influence the behavior of cancer cells," said Scott Verbridge, a member of the team, associate professor in the Virginia Tech Department of Biomedical Engineering and Mechanics in the College of Engineering, and principal investigator of the Laboratory of Integrative Tumor Ecology. "He had developed the ability to genetically modify this bacterium. He had some amazing technology to culture this bacterium with cancer cells that was beyond anything that we could do in my lab."

According to Slade and his team, there is no evidence that this bacterium is directly initiating cancer. Also, this bacterium does not appear to be releasing molecules that are causing the cancer cells to migrate.



F. nucleatum, a common bacteria that can leave the mouth and potentially cause existing cancer cells in other parts of the body to spread, pictured inside of colon cancer cells. Credit: Virginia Tech

Instead, *F. nucleatum* sticks to and even enters cancer cells using the protein Fap2, which docks with sugars overrepresented on the surface of cancer cells. This in turn causes cancer cells to release two proteins known as IL-8 and CXCL1, which are members of the cytokine protein family that play critical roles in immune system activation against infections.

Strikingly, the cytokine combination of IL-8 and CXCL1 was previously shown in multiple studies to induce the spread of cancer cells. However, Slade and his team believe this is the first example of a tumor-associated bacterium producing this distinct cytokine combination.

These cytokines released by an infected cell then can talk back to the same cell or those signals can be sent out to other cancer cells, immune cells, and various other cell types that surround a tumor. In essence, one infected cell could be affecting multiple neighboring cells, so there doesn't have to be a widespread infection within a tumor for it to be influencing a large surrounding area.

In addition to IL-8 and CXCL1 contributing to cellular migration or metastasis, they are also potent immune cell attractants, which can lead to inflammation; a hallmark of cancer. The attraction and subsequent infection of immune cells known as neutrophils and macrophages by *F. nucleatum* could in turn lead to additional pro-cancerous proteins being released, which Slade and colleagues show in this work. A key contributor to the team in understanding the interactions of *F. nucleatum* with immune cells was Liwu Li, a professor in the Department of Biological Sciences and an affiliated researcher in the Fralin Life Sciences Institute.

F. nucleatum, a [common bacteria](#) that can leave the mouth and potentially cause existing cancer cells in other parts of the body to spread, pictured inside of colon cancer cells.

Eyes on the future

The long-term goal of Slade and his team is to advance cancer treatment by addressing the role bacteria play in disease, which could be a critical piece that has been missing from the puzzle.

Finding pro-metastatic human proteins that are released by cancer cells upon bacterial infections has opened the door for future research. These results provide an insight into potentially blocking the secretion of cytokines to combat metastasis induced by bacteria. This is an attractive alternative to using antibiotics to kill *F. nucleatum*, which could also clear beneficial bacteria.

"We need to know if there are other important bacteria that could be working in synergy with *F. nucleatum* to drive cancer. We need to understand the physiological role of these bacteria as we can't just go about clearing them from the body because we need them for some situations. Oftentimes, bacteria are needed for chemotherapy to be fully effective," Verbridge said.

