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समाचार पत्रों से चयित अंश Newspapers Clippings

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COVID-19: DRDO's Contribution

Wed, 02 Sep 2020

As Parliament gets Covid ready, here is list of all that is being done

The Special Frontier Force has played a role in most major Indian conflicts

By Shreya

New Delhi:: Thousands of masks and gloves, hundreds of sanitiser bottles and face shields, touch-free operation of doors, and COVID-19 tests for an estimated 4,000 people including MPs and staff members - several arrangements have been made for the 18-day Parliament session from September 14 that would be held under the shadow of a pandemic for the first time ever.

Frequent sanitisation of the entire Parliament complex will also be carried out, while arrangements have been made to sanitise various parliamentary papers as well as footwear and cars of MPs, officials said. Frisking of people will also make way for touchless security scanning, while thermal scanning will also be totally touch-free. The first-of-its-kind monsoon session will see Lok Sabha and Rajya Sabha sitting in two different shifts, while special seating arrangements have been made for MPs in adherence to social distancing guidelines.



Representational Image

For making the entire Parliament complex a safe zone in view of the COVID-19 pandemic, Lok Sabha Speaker Om Birla and Rajya Sabha Chairman M Venkaiah Naidu have held extensive discussions with officials of the Home Ministry, Health Ministry, ICMR and the DRDO.

As per the standing operating procedures finalised for holding the session from September 14 till October 1, MPs and staff of secretariats of both houses, as also the media personnel covering the proceedings, will be asked to undergo COVID-19 test at least 72 hours before the start of the session.

Officials said arrangements have been made for tests of close to 4,000 people, including the MPs, staff members and journalists. Only MPs and ministers will be allowed inside the main building, while necessary seating arrangements will be made for separate seating of their personal staff in the complex.

A new seating arrangement following social distancing guidelines has been prepared by both houses for their respective members. MPs will also be allowed to address the Chair while seated and wearing their masks so that the risk of infection might be minimised.

It has also been decided that air of air conditioners will be exchanged six times every day to avoid any possible infection. The DRDO will also provide multi-utility COVID-19 kits to all MPs.

Each kit will contain 40 disposable masks, five N-95 masks, 20 bottles of sanitisers of 50 ml each, face shields, 40 pairs of gloves, a touch-free hook to open and close doors without touching them, herbal sanitation wipes and tea bags to enhance immunity.

The two houses together have more than 780 members at present. The Health Ministry has also suggested that the movement of Members of Parliament in chambers of both the houses can be made unidirectional to avoid face-to-face interactions.

The Ministry will make available short video clips to all MPs on awareness about COVID-19 infections and the benefits of wearing masks, etc.

Touchless sanitisers will be kept at 40 different places within the Parliament House complex, and emergency medical teams and ambulances will also be stationed.

All guidelines related to COVID-19 prevention will be strictly followed, presiding officers of both houses said.

The provision of ultraviolet boxes has also been made to sanitise various parliamentary papers handled by the presiding officers and members. Arrangements are also being made for sanitisation of footwear and cars used by the members and those provided by the Secretariat by providing mats of required dimensions soaked in Hypochloride gel placed in troughs.

Marshals will also wear masks and face shields.

<https://www.oneindia.com/india/as-parliament-gets-covid-ready-here-is-list-of-all-that-is-being-done-3142772.html>

DRDO Technology News

TIMESNOWNEWS.COM

Wed, 02 Sep 2020

Govt inks landmark Pinaka deal: What's special about India's first indigenously designed guided weapon system?

Indigenously developed by the Defence Research and Development Organisation, the Pinaka rocket launcher got its first glimpse of action during the 1999 Kargil War

Key Highlights

- *The deal comes just over a week after the first ever Pinaka rocket launchers exclusively manufactured by the private sector were successfully test fired at a firing range in Pokhran*
- *The multi-barrel rocket launch system has undergone a series of upgrades, consistently proving its worth while sitting on India's peaks and neutralising enemy assets with devastating precision*
- *The earlier version of the Pinaka rocket had a range of approximately 40km. However, the upgraded Pinaka Mark II is said to have an extended range between 70 and 80 km*

On Monday, the Indian Defence Ministry put pen to paper sealing a deal with two leading private defence majors for the development and procurement of Pinaka rocket launchers for six Army regiments at a total cost estimated to be Rs 2,580 crore.

Officials from the Defence Ministry stated that the Pinaka regiments are to be deployed along India's border with China and Pakistan to improve operational preparedness of the nation's armed forces. The two companies which have won the contract to develop the launchers are Tata Power Company Ltd (TPCL) and Larsen & Toubro (L&T). Bharat Earth Movers Ltd (BEML) will reportedly, also provide the vehicles upon which the rocket launchers will be mounted.

The deal comes just over a week after the first ever Pinaka rocket launchers exclusively manufactured by the private sector were successfully test fired at a firing range in Pokhran. Against the backdrop of the government's push to increase involvement of private enterprises in the defence

sector so as to reduce the armed forces' reliance on PSUs like Hindustan Aeronautics Limited and the Ordnance Factory Board, the latest agreement will look to see 114 Pinaka Launchers operationalised by 2024.

The government's drive to bring in private sector players into defence production comes on the back of several complaints lodged by the Indian Air Force, the Army and the Navy regarding sub-standard equipment produced by India's PSUs. As far as the Pinaka rockets themselves go, India has an extremely high annual requirement of them at over 1,000 units.

Features of the highly successful Pinaka rocket launcher

Indigenously developed by the Defence Research and Development Organisation, the Pinaka rocket launcher got its first glimpse of action during the 1999 Kargil War. Since then, the multi-barrel rocket launch system has undergone a series of upgrades, consistently proving its worth while sitting on India's peaks and neutralising enemy assets with devastating precision.

The complete Pinaka MBRL system is comprised of six launcher vehicles, each of which are equipped with 12 rockets, with six loader-replenishment vehicles, two command post vehicles integrated with a fire control computer and a DIGICORA MET radar.

However, each launcher can also operate independently and can be controlled by individual computers. The launcher is made up of two pods that sit alongside each other, mounted on a Tatra launch vehicle. Rockets can be fired individually or at one go in different directions. The launcher can operate in four modes – manual, remote, standalone, and autonomous.

The earlier version of the Pinaka rocket had a range of approximately 40km. However, the upgraded Pinaka Mark II is said to have an extended range between 70 and 80 km. The launch system is capable of firing up to 12 rockets within 40 seconds, with an arsenal of six launchers capable of levelling an area of around 1,000m by 800m. The Pinaka rockets can also use a variety of warheads from pre-fragmented high explosives, anti-tank bomblets, anti-personnel mines, incendiary practice warheads, anti-tank minelets or pilot shots.

<https://www.timesnownews.com/india/article/govt-inks-landmark-pinaka-deal-whats-special-about-indias-first-indigenously-designed-guided-weapon-system/645978>



The first Pinaka rocket launchers exclusively manufactured by private sector enterprises were test fired in Pokhran in late August. | Photo Credit: Twitter

Explained: The Pinaka missile system that will be deployed along India's borders with Pakistan, China

Pinaka Rocket System: A look at the indigenously developed rocket system named after Lord Shiva's bow, its role in the battlefield and importance of the latest acquisition, which will be complete by 2024

By Sushant Kulkarni

Pune: The Ministry of Defence (MoD) on Monday announced that it's acquisition wing had signed contracts with three Indian companies for supply of six regiments of the Pinaka Rocket System to be deployed along borders with Pakistan and China.

A look at the indigenously developed rocket system named after Lord Shiva's bow, its role in the battlefield and importance of the latest acquisition, which will be complete by 2024.