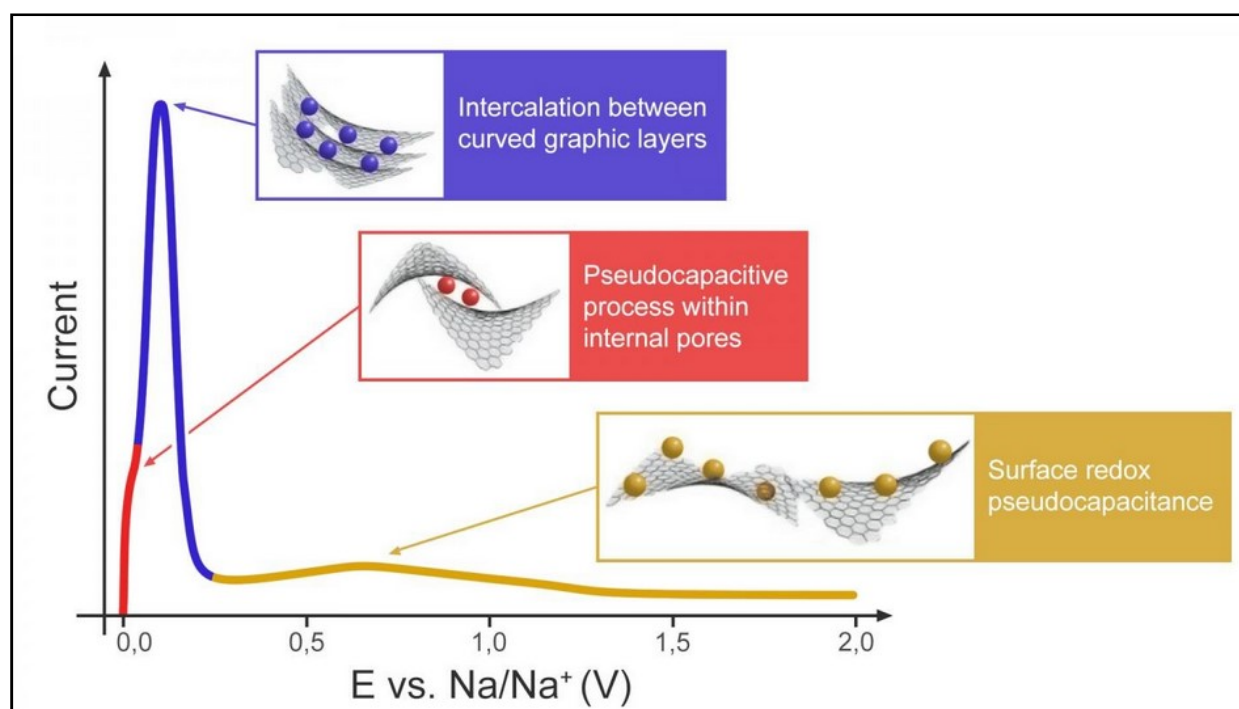
"I also think it's interesting to ask if the bacteria are causing this cellular migration as a way to get around in the human body. There could be a selective advantage for any infectious agent, a virus or bacteria, that could get inside of a host cell and migrate," Verbridge said. This could be particularly important for *F. nucleatum* as it is classified as a nonmotile bacterium; one that does not possess the ability to move through a lack of molecular appendages like flagella that drive movement.

Together, these results provide a deeper understanding of how bacteria influence cancer. While this process was shown to occur with colorectal cancer cells, the team is exploring if the same process is influencing other types of cancer, including pancreatic cancer, breast cancer, and oral squamous cell carcinoma of the mouth.

<https://medicalxpress.com/news/2020-07-mouth-bacterium-colon-cancer.html>

Scientists identified energy storage mechanism of sodium-ion battery anode

Scientists from Skoltech and Moscow State University (MSU) identified the type of electrochemical reaction associated with charge storage in the anode material for sodium-ion batteries (SIB), a new promising class of electrochemical power sources. Their findings along with the anode manufacturing method developed by the same team will help bring closer the SIB commercialization in Russia and beyond. The research was published in the journal *Electrochimica Acta*.



A proposed model during desodiation of hard carbon Credit: Zoia V. Bobileva et al. / *Electrochimica Acta*

Today lithium-ion batteries (LIB) are the most popular electrochemical power sources used in diverse applications running the gamut from mobile phones (several watt-hours) to buffer systems at power plants (millions of watt-hours). The demand for LIB and the average size of storage devices are constantly growing, however this growth trend is encountering multiple barriers, such as the high cost of lithium salts, limited global reserves of lithium and uneven distribution of lithium-containing deposits across countries. To overcome these hurdles, scientists worldwide, Russia included, are working on SIB, an alternative technology that may challenge both LIB and the widely used lead-acid batteries.

Sodium is the sixth most common element in the Earth's crust. Its salts are about 100 times cheaper as compared to lithium. Although similar to lithium in terms of chemical properties, sodium has other distinctions that call for new approaches in SIB design. A battery is made up of three main components: the cathode, the anode and the electrolyte. There is a broad diversity of compositions and structures that could be suitable for SIB cathodes or electrolytes, whereas the anode still remains a stumbling block. Graphite, which is successfully used in LIB, does not work for SIB because the sizes of carbon hexagons and sodium cations differ too much to provide intercalation. Hard carbon seems to be the only material that can actually be used in the anode. Hard carbon formed by an irregular arrangement of distorted graphite-like layers demonstrates

sodium-ion storage properties comparable to those of graphite in LIB, however it still remains unclear why and how this happens.

"There are several hypotheses as to how sodium could be introduced into hard carbon. In our study, we validated and slightly expanded one of them. We found that hard carbon exhibits intercalation-type behavior to accumulate most of the charge, which is great news. Intercalation is exactly what the battery needs, while the surface processes associated with "pseudocapacitance" are the responsibility of supercapacitors that form a very narrow niche among chemical power sources. Funnily enough, our Japanese colleague and research supervisor for our principal investigator and MSU Ph.D. student, Zoya Bobyleva, held a totally different view at the start. He is one of the world's top experts in SIB and hard carbon and we had a hard time convincing him that we were right, but we did it!" says Oleg Drozhzhin, project lead and senior research scientist at Skoltech's Center for Energy Science and Technology (CEST) and MSU.

Last year, Nobel Prizes in Chemistry were awarded to three scientists "for the development of lithium-ion batteries". One of the winners owes his prize to hard carbon, an anode material that gave life to the LIB technology about three decades ago and was later replaced with graphite. Now hard carbon can once again give rise to a new technology.

"This work is remarkable not only in showing how hard carbon works in the sodium-ion system but also in finding a way to produce hard carbon with a capacity of over 300 mAh/g comparable to that of graphite in LIB. Creating and optimizing a new method takes a lot of painstaking effort that typically remains behind the scenes and is hardly ever reported in scientific papers, so it is important for us to show the ultimate result: we succeeded in making good anode materials for SIB and we know how they work," comments Evgeny Antipov, a Skoltech professor and head of the Department of Electrochemistry at the MSU Faculty of Chemistry.

More information: Zoia V. Bobyleva et al, Unveiling pseudocapacitive behavior of hard carbon anode materials for sodium-ion batteries, *Electrochimica Acta* (2020). DOI: [10.1016/j.electacta.2020.136647](https://doi.org/10.1016/j.electacta.2020.136647)
<https://techxplore.com/news/2020-07-scientists-energy-storage-mechanism-sodium-ion.html>



Researchers develop new tools to rapidly test activity of anti-coronavirus antibodies

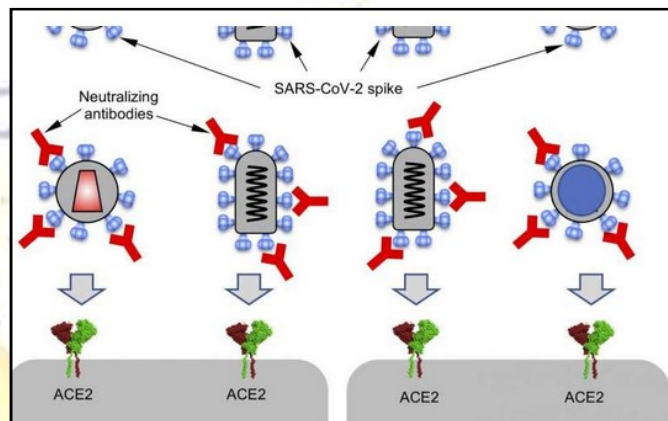
Researchers at The Rockefeller University in New York have developed new tools to rapidly test the ability of antibodies to neutralize SARS-CoV-2, the novel coronavirus responsible for the COVID-19 pandemic. The approach, described today in the *Journal of Experimental Medicine (JEM)*, will help researchers understand whether patients are susceptible to reinfection by SARS-CoV-2 and assess the effectiveness of experimental vaccines, as well as develop antibody-based therapies against the disease.

People infected with SARS-CoV-2 produce neutralizing antibodies that prevent the virus from infecting cells by binding to the spike protein on the virus's surface. Early studies have suggested that the strength of this antibody response varies greatly between patients, and it remains unknown how long any such neutralizing antibodies persist in the blood to provide protection against reinfection.