The origin of Pinaka rocket system

In the battlefield, long range artillery systems like Pinaka are used for attacking the adversary targets prior to the close quarter battles which involve smaller range artillery, armoured elements and the infantry.

The development of the Pinaka was started by the Defence Research and Development Organisation (DRDO) in the late 1980s, as an alternative to the multi-barrel rocket launching systems of Russian make, called like the 'Grad', which are still in use.

After successful tests of Pinaka Mark-1 in the late 1990, it was first used in the battlefield during the Kargil War of 1999, quite successfully. Subsequently multiple regiments of the system came up over the 2000s.

The salvo of Pinaka, its versions and capabilities

The Pinaka, which is primarily a multi-barrel rocket system (MBRL) system, can fire a salvo of 12 rockets over a period of 44 seconds. One battery of Pinaka system consists of six launch vehicles, accompanied by the loader systems, radar and links with network based systems and a command post. One battery can neutralise an area one kilometre by one kilometre. As a key tactic of long range artillery battle, the launchers have to 'shoot and scoot' to ensure they themselves do not become the targets, especially due to its back blast. Thus the launcher vehicles are required to have a high degree of maneuverability.

The Mark-I version of Pinaka has a range of around 40 kilometres and the Mark-II version can fire up to 75 kilometres. Over late 2010s, multiple successful tests of the Mark-II version have been carried out by the DRDO latest ones taking place this month at Pokhran.

The Mark-II version of the rocket has been modified as a guided missile system by integrating it with the navigation, control and guidance system to improve the end accuracy and increase the range. The navigation system of the missile is linked with the Indian Regional Navigation Satellite System. In comparison to artillery guns, rockets are less accurate, but with addition of guidance and navigation systems, this aspect is taken care of.

With its upgrades, the Pinaka Mark-II can be a key element in the "network centric warfare". The rocket system can operate various modes and can carry different types of warheads.



The Ministry of Defence is acquiring six Pinaka Rocket Systems at an approximate cost of Rs 2,580 crore. (Twitter/@PIB_Panaji)

The latest acquisition

At the time when India is facing hostilities on both fronts, the announcement enhancing the long range artillery capabilities can be looked as a strong signal to the adversaries.

The acquisition wing of MoD has on Monday signed contracts with public sector entity Bharat Earth Movers Ltd and private players Tata Power Company Ltd (TPCL) and Larsen & Toubro (L&T) for supply of six Pinaka Regiments to the Regiment of Artillery of the Indian Army at an approximate cost of Rs 2,580 crore.

“These six Pinaka regiments comprise 114 launchers with Automated Gun Aiming and Positioning System (AGAPS) and 45 Command Posts to be procured from TPCL and L&T and 330 vehicles to be procured from BEML. These six Pinaka Regiments will be operationalised along the Northern and Eastern Borders of our country further enhancing the operational preparedness of our armed forces. Induction of six Pinaka regiments is planned to be completed by 2024,” a statement from the MoD said.

The ministry has called this step a major boost to ‘Make in India.’ “This is a flagship project showcasing public private partnership under the aegis of Government of India (DRDO and MoD) enabling ‘Aatmnirbharta’ in cutting edge Defence technologies,” it said.

<https://indianexpress.com/article/explained/pinaka-rocket-system-acquisition-features-capabilities-origin-6578723/>

नवभारत टाइम्स

Wed, 02 Sep 2020

बॉर्डर पर दुस्साहस अब बर्दाश्त नहीं, जानिए उस पिनाक मिसाइल सिस्टम के बारे में जो चीन, पाक सीमा पर होगा तैनात

रक्षा मंत्रालय ने टाटा पावर कंपनी लिमिटेड (टीपीसीएल) और लार्सन एंड टूब्रो (एल एंड टी)

के साथ छह सैन्य रेजिमेंट के लिए 2580 करोड़ रुपये की लागत

By Vishva Gaurav

हाइलाइट्स:

- 6 पिनाक रॉकेट लॉन्चर के निर्माण को लेकर रक्षा मंत्रालय ने किया दो कंपनियों से समझौता
- भगवान शिव के धनुष के नाम पर स्वदेशी रूप से विकसित होगा ये मिसाइल सिस्टम
- 1980 के दशक के अंत में DRDO ने शुरू किया था पिनाक को बनाने का काम

नई दिल्ली: एक ओर जहां लद्दाख में चीन लगातार भारत को आंखें दिखाने की कोशिश कर रहा है, और दूसरी ओर जहां पाकिस्तान घुसपैठ की कोशिशों में लगा है, वहीं भारत ने बड़ा फैसला लेते हुए चीन और पाकिस्तान बॉर्डर पर पिनाक मिसाइल को तैनात करने का फैसला किया है। रक्षा मंत्रालय ने छह मिलिटरी रेजिमेंट के लिए 2580 करोड़ रुपये की लागत से पिनाक रॉकेट लॉन्चर के निर्माण को लेकर सोमवार को दो अग्रणी घरेलू रक्षा कंपनियों के साथ समझौता किया है। इसी के साथ भारत ने ये साफ संकेत दे दिए हैं कि पाकिस्तान हो या चीन, सीमा पर किसी का भी दुस्साहस बर्दाश्त नहीं किया जाएगा।

भगवान शिव के धनुष के नाम पर स्वदेशी रूप से विकसित इस मिसाइल सिस्टम के लिए टाटा पावर कंपनी लिमिटेड (टीपीसीएल) और लार्सन एंड टूब्रो (एल एंड टी) के साथ कॉन्ट्रैक्ट साइन किया गया है। पिनाक को बनाने का काम रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) द्वारा 1980 के दशक के अंत में शुरू किया गया था। इसे रूस के मल्टी-बैरल रॉकेट लॉन्चिंग



सिस्टम 'ग्रेड' के एक विकल्प के रूप में देखा जाता है। आपको बता दें कि 'ग्रेड' अभी भी उपयोग में है। तो आइए, जानते हैं इस पिकान मिसाइल सिस्टम से जुड़ी कुछ खास बातें...

करगिल में पाकिस्तान के छुड़ाए थे छक्के

1990 के अंत में पिनाक मार्क -1 का सफल परीक्षण किया गया था। इसके बाद, इसे पहली बार 1999 के कारगिल युद्ध के दौरान इस्तेमाल किया गया था, जो सफल भी रहा था। मुख्य रूप से मल्टि-बैरल रॉकेट सिस्टम (MBRL) पिनाक 44 सेकंड में 12 रॉकेट लॉन्च कर सकता है। पिनाक की एक बैटरी में 6 लॉन्चर होते हैं, जिसमें लोडर सिस्टम, रडार और नेटवर्क बेस्ड सिस्टम एक कमांड पोस्ट के साथ लिंक होते हैं।

हाल ही में पोखरण में हुआ सफल परीक्षण

पिनाक की एक बैटरी एक स्कॉयर किलोमीटर इलाके को पूरी तरह से ध्वस्त कर सकती है। लॉन्ग रेंज आर्टिलरी बैटल की अहम रणनीति के तौर पर, लॉन्चर को 'शूट एंड स्कूट' करना पड़ता है ताकि यह सुनिश्चित हो जाए कि वे खुद टारगेट न बनें। पिनाका के मार्क- I वर्जन में करीब 40 किलोमीटर की रेंज तक मार करने की क्षमता थी, वहीं मार्क-II वर्जन 75 किलोमीटर तक फायर कर सकता है। DRDO की ओर से 2010 के बाद मार्क- II वर्जन के कई सफल परीक्षण किए गए। इसी महीने पोखरण में भी इसका हालिया परीक्षण किया गया।