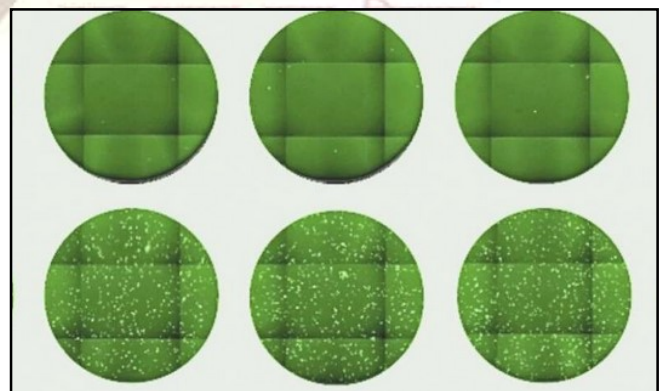
Meanwhile, efforts are under way to treat and prevent COVID-19 using either purified antibodies or whole blood plasma collected from convalescent patients who produce large amounts of neutralizing antibodies. Moreover, any successful vaccine against SARS-CoV-2 will have to induce the production of neutralizing antibodies.

"Whether elicited by natural infection or vaccination, or administered as convalescent plasma or in recombinant form, neutralizing antibodies will likely be crucial for curtailing the global burden of COVID-19 disease," says Paul D. Bieniasz, a professor at The Rockefeller University and investigator at the Howard Hughes Medical Institute. "For this reason, the availability of rapid, convenient, and accurate assays that measure neutralizing antibody activity is crucial for evaluating naturally acquired or artificially induced immunity against SARS-CoV-2."

Antibody tests using the SARS-CoV-2 virus itself are labor intensive and must be carried out in biosafety level 3 facilities, limiting their widespread application. Bieniasz and colleagues therefore developed a number of safer, surrogate viruses that can be used in place of SARS-CoV-2 to test the neutralizing activity of antibodies targeting the coronavirus spike protein.



A diagram of how surrogate viruses expressing the SARS-CoV-2 spike protein can be used to measure the activity of neutralizing antibodies that target the spike protein and prevent the virus from entering cells. Credit: Schmidt et al., 2020



Higher concentrations of a neutralizing antibody block the entry of a vesicular stomatitis virus expressing the SARS-CoV-2 spike protein into cells grown in the laboratory. Credit: Schmidt et al., 2020

The surrogate viruses are versions of either the human immunodeficiency virus type-1 (HIV-1) or vesicular stomatitis virus (VSV) that produce the SARS-CoV-2 spike protein instead of their own surface proteins. Some of these surrogate viruses are unable to replicate, making them even safer to use in the laboratory. Moreover, the viruses are engineered to generate fluorescent or luminescent infected cells, making it easy for researchers to track infection and measure how well this process is blocked by potential neutralizing antibodies.

Bieniasz and colleagues tested the ability of convalescent patient plasma samples and purified antibodies to block the entry of the surrogate viruses into human cells grown in the laboratory. "Each of the surrogate virus-based assays generated quantitative measurements of neutralizing activity that correlated well with neutralization measured using authentic SARS-CoV-2," says Theodora Hatziioannou, a research associate professor at Rockefeller who co-directed the study with Bieniasz. "In just a few weeks, we have already used these assays to determine the neutralizing potencies of hundreds of plasma samples and monoclonal antibodies in a biosafety level 2 laboratory."

Bieniasz adds, "Automation and additional miniaturization is certainly feasible to further increase throughput—a notable consideration given the sheer number of vaccine candidates in the development pipeline. We think that these surrogate viruses and assays will be of significant use in curtailing the COVID-19 pandemic."

More information: Fabian Schmidt et al, Measuring SARS-CoV-2 neutralizing antibody activity using pseudotyped and chimeric viruses, *Journal of Experimental Medicine* (2020). DOI: [10.1084/jem.20201181](https://doi.org/10.1084/jem.20201181)

Journal information: [Journal of Experimental Medicine](https://medicalxpress.com/news/2020-07-tools-rapidly-anti-coronavirus-antibodies.html)
<https://medicalxpress.com/news/2020-07-tools-rapidly-anti-coronavirus-antibodies.html>

INDIA
TODAY

Thu, 23 July 2020

Coronavirus vaccine news: After Oxford, Chinese vaccine shows results, India's Covaxin at trial stage | 10 points

Coronavirus vaccine news update: After the coronavirus vaccine being developed by Oxford University showed positive results, another vaccine being developed by China has also shown favourable results. India has also entered the human trial stage with the indigenous Covaxin, developed by Bharat Biotech and ICMR

By Sanchari Chatyerjee

After the coronavirus vaccine being developed by Oxford University showed positive results, another vaccine being developed by China has also shown favourable results as the world grapples with rising number of coronavirus cases.