नए वर्जन में बेहतर नेविगेशन सिस्टम

रॉकेट के मार्क- II वर्जन में बेहतर नेविगेशन, कन्ट्रोल और गाइडेंस सिस्टम के साथ अपग्रेड किया गया है। इससे इसकी रेंज और सटीकता बढ़ गई है। मिसाइल का नेविगेशन सिस्टम इंडियन रीजनल सैटलाइट सिस्टम से लिंक है। पिनाक मार्क-II अपग्रेड होने के बाद 'नेटवर्क केंद्रित युद्ध' में काफी अहम भूमिका निभा सकता है। रॉकेट सिस्टम अलग-अलग मोड को ऑपरेट कर सकता है और विभिन्न प्रकार के वॉरहेड कैरी कर सकता है।

2024 तक शुरू होगा संचालन

जिस समय भारत दोनों मोर्चों पर दुश्मनों का सामना कर रहा है, उस समय लॉन्ग रेंज आर्टिलरी क्षमताओं को बढ़ाने वाली घोषणा को एक मजबूत जवाब के संकेत के तौर पर देखा जा रहा है। आपको बता दें कि रक्षा मंत्रालय ने सोमवार को कहा था कि 6 पिनाक रेजिमेंट में 'ऑटोमेटेड गन एमिंग एंड पोजिशनिंग सिस्टम' (एजीएपीएस) के साथ 114 लॉन्चर और 45 कमान पोस्ट भी होंगे। बयान में कहा गया था कि मिसाइल रेजिमेंट का संचालन 2024 तक शुरू करने की योजना है।

पिनाक में 70% स्वदेशी मटीरियल

रक्षा मंत्रालय के बयान के मुताबिक, वेपन सिस्टम में 70 प्रतिशत स्वदेशी मटीरियल होगा और रक्षा मंत्री राजनाथ सिंह तथा वित्त मंत्री निर्मला सीतारमण ने प्रॉजेक्ट को मंजूरी दी है। पिनाका मल्टीपल लांच रॉकेट सिस्टम (एमएलआरएस) को डीआरडीओ ने डिवेलप किया है। मंत्रालय ने बताया, 'यह एक महत्वाकांक्षी प्रॉजेक्ट है जो 'आत्मनिर्भर' बनने के लिए अत्याधुनिक टेक्नॉलजी के क्षेत्र में पब्लिक-प्राइवेट सेक्टर की पार्टनरशिप को प्रदर्शित करती है।'

<https://navbharattimes.indiatimes.com/india/explainer-know-specialities-of-pinaka-missile-system-who-will-respond-china-and-pakistan-on-the-border/articleshow/77871053.cms>

Indian MoD orders six regiments' worth of Pinaka multi-barrel rocket launchers

Pinaka Rocket System: A look at the indigenously developed rocket system named after Lord Shiva's bow, its role in the battlefield and importance of the latest acquisition, which will be complete by 2024

By Rahul Bedi

India's Ministry of Defence (MoD) has signed a INR25.8 billion (USD353.5 million) contract with two domestic private-sector companies and a public-sector enterprise for the supply of six regiments' worth of indigenously developed Pinaka Mk I multi-barrel rocket launcher (MBRL) systems to the Indian Army (IA).

A Pinaka MBRL system. The Indian government announced on 31 August that it placed an order for six regiments' worth of the system for the Indian Army. (BEML Limited)

The Indian government's Press Information Bureau (PIB) announced on 31 August that the deal includes procuring 114 launchers with automated gun alignment and positioning systems (AGAPSSs) and 45 command posts from Tata Power and Larsen & Toubro.

A total of 330 high-mobility vehicles - worth a combined INR8.42 billion - will be manufactured by BEML Limited at its Palakkad plant in Kerala, with deliveries expected to be completed within three years. The majority of these vehicles, however, will not be fitted with launchers, but will instead be used to carry additional rockets for the Pinaka systems.

Meanwhile, the rockets, which have an estimated range of 38-40 km, will be manufactured by private-sector company Economic Explosives Limited in Mumbai. The rockets had previously been made by the state-owned Ordnance Factory Board (OFB).

The PIB stated that deliveries of the recently ordered Pinaka systems are to be completed by 2024, adding that all six regiments' worth "will be operationalised along the northern and eastern borders to further enhance the armed forces' operational preparedness". This region includes the disputed 4,057 km-long Line of Actual Control (LoAC) with China.

<https://www.janes.com/defence-news/news-detail/indian-mod-orders-six-regiments-worth-of-pinaka-multi-barrel-rocket-launchers>



Atmanirbharta in Defence

By Dr. Sudershan Kumar

Ever since the Modi Government has taken over the reigns of the country, a constant emphasis and thrust has been on making India self sufficient and a world superpower. To achieve this afore mentioned vision, the concept of making India Atma Nirbhar in key areas including Defence seems indispensable. This assumes even more significance in the wake of covid pandemic.

Prime Minister Narendra Modi on 20th May 2020 reiterated his vision of making “Atma Nirbhar Bharat” while announcing the COVID-19 related economic package. This concept of self reliance is imperative not only to prepare India for a much bigger and strategic role in the fast changing dynamics of the globalized world but also to minimize the dependency on other countries. But by no means does it aim to propagate alienation.



The present Government of India has taken numerous initiatives such as changing the definition of MSME's, boosting scope for private participation and increase of foreign direct investment in defence etc. Many in the country have designated this as a repacked version of Make in India by using the new tag line “Vocal for Local”. But ironically, this push by the Government has yielded fruits especially at the time when the country is battling the impact of COVID-19 pandemic. This is evident by the fact that India's personnel Protective Equipment sector has risen exponentially from Zero before March 2020 to 150,000 per day in just two to three months. Similar push is required in renewable energy, information technology and defence manufacturing to bolster the economy of the country.

Besides, the aggressive expansionist posture adopted by China along LAC in close proximity with Pakistan furthermore necessitates and endorses the significance of self reliance in defence. Moreover the recent incidents of incursions, scuffles, and face off at LAC and frequent cease fire violations along LOC especially targeting civilian populations are clear future telltale signs that India is destined to face multi fold security threats from Northern & Western neighbours. Hence calibrated and coordinated efforts both on long term and short basis from all stakeholders are required to achieve 80 to 90 percent Atma -Nirbartha for indigenous development and manufacturing of systems in defence. Ironically, even after seven decades of independence, India could achieve self-reliance in development and manufacturing of indigenous systems to the tune of 35 to 40% only. Rest 60% needs of armed forces are met through import of major defence systems from friendly countries which creates vulnerability during crisis. Therefore the need of the hour is to thoroughly introspect our past strategy and work towards filling the gaps in the light of the swift changing global scenario since World-II.

Furthermore, after a detailed analysis, it's very evident that the global scenario after world war-II underwent a paradigm shift with countries following the policy of nurturing their Defence Industry Base (DIB) for external threats especially when the world was divided in two blocks Eastern Block and Western block. There after the disintegration of Soviet Union and the end of cold war again facilitated a security scenario alteration drastically. Most of these nations revised their security policy. For sustenance of their Defence Industry Base (DIB), they also adopted the approach of manufacturing through privatization, international trade, forming alliances, and pooling resources of likeminded nations. Even the United States of America and Russia made defence export as their critical component of their policy and laid greater focus on R&D and manufacturing by spending nearly 2.8% and 1.5% respectively of their GDPs on R&D.

Interestingly Israel, even though a small country comes in the category of 5 top defence exporters with defence export worth nearly 7.2 billion US \$. Besides countries like Japan, Germany, South Korea, France spend nearly 3.4%, 2.9%, 3.6% and 2.3% of their GDP on R&D respectively. On the contrary, India is heavily dependent on foreign systems / platform to cater to the needs of armed forces. Therefore, introspection is required into the low indigenous development rate and delay in manufacturing despite the presence of rich pool of young talented and innovative scientific manpower.

Also this tortoise approach over the years comes against the backdrop of huge infrastructure for R&D in the form DRDO, ISRO, DAE, IIT's, NIT's, large number of Universities and Technical Institutes and for manufacturing ordinance factories, and defence PSU's. Following reasons can be cited: Firstly, the ownership of defence related projects from development to manufacturing among developer, manufacturer and end user is not well defined. It is also not linked with accountability and responsibility. This resulted into cost overrun and time delay.

Secondly, Indian defence budget is around 448,820 crores (2019-20) with capital outlay more than one lakh crores. This capital portion must be cumulative, non-lapsable and project oriented with separate budget for strategic projects. R&D component must be enhanced from 0.9% to at least 1.5 percent.

Thirdly, the gestation period is too long. Manufacturing infrastructure is not adequate to produce large numbers in short time. It is only confined to ordnance factories and defence PSUs. It takes years to execute the orders as a result the technology becomes obsolete. Although in recent past, efforts have been made to rope in private players for defence manufacturing still a long road needs to be travelled.

Fourth, authorities at the helm of affairs have not been able to tap the potential of the younger innovative minds especially in the field of information warfare and space weaponisation. In these genres and frontiers of research, genius Indian minds can excel and lead the world if tapped properly. Time and again, these young talented minds have always delivered and developed various technological innovations at very low costs and in a record time.

Moreover, last but not the least, and the most important is the frail coordination between all the stakeholders that is MOD, Services, R&D organizations, manufacturing agencies including the private industry. The blame game which further ensues following their failure further vitiates the process.

Lastly and significantly, the short term long term strategy for indigenous development of critical technologies keeping new millennium threats in mind has to be evolved. Parallely the immediately needs can be met through ex-import.

To strengthen the Atma Nirbharta in defence the present Modi Government has already initiated a number of measures. Notably among them are:- the appointment of four star general as Chief of defence staff (CDS), increase in foreign direct investment (FDI), reforms in procurement procedures, allowing Indian companies for export of defence equipment to friendly countries including restriction on import of 101 items, also DRDO handing over list of 108 items to industry and many others. But a lot more is required.

First and foremost, we need a correct assessment of the new millennium future security threats emanating from newer technologies in five verticals. These are conventional, unconventional, information warfare (including cyber warfare, artificial intelligence and quantum communication) deep sea technologies and space research and many newer technologies. For that a task force, comprising of ex Service Chiefs, ex R&D experts and strategists from think tanks, needs to be formed with clear mandate to predict and foresee the future threats for next fifty years and forecast the technologies to contain and thwart these threats.

Task of development of these critical technologies on war footing be assigned to younger genius minds with incentives and rewards. Second, greater push is required for up gradation and modernization of manufacturing infrastructure with abrogation of monopoly of Defence PSUs and Ordnance factories. Equal level playing field be provided to private players with firm commitment

of numbers, life cycle supports & maintenance including spares. Third, the much talked about reforms in armed forces be expedited.

Besides local youths from the border villages be enrolled in ITBP, Ladakh, Scouts, Territorial Army for manning the Indian borders This move will serve as double edged weapon for maintaining the strict vigil along the border and will also provide employment to local youth of the area. Fourth, it is often observed that development of technology takes much less time as compared to induction and manufacturing. To overcome this issue, a consortium approach be adopted from conception to development, then induction and manufacturing. This will pave the way for complete synergy between end user, developer and manufacturer. There must be R&D audit, manufacturing audit Induction audit. The ownership of the project be fixed with sense of responsibility and accountability with rewards and punishment. The author is of the opinion that the implementation of these steps will not only make country Atma Nirbhar in defence but also pave the ways for Bharat to become Vishwa Guru.

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<https://www.dailyexcelsior.com/atmanirbharta-in-defence/>

Defence News

Defence Strategic: National/International



Wed, 02 Sep 2020

Indian Army foils 3rd Chinese attempt in 3 days to transgress across LAC: Sources

Indian security forces on Tuesday foiled an attempt by the Chinese Army to transgress into Indian areas in the general area of Chumar, a border patrol facility located in south-eastern Ladakh

By Manjeet Singh Negi

New Delhi: While a Brigade Commander-level meeting to ease tensions along the LAC ended in a stalemate, Indian security forces on Tuesday foiled an attempt by the Chinese Army to transgress into Indian areas in the general area of Chumar, a border patrol facility located in Kaala Top area in south-eastern Ladakh. This was the third attempt by the Chinese troops in last three days to transgress into the Indian side.

Around seven to eight heavy vehicles of the Chinese army set off towards the Indian side of the Line of Actual Control (LAC) from their Chepuzi camp, Sources told India Today TV.

According to sources, the Indian security forces also deployed vehicles to prevent any intrusion. Seeing the vehicles from the Indian side along with troops, the Chinese side returned towards their camp, sources said.

Indian security forces are on high alert all along the LAC to prevent any incursion by the Chinese in any sector.

India on Tuesday said that even as it was engaged with China to de-escalate tensions after the fresh border standoff in the intermittent night of August 29-30, Chinese troops on Monday engaged in "provocative action" for the second time.

Ministry of External Affairs (MEA) spokesperson Anurag Srivastava in a statement said, "Yesterday (August 31), even as the ground commanders of the two sides were in discussions to de-escalate the situation, the Chinese troops again engaged in provocative action. Due to the timely defensive action, the Indian side was able to prevent these attempts to unilaterally alter the status quo."

According to sources, the Chinese forces on Monday had once again tried to close in on Kaala Top and Helmet Top in an aggressive manoeuvre. However, they were stopped by Indian forces who shouted to them using megaphones to tell them that they had been spotted.

The MEA was responding to media questions on the recent developments in the India-China border areas in the Pangong Tso Lake area in Ladakh.

Kaala Top is actually a hill area which lies in the Indian territory, however, there has never been any army deployment on these hills from either countries. In 2014 the Chinese Army had put tents on the Kaala Top area, but after India's objection, they returned after two months.

China has been eyeing the Kaala Top area for many years. In fact, from this area, India's territory can be monitored far and wide. Neither Chinese nor Indian troops are deployed here.

<https://www.indiatoday.in/india/story/indian-army-foils-attempt-chinese-army-lac-chumar-ladakh-border-standoff-1717548-2020-09-01>



Wed, 02 Sep 2020

India, China hold Brigade Commander-level talks in Chushul on the Indian side of LAC

Synopsis

On Monday, the Indian Army said the Chinese military carried out "provocative military movements" to "unilaterally" change the status quo on the southern bank of Pangong lake on the intervening night of August 29 and 30 but the attempt was thwarted by the Indian troops.

New Delhi: India and China on Tuesday held another round of military talks to ease escalating tension triggered by fresh confrontation between the two sides on the southern bank of the Pangong lake in eastern Ladakh, government sources said. The Brigade Commander-level talks began at 10 am in Chushul on the Indian side of the Line of Actual Control (LAC) in eastern Ladakh with a specific agenda to discuss the situation around the Pangong lake, they said, adding the meeting is underway.

On Monday, the Indian Army said the Chinese military carried out "provocative military movements" to "unilaterally" change the status quo on the southern bank of Pangong lake on the intervening night of August 29 and 30 but the attempt was thwarted by the Indian troops.

The two sides held talks for around six hours on Monday as well but no concrete outcome emerged from the engagement, the sources said.

They said a sizeable number of Chinese troops attempted to occupy the area in a bid to open a new front as the two sides continue to hold talks to resolve the three-and-half-month-long border row.

The two sides were earlier engaged in a confrontation on the northern bank of Pangong lake but it was for the first time such an incident occurred on its southern bank, they said.

Following the Chinese attempt, the Indian Army has significantly strengthened its presence on a number of "strategic heights" around the Pangong lake besides further bolstering its presence in the area.