India has also started with the human trials of the indigenous Covaxin being jointly developed by Bharat Biotech and ICMR. Human trials of Covaxin has started at some of the 12 centres approved by the ICMR and the results can be expected in 2-3 months.



China's coronavirus vaccine candidate Sinovac has shown positive results after human trials in Brazil. (Reuters)

COVID-19 VACCINES' PROGRESS SO FAR

1. India's indigenous coronavirus vaccine being developed by Hyderabad-based Bharat Biotech and the Indian Council of Medical Research (ICMR) has entered the first phase of human trials. While the Phase-1 human clinical trials

for Covaxin has already begun at the Nizams Institute of Medical Sciences (NIMS) in Hyderabad, AIIMS Delhi has recruited candidates who would undergo trials.

2. The trial centre for Covaxin in Bhubaneswar is all set to begin the human trials. Earlier, ICMR landed in a controversy with Covaxin when it set a deadline for the developers to unveil the coronavirus vaccine before August 15.
3. The coronavirus vaccine developed by Oxford University and AstraZeneca has shown positive results, sending cheers across the world. Scientists have said the vaccine has shown it can generate both antibodies and cell-mediated immune responses. However, the Oxford research team has said there is still a long way to go.
4. The University of Oxford's possible Covid-19 vaccine could be rolled out by the end of the year but there is no certainty, the lead developer of the vaccine has said. The experimental vaccine produced an immune response in early-stage clinical trials, data showed on Monday, preserving hopes it could be in use by the end of 2020.
5. As the Covid-19 vaccine developed by Oxford University and AstraZeneca gave positive results, the Serum Institute of India (SII) said it will be able to produce about 300-400 million doses of the vaccine by December and half of its production will be for India. SII, the largest vaccine manufacturer in the world, has been chosen by Oxford and its partner AstraZeneca to manufacture the vaccine once it gets ready.
6. SII CEO Adar Poonawalla said they will apply for license from the Indian regulator to start clinical trials of the Oxford vaccine in a week's time.
7. The Drugs Controller General of India (DCGI) has so far permitted two vaccines developed in India -- one by the Bharat Biotech International Limited in collaboration with the ICMR and another one by Zydus Cadila Healthcare Ltd -- to go in for phase 1 and 2 human clinical trials.
8. The phase II clinical trials of a Covid-19 vaccine developed by CanSino Biologics Inc and China's military research unit has shown that it is safe and induces an immune response. The results were published in a study in The Lancet. Scientists, including those from the Chinese Center for Disease Control and Prevention, said the trial sought to evaluate the safety and immunogenicity of the vaccine candidate.
9. Meanwhile, Brazil has approved clinical trials for a potential COVID-19 vaccine under joint development by US pharmaceutical company Pfizer and Germany's BioNTech. This is the third such vaccine to be tested in the country. Earlier, Brazil had approved the two vaccines developed by Oxford University and China to be tested in the country.
10. Moderna Inc and Merck & Co on Tuesday told a US Congressional panel that they expect to profit from their coronavirus vaccines once approved. "We will not be selling our vaccine at cost, although it is premature for us as we're a long way from understanding the cost-basis," Julie Gerberding, chief patient officer for Merck, told the House. Merck's has yet to begin human studies of its experimental vaccine, lagging the leading candidates.

(With agency inputs)

<https://www.indiatoday.in/science/story/coronavirus-vaccine-latest-news-update-covid-19-medicine-india-oxford-who-status-tracker-1703173-2020-07-22>

COVID-19 vaccine India updates: Clearance soon to Pune firm which aims to provide Oxford vaccine at Rs 1,000

The CEO of the firm, Adar Poonawalla, has said in interviews that the mass production of the vaccine will begin next year. The cost of the vaccine will be kept below Rs 1,000

Edited By Poulomi Ghosh

COVID-19 Vaccine India Updates: The Centre is expediting the process to give clearance to Serum Institute, Pune, which wants to take up the phase 3 trial of the Oxford vaccine before it starts mass-producing the vaccine.