A battalion of the Special Frontier Force was also deployed in the area. It is learnt that Chief of Army Staff Gen M M Naravane reviewed the overall situation in eastern Ladakh at a high-level meeting in the Army headquarters.

The sources said the Indian Air Force (IAF) has also been told to enhance its surveillance on increasing Chinese air activities along the LAC in eastern Ladakh.

There have been reports that China has deployed J-20 long-range fighter jets and several other key assets in strategically located Hotan airbase which is around 310 kms from eastern Ladakh.

In the last three months, the IAF deployed almost all its frontline fighter jets like Sukhoi 30 MKI, Jaguar and Mirage 2000 aircraft in the key frontier air bases in eastern Ladakh and elsewhere along the LAC.

The fresh attempt by China to change the status quo in the Pangong lake area is the first major incident in the area after the Galwan Valley clashes on June 15 in which 20 Indian Army personnel were killed.

China also suffered casualties but is yet to make the details public. According to an American intelligence report it was 35.

India and China have held several rounds of military and diplomatic talks in the last two-and-half months but no significant headway has been made for a resolution to the border row in eastern Ladakh.

<https://economictimes.indiatimes.com/news/defence/india-china-hold-brigade-commander-level-talks-in-chushul-on-the-indian-side-of-lac/articleshow/77868996.cms>



Wed, 02 Sep 2020

India China Standoff and the significance of Galwan clashes on 15/6

Before the event fades into the annals of history, its special significance for the combative spirit of the Indian army soldier needs to be highlighted and etched in stone

By Maj Gen Shashikant Pitre

15th June (15/6) was just not an 'another day' in the chronicles of the Indian Army. That is so, not only because twenty gallant Indian soldiers made the supreme sacrifice for their motherland and attained martyrdom. It is also not because an unknown number of Chinese soldiers much larger than twenty were killed in the duel. A grateful nation paid its tributes repeatedly for the divine oblation for the Indian martyrs. The clash was voluminously covered in the print and television media; dissected, analysed and its raison d'être' unceasingly questioned by expert carpers. Ostensibly, all that was to be said about the episode was said.

However, before the event fades into the annals of history, its special significance for the combative spirit of the Indian army soldier needs to be highlighted and etched in stone. The incident brought out some relevant lessons regarding the feeble potential of a Chinese soldier and the intrepid fighting psyche of an Indian soldier. It is necessary to pause and assimilate their significance. Not that this is any new discovery, yet it will be of benefit to restate the obvious.



The Indian Army came face to face with the PLA on a large scale for the first time in 1962. For a variety of reasons; such as the inept political vision including non-utilisation of the Indian Air Force, total lack of appreciation of the enemy capability and intelligence, the flawed 'Forward Policy' entailing deployment in tactically unacceptable penny-packets right in the 'shop-window' with no depth, induction of ill-equipped, inadequately clothed, ill-administered and unacclimatised troops and injudicious as well as impulsive decisions of senior military officers like the attack on strongly held Thagla Ridge or premature vacation of fairly formidable defences at Sela; India suffered an ignominious and decisive defeat. These blunders were at the level of grand and operational strategy. At the tactical level, the Indian soldier fought valiantly.

Ironically, the most damaging aftermath of the 1962 debacle was at the tactical level: the ill-conceived and unreal larger- than- life image of a Chinese soldier generated in the minds of not only the Indian populace but even that of the soldiers.

Fortunately, we had to carry this baggage only for a brief period of less than five years. It was demolished in 1967, when the Indian troops mauled the Chinese garrisons at Nathula in Sikkim on September 11 and at Chola in Arunachal Pradesh on October 1 of that year. The Chinese suffered grievously on both occasions and were totally humbled.

In Nathula, we were fortunate to have a staunch Divisional Commander of the calibre of Gen Sagat Singh, who gave orders to attack the Chinese post and even brought artillery fire on the post. There was an equally capable and brave Commanding Officer of the Grenadier battalion, Lt Col Rai Singh who carried out those orders in true letter and spirit, in spite of being wounded. A resolute response was displayed by the Indian soldiers. While 65 Indian soldiers were martyred, the Chinese casualties were in the region of 300-350. Another incident when the Chinese were taught a lesson took place during the same month at Chola, on the border in the Arunachal Pradesh, when a Gorkha JCO standing with his leg on a boulder was told by a Chinese soldier to take it off because, according to him, the boulder was in the Chinese Territory. When the Indian JCO told him sternly that he was standing in the Indian Territory, the Chinese made a threatening gesture. The Gorkha JCO took out his Khukri and sheared off the arm of the Chinese. In a battle which took place the next day, the Gorkha battalion recaptured the post at Point 15450.

These incidents are mirror images of the June 15 incident under the able command of Col Suresh Babu. There is a lesson to learn from all of them and that's the purpose of this narrative.

The Indian soldier in 1950s primarily came from a rural background. As such, the Indian Army never carried the Martial Race mindset. The soldiers came from everywhere throughout the length and breadth of India, yet they had one thing in common. They were simple, amenable to good order and discipline, possessed a high sense of loyalty to 'Naam, Namak aur Nishan', had frugal personal needs and could be groomed in excellent fighting combatants. Under good leadership, they formed an incomparable fighting machine. They are the rightful claimants of the maxim of 'man behind the machine.' That can be equally stated about the junior leadership of the Indian Army. With rigorous selection methods, quality training and high levels of motivation; they are an apt counterpart of the men they lead. Together they form the sharp edge of the sword blade which has to cut through the enemy time and again. With mediocre weapons and weapon platforms, they have won every war and the battle they have fought and also performed exceptionally well against the terrorists.

With the passage of time, the higher proportion of entrants is now from the urban origin, more educated and with higher aspirations. The Indian soldier is also now better paid, and attuned to comfort due to the enhancement in his quality of life. The art of the higher leadership is to ensure that these assets do not degrade the fighting potential particularly of soldiers of the infantry and other fighting arms. The 15/6 episode has shown that it has not. It has demonstrated that he can be ferocious and savage if the enemy challenges him to be so. It has shown that he can excel in the technique of unarmed combat, not merely on the training ground but right in the face of the Chinese, using if necessary, enemy's crude implements of the medieval era and pay him back in his coin. Notwithstanding those huge congregations of Chinese awesome modern weapon platforms of armoured vehicles, missiles and guns paraded on their Independence Day, what is

going to matter is the will and 'never-say-die' spirit of the Indian soldier fighting in the freezing high altitudes of Ladakh and Arunachal Pradesh on the Actual Line of Control (LAC).

In the present scenario, the chances of China launching a major offensive in that arduous mountainous terrain are lesser than he trying to use his 'Salami Slicing' stratagem to grab tactically important territory on the LAC and attempt to gain moral ascendancy over India. The fragile spirit and physical weakness of the Chinese soldier was exposed in various duels fought since May 5, which became glaringly apparent during the 15/6 episode. The combative zeal and expertise of the 'Ghatak' platoons, the Commandos, of forward infantry battalions actually won the day. This asset of the Indian soldier will dissuade the Chinese to grab small pieces of territory on the LAC. Maximum endeavour must be made to nurture and intensify this psyche. The PLA is surely not that dumb not to take note of this gradual enhancement in the moral ascendancy of the Indian Armed Forces. This is the significance of 15/6.

(The author is an Indian Army Veteran. He was GOC 9 DIV, COS ARTRAC. Views expressed are personal.)

<https://www.financialexpress.com/defence/india-china-standoff-and-the-significance-of-galwan-clashes-on-15-6/2071407/lite/>



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Indian Navy to launch bidding process by year-end to procure 6 indigenous submarines

India is ready to start the bidding process by next month for a Rs 55,000-crore (7.536.826,00\$) ambitious project to build six indigenous submarines for the Indian Navy to taper the gap with China's growing naval capabilities, government sources said on August 30 2020.

The submarines will be built in India under the Navy's P75I program and guided by the Ministry of Defence's Strategic Partnership model, which aims to build indigenous capabilities in order to reduce import dependence, a senior ministry official said.

The RFP for the project, which is being billed as one of biggest "Make in India" ventures, will be issued by October and the defence ministry has already shortlisted two Indian shipyards, L&T group and state-owned Mazagaon Docks Ltd (MDL), and five foreign defence majors for the project, ThyssenKrupp Marine Systems (Germany), Navantia (Spain) and Naval Group (France) are foreign partners.



An artist rendering of the Project 75I submarine of the Indian Navy. (Picture source: Indian Navy)

The P75I Scorpene-class diesel-electric / air-independent propulsion (AIP) submarines are based on the Scorpene-class submarines, which were designed by French naval shipbuilding firm DCNS in partnership with Spanish shipbuilding firm Navantia.

The P75I Scorpene-class submarines are armed with six torpedo launching tubes, 18 heavy weapons, tube-launched MBDA SM-39 Exocet anti-ship missiles and precision-guided weapons. The weapons are carried in weapon launching tubes and can be easily reloaded at sea.

<https://navyrecognition.com/index.php/news/defence-news/2020/september/8924-indian-navy-to-launch-bidding-process-by-year-end-to-procure-6-indigenous-submarines.html>

Vice Adm SR Sarma assumes charge as Chief of Materiel of Indian Navy

During his illustrious career spanning over three and a half decades, the Admiral has served onboard Indian Naval ships Vindhyagiri, Rana, Krishna and Mysore in various capacities

New Delhi: Vice Admiral SR Sarma, AVSM, VSM has assumed charge as the Chief of Materiel, of the Indian Navy today (01 Sep 2020). The Admiral is a post-graduate in Computer Science and Engineering from IISc, Bengaluru and distinguished alumni of Naval Higher Command Course.

During his illustrious career spanning over three and a half decades, the Admiral has served onboard Indian Naval ships Vindhyagiri, Rana, Krishna and Mysore in various capacities.

He has tenanted varied and challenging appointments in Naval Dockyards at Mumbai and Visakhapatnam, and at Weapons and Electronics Systems Engineering Establishment (WESEE), Headquarters, Advanced Tactical Vessel Program (HQ ATVP) and Naval Headquarters in New Delhi.

As a Flag Officer, the Admiral has served as Assistant Chief of Materiel (IT & Systems) in Naval Headquarters, Admiral Superintendent of Naval Dockyard, Visakhapatnam; Chief Staff Officer (Technical), HQ ENC; Director General Naval Projects at Vishakhapatnam, Programme Director, HQ ATVP; and as Controller of Warship Production and Acquisition in Naval Headquarters.

In recognition of his distinguished services, the Admiral was awarded the Ati Vishisht Seva Medal and Vishisht Seva Medal. He is also a recipient of Lt VK Jain Gold Medal in 1994.

As a Principal Staff Officer and the senior-most Technical Officer in the Indian Navy, the Admiral would be in charge of all aspects related to Maintenance Management and Life-Cycle Product Support of all Engineering, Electrical, Electronics, Weapons, Sensors, and IT-related equipment and systems for ships and submarines; and creation of major marine and technical infrastructure.

He relieves Vice Admiral GS Pabby, PVSM, AVSM, VSM who superannuates on completion of an illustrious Naval career spanning close to four decades.

(With Inputs from PIB)

<https://www.devdiscourse.com/article/headlines/1193373-vice-adm-sr-sarma-assumes-charge-as-chief-of-materiel-of-indian-navy>



The Admiral is a post-graduate in Computer Science and Engineering from IISc, Bengaluru and distinguished alumni of Naval Higher Command Course. Image Credit: [Twitter\(@PIB_India\)](#)

Indian Navy to hold mega exercise with Russia in Bay of Bengal on September 4 and 5

The exercise is taking place at a time when India is engaged in a bitter border row with China in eastern Ladakh. The Indian Navy has significantly expanded its presence in the Indian Ocean Region, deploying a plethora of warships and submarines following the border row to send across a message to Beijing as the maritime space around the Malacca Strait is very critical for China's supply chain through sea routes

New Delhi: The Indian and Russian navies will hold a mega military exercise in the Bay of Bengal on September 4 and 5 to further bolster their operational interoperability in dealing with emerging security challenges, official sources said on Tuesday. As part of the Indra Navy exercise, a plethora of maritime drills such as gun firing on surface and aerial targets, tracking exercises and replenishment at sea approaches are planned, they said.

The exercise is taking place at a time when India is engaged in a bitter border row with China in eastern Ladakh. The Indian Navy has significantly expanded its presence in the Indian Ocean Region, deploying a plethora of warships and submarines following the border row to send across a message to Beijing as the maritime space around the Malacca Strait is very critical for China's supply chain through sea routes.

In July, the Indian Navy carried out a military exercise with a US Navy carrier strike group led by the nuclear-powered aircraft carrier USS Nimitz off the coast of Andaman and Nicobar Islands. The USS Nimitz is the world's largest warship. The Indra exercise was earlier planned in Vladivostok in Russia but was postponed due to the coronavirus pandemic.

Russian Navy ships Admiral Vinogradov, Admiral Tributs and Boris Butoma along with a fleet of helicopters will be part of the exercise, the sources said. The Indian Navy will deploy Ranvijay (destroyer), Sahyadri (frigate) and Kiltan (corvette) and Shakti (tanker) with integrated helicopters, they said.

The sources said the exercise will be non-contact and at sea only passage exercise. "The exercise will once again showcase the level of friendship, trust and interoperability between Indian Navy and the Russian Navy," said a source.

The Russian naval fleet is visiting the port of Hambantota in Sri Lanka from August 31 to September 3. India-Russia Indra exercises among the armies, navies and air forces of the two countries have been taking place since 2005.

In the exercise with the US Navy in July, four frontline warships of the Indian Navy participated. The US carrier strike group was transiting through the Indian Ocean Region on its way from the South China Sea. The US Navy carrier strike group comprises USS Nimitz, Ticonderoga-class guided-missile cruiser USS Princeton and Arleigh Burke-class guided-missile destroyers USS Sterett and USS Ralph Johnson.

The Indian Navy carried out similar exercises with the Japanese navy in June.

<https://www.news18.com/news/india/indian-navy-to-hold-mega-exercise-with-russia-in-bay-of-bengal-on-september-4-and-5-2839973.html>



(Image for representation) The Indian Navy's vessels INS Rana and INS Kulish. (Photo: Twitter/@jmsdf_pao_eng)



Wed, 02 Sep 2020

चीन सीमा पर तनाव के बीच बंगाल की खाड़ी में भारत और रूस करेंगे नौसैनिक अभ्यास

यह अभ्यास ऐसे समय किया जा रहा है जब भारत, पूर्वी लद्दाख में चीन के साथ गतिरोध की स्थिति में है।

नई दिल्ली: भारत और रूस की नौसेनाएं बंगाल की खाड़ी में चार से पांच सितंबर के बीच बड़ा सैन्य अभ्यास करेंगी। आधिकारिक सूत्रों ने मंगलवार को यह जानकारी दी। उन्होंने कहा कि सुरक्षा के क्षेत्र में उभरती हुई चुनौतियों से निपटने के लिए दोनों देशों की नौसेनाओं की क्षमता को और विकसित करने के वास्ते यह अभ्यास किया जाएगा।