Soon after the Oxford vaccine kindled some hope in the worldwide fights against COVID-19, Serum Institute of India chief executive officer Adar Poonawalla said that the company will apply for permission for phase 3 trials for the Oxford vaccine in India next week and will begin the study soon.

The Centre has said that the clearance process will be expedited and the firm will be provided with every kind of assistance.

The CEO of the firm, Adar Poonawalla, has said in interviews that the mass production of the vaccine will begin next year. The cost of the vaccine will be kept below Rs 1,000. But in all probabilities, the government may buy and provide to the public at a free of cost through immunisation programmes, reports said. The firm is also working for other countries.

Apart from this, the Centre has already started discussions on how to make COVID-19 vaccines, being developed in India, available to all those who need it, Dr VK Paul, Member (Health), NITI Aayog, has said.

“Discussions have already begun on how will the vaccines be made available to all those who need it,” he said.

Bharat Biotech, Serum Institute, Zydus Cadila, Panacea Biotec, Indian Immunologicals, Mynvax and Biological E are among the seven domestic pharma firms working on the coronavirus vaccines in India.

Bharat Biotech’s Covaxin has started human trials. There are 12 places where the trial for Covaxin will take place as per the Indian Council for Medical Research (ICMR).

Zydus Cadila has said that it is looking to complete clinical trials of its COVID-19 vaccine candidate ZyCoV-D in seven months.

<https://www.india.com/news/india/covid-19-vaccine-india-updates-clearance-soon-to-pune-firm-which-aims-to-provide-oxford-vaccine-at-rs-1000-4091194/>

Garmin, PhysioQ join hands for COVID-19 research

Garmin India has announced an exclusive partnership with PhysioQ, a non-profit organisation that will connect registered users' health data from Garmin smartwatches to PhysioQ-Neo platform. The platform has been launched specifically focusing on the COVID-19 research. This connected self-monitoring system allows users to monitor their own and their family members' vitals through the Neo mobile app, say the companies.

PhysioQ-Neo will work with Garmin to collect health data such as heart rate, respiration and SpO2 through smartwatches. Data shared by PhysioQ-Neo users will be anonymised and aggregated to aid medical researchers studying novel coronavirus to combat this and future pandemics, say the companies. This will be a freely available tool for all researchers.

PhysioQ's Neo app will be available on Android and iOS platforms for free and is compatible with Garmin's range of smartwatches that tracks SpO2, including the latest Venu, Vivoactive 4, Vivomove 3 series, Forerunner 245/245M, Forerunner 945, Fenix 6 series, Vivosmart 4, and Fenix 5X Plus.

<https://timesofindia.indiatimes.com/gadgets-news/garmin-physioq-join-hands-for-covid-19-research/articleshow/77095952.cms>

NATIONAL HERALD

New study show immunity drops quickly in mild COVID-19 cases

A research team at California University, Los Angeles, did an in-depth study of 34 people who had recovered from mild COVID-19 infections.

They tested their blood two or three times over three months

A study shows that in people with mild COVID-19 cases, their antibodies against the coronavirus drop sharply over the first three months after infection.

A research team at the University of California, Los Angeles, did an in-depth study of 34 people who had recovered from mild COVID-19 infections. They tested their blood two or three times over three months, Xinhua news agency reported on Tuesday.



The researchers found a rapid drop in antibodies - the immune system proteins that help stop viruses from infecting cells in the body. On average, the antibody levels fell by half every 73 days, according to the study published in The New England Journal of Medicine.

The findings raise concern that humoral immunity against SARS-CoV-2 may not be long lasting in persons with mild illness, who compose the majority of persons with COVID-19, said the study.

Further studies will be needed to define a quantitative protection threshold and rate of decline of antiviral antibodies beyond 90 days, according to the study.

<https://www.nationalheraldindia.com/health/new-study-show-immunity-drops-quickly-in-mild-covid-19-cases>