सूत्रों ने कहा कि 'इंद्र नौसैनिक अभ्यास' के तहत सतह और हवा में मौजूद लक्ष्यों को मार गिराने जैसे अनेक अभ्यास किए जाएंगे।

यह अभ्यास ऐसे समय किया जा रहा है जब भारत, पूर्वी लद्दाख में चीन के साथ गतिरोध की स्थिति में है। इंद्र अभ्यास पहले रूस के व्लादिवोस्तक में आयोजित होना था लेकिन कोविड-19 महामारी के चलते इसे टाल दिया गया था।

सूत्रों ने बताया कि इस नौसैनिक अभ्यास में रूसी युद्धपोत एडमिरल विनोग्रादोव, एडमिरल त्रिबुत्स और बोरिस बुतोमा के अलावा हेलीकॉप्टरों का बेड़ा भी भाग लेगा। उन्होंने कहा कि भारतीय नौसेना अपने युद्धपोत रणविजय, सहयाद्रि, किल्टान, शक्ति और हेलीकॉप्टरों के साथ अभ्यास में भाग लेगी।



(प्रतीकात्मक तस्वीर)

<https://www.abplive.com/news/india/indian-navy-to-hold-exercise-with-russia-in-bay-of-bengal-1547767>



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India, France holds discussions for Mission Alpha-like equipment for Gaganyaan astronauts

Mission Alpha is the name given to French Astronaut Thomas Pesquet's mission, under which, he will be sent off to the International Space Station (ISS) while flying on Crew Dragon spacecraft early next year

By Sangeeta Nair

India and France are in an advanced stage of discussions for providing Mission Alpha-like equipment to 'Gaganyaan' astronauts.

According to a senior official at the French space agency, National Centre for Space Studies (CNES), the discussions are in the final stage and an announcement is likely to be made soon regarding the same. The official also confirmed that the work on the instrumentation for Mission Alpha was on.

Mission Alpha is the name given to French Astronaut Thomas Pesquet's mission, under which, he will be sent off to the International Space Station (ISS) while flying on Crew Dragon spacecraft early next year.



Key Highlights

- ISRO and CNES are holding discussions for providing required equipment to the Gaganyaan astronauts, similar to the one that will be used by French Astronaut Thomas Pesquet during Mission Alpha.
- Pesquet, who spent six months on the International Space Station between November 2016 and June 2017, is currently training with Crew Dragon spacecraft and station simulators for Mission Alpha, in which he will return to the ISS.
- His new mission has been named 'Alpha' after a competition organised by the European Space Agency in partnership with CNES that attracted more than 27,000 entries. The name 'Alpha' came up 47 times in the entries received.
- The four short-listed Indian Air Force pilots and prospective astronauts for India's Gaganyaan mission are currently undergoing training in Russia.

Significance

France has a well-established mechanism for space medicine and it also has the French Institute of Space Medicine and Physiology space clinic, which is a subsidiary of CNES, where space surgeons undergo training. Indian space surgeons are scheduled to visit France in 2020 once the COVID-19 situation eases for training.

Mission Alpha

The European Space Agency has established User Support and Operations Centres (USOC) to allow European scientists to gain access to the International Space Station and coordinate activities there. One of the centres, the centre for the development of microgravity applications and space operations (CADMOS) is located at CNES's Toulouse Space Centre.

The CADMOS centre is a point of contact between the ground segments in the US, Europe and Russia and the science teams supporting astronauts, as they perform experiments in real-time during human space flights.

Background

India and France share close collaborations in the space sector. The space agencies of the two nations are also collaborating on the nearly Rs 10,000 crore Gaganyaan mission, which aims to send three Indians to space by 2022. French flight surgeon Brigitte Godard was in India in 2019 to train Indian physicians and engineers.

<https://www.jagranjosh.com/current-affairs/india-france-holds-discussions-for-mission-alphalike-equipment-for-gaganyaan-astronauts-1598963120-1>



Wed, 02 Sep 2020

New advancement in nanophotonics has the potential to improve light-based biosensors

By Steve Carr

As COVID-19 swept across the world this year, claiming hundreds of thousands of lives, it quickly became clear that one essential factor for controlling its spread is the ability to rapidly and accurately test for the virus causing it, SARS-CoV-2, as well as the antibodies it produces.

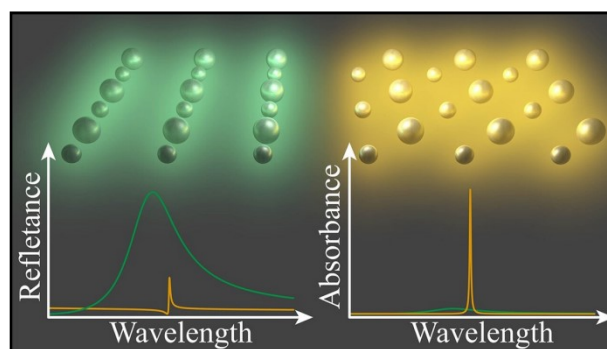
Now, scientists from The University of New Mexico and the Autonomous University of Madrid (UAM) in Spain have published a new study that they say could contribute to faster and more effective testing for viruses like SARS-CoV-2. Their work, titled "Super- and Subradiant Lattice Resonances in Bipartite Nanoparticle Arrays," was published in the journal *ACS Nano*.

Led by Assistant Professor Alejandro Manjavacas from the Theoretical Nanophotonics Group of the UNM Department of Physics and Astronomy, and Antonio Fernández-Domínguez from UAM, the work falls under the realm of nanophotonics, the field that studies the interactions between light and objects that have sizes on the order of hundreds of nanometers. For reference, the thickness of a human hair is approximately 40,000 nm, while the size of the virus causing COVID-19 is 125 nm.

Many applications of nanophotonics, including ultrasensitive biosensing, which is needed to detect viruses like SARS-CoV-2, and nanoscale lasing, which can be used to produce coherent light of a desired color, rely on systems that only respond to a very narrow range of colors, or, in other words, wavelengths of light. One way to design systems with spectrally narrow responses like this is to take advantage of the collective interactions between a collection of metallic nanoparticles, tiny structures with nanoscale dimensions, arranged in an ordered fashion called a periodic array.

In the study, the researchers specifically looked at periodic arrays that contain nanoparticles of two different sizes, rather than more common arrangements that feature completely uniform ones.

"The interplay between the two different nanoparticles gives rise to even narrower responses than arrays with particles of only one size," says Alvaro Cuartero-González, a graduate student



Credit: University of New Mexico

from UAM and lead author of the paper. "And, as an added bonus, it makes them more robust to fabrication imperfections, so arrays with the desired response can more easily be built in labs."

This increased robustness can make an enormous difference when it comes to mass-production of tests or other devices exploiting the optical response of these systems.

This exciting work involved a combination of semi-analytical calculations and rigorous numerical simulations, carried out through the synergistic collaboration of three graduate students Cuartero-González, who visited UNM between September 2019 and February 2020, as well as Stephen Sanders and Lauren Zundel, both from the UNM Department of Physics and Astronomy.

"Our semi-analytical predictions give insight into the physics behind our results, while the numerical computations helped to confirm their validity," said Sanders about the work. "The key to understanding the robustness of the system comes from our calculations for finite systems," added Zundel.

"Combining the expertise of the two groups was essential to the success of this work," said Manjavacas of the collaboration.

Fernández-Domínguez agrees, adding, "I hope that this is just the beginning of many collaborative efforts between us."

More information: Alvaro Cuartero-González et al. Super- and Subradiant Lattice Resonances in Bipartite Nanoparticle Arrays, *ACS Nano* (2020). DOI: [10.1021/acsnano.0c04795](https://doi.org/10.1021/acsnano.0c04795)

Journal information: [ACS Nano](https://doi.org/10.1021/acsnano.0c04795)

<https://phys.org/news/2020-09-advancement-nanophotonics-potential-light-based-biosensors.html>



Wed, 02 Sep 2020

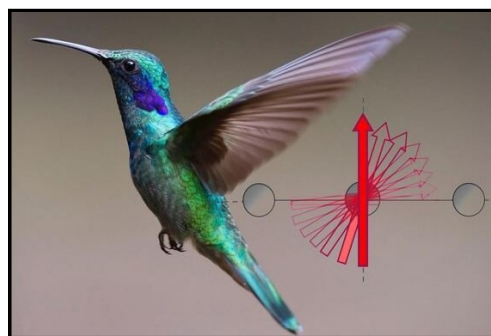
Why different measurements of material properties sometimes give different results

By Florian Aigner

It is very hard to take a photo of a hummingbird flapping its wings 50 times per second. The exposure time has to be much shorter than the characteristic time scale of the wing beat, otherwise you will only see a colorful blur. A similar problem is encountered in solid-state physics, where the aim is to determine the magnetic properties of a material. The magnetic moment at a certain location can change very quickly. Therefore, researchers require measuring methods that are fast enough to resolve these fluctuations. With this basic idea in mind, scientists at TU Wien (Vienna), in collaboration with research groups from Würzburg (Germany), has now succeeded in solving a puzzle of solid-state physics.

Magnetism and superconductivity

"If you want to understand a material, you have to understand its magnetic properties," says Prof. Alessandro Toschi from the Institute of Solid State Physics at TU Wien. "Not only do they tell us how the material reacts to magnetic fields, they are also closely related to other properties of the material—for example, its electrical behavior." Magnetic material properties play a particularly important role in the search for high-temperature superconductors.



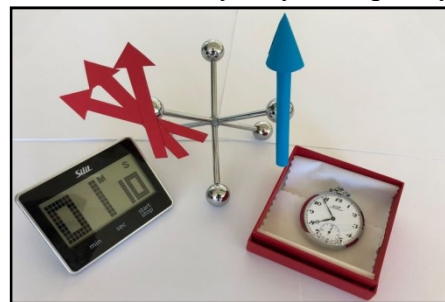
Credit: Vienna University of Technology

However, researchers repeatedly found that different measurements of the magnetism of certain materials lead to different results. "Sometimes no meaningful results were obtained at all, sometimes different measurement methods led to contradictory data," says Clemens Watzenböck

(Institute for Solid State Physics, TU Wien). "We were now able to solve this mystery with purely theoretical calculations."

The mobility of the electrons

The team from Vienna and Würzburg was able to show that the mobility of the electrons in the material determines which methods can be used to measure the magnetic properties. "The spin of the electrons in the material causes a magnetic moment that fluctuates quite spontaneously. These magnetic fluctuations are caused by the natural movement of the electrons. Therefore, the magnetic moment can also be cancelled out very quickly by the motion of the electrons," says Toschi. "The faster the electrons can move inside the material, the faster they can obscure the occurrence of a magnetic moment."



Sometimes the magnetic moment changes direction fast, sometimes it is more stable. It is important to choose sufficiently short timescales for the measurement - otherwise, it's all a blur. Credit: Vienna University of Technology

This means that if there is a process in the material that slows down the electrons—e.g., strong scattering with other electrons or with the vibrating atoms of the material so that they can no longer move very fast in the crystal—then the corresponding magnetic moment remains measurable for much longer.

"We have developed a method that allows us to find out, through refined theoretical analyses and numerical simulations, on which typical time scale the magnetic moments in a particular material are shielded," explains Watzenböck. The magnetic moment can only be measured if you have a measuring method that produces a result on a shorter time scale. If the measurement takes longer, you only get a blurred average result—similar to when you photograph a hummingbird with a long exposure time.

Iron superconductors

The research team was able to apply this approach to the particularly important material class of iron-based superconductors. "We were able to show that the characteristic time scale of magnetic fluctuations in these superconductors differs by an order of magnitude depending on the material—it ranges from about 3 femtoseconds to about 30 femtoseconds," reports Clemens Watzenböck.

This explains why the results of inelastic neutron experiments are easy to interpret for some materials and not for others: The time scale of such neutron experiments is about 10 femtoseconds. Short enough for some materials, but too long for others. If, on the other hand, other measuring methods are used, such as X-ray spectroscopy, which operates on a shorter time scale, the magnetic moment of all these materials should remain clearly visible.

The newly developed method of calculating characteristic time scales of materials can be applied not only to magnetic properties but also to other important material properties. "We assume that our new method will be very useful in the future for planning and correctly interpreting a wide variety of spectroscopic experiments," says Alessandro Toschi, "There are still many open questions in this field—with our method we now want to better understand the physics of known materials and even facilitate the search for new, better materials, such as superconductors with high critical temperatures."

More information: C. Watzenböck et al. Characteristic Timescales of the Local Moment Dynamics in Hund's Metals, *Physical Review Letters* (2020). DOI: [10.1103/PhysRevLett.125.086402](https://doi.org/10.1103/PhysRevLett.125.086402)

Journal information: [Physical Review Letters](https://phys.org/news/2020-09-material-properties-results.html)
<https://phys.org/news/2020-09-material-properties-results.html>

Researchers manipulate two bits in one atom

By Jerwin De Graaf

Researchers at Delft University of Technology have succeeded in independently manipulating two different types of magnetism within a single atom. The results are relevant for the development of extremely small forms of data storage. In time, this new discovery could make it possible to store two bits of information in one atom.

The magnetism of an atom is the result of electrons orbiting around the nucleus of the atom. These rotations can be divided into two categories. "Compare it with the Earth orbiting around the sun," explains research leader Sander Otte. "On the one hand, the Earth orbits around the sun, which takes a year. On the other hand, the Earth also rotates around its own axis, which leads to the day/night cycle." It is the same with an electron revolving around an atom: the rotation around the nucleus of the atom is called the orbital angular momentum and the rotation of the electron around its own axis is called spin angular momentum or, in short, spin.

Orbital direction

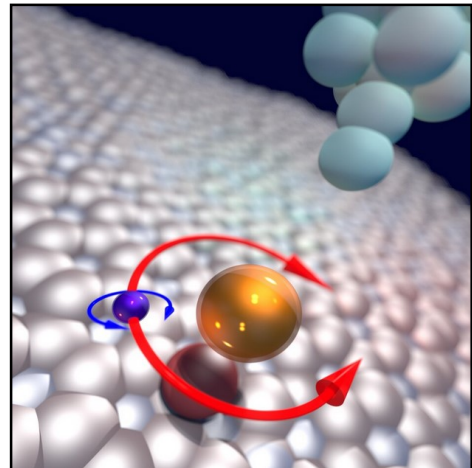
Each of these movements could, in principle, be used to store information. The orbital rotation, for instance, can be clockwise or counterclockwise. These two rotational directions can thus represent the 0 and the 1 of a bit. The spin also has two possible rotational directions. So in theory you should be able to store two bits of information in a single atom. "In practice, however, this is quite difficult," Otte continues. "If you reverse the orbital direction, the spin direction almost always changes with it—and vice versa."

The Delft study, carried out in collaboration with Spanish and Chilean researchers, makes it possible to only reverse the direction of the orbital direction without affecting the spin direction. The fact that this has now been achieved is due to a phenomenon once predicted by Einstein and the Dutch physicist Wander Johannes de Haas. According to this Einstein-de Haas effect, the reversal of the orbital direction can also be compensated by an immeasurably small rotation of the environment—in this case the piece of metal to which the atom belongs. This effect had not been previously observed on the scale of a single atom, let alone that it could be applied to manipulate atomic magnetism.

Perfect separation

The researchers used a scanning tunneling microscopy, in which a very sharp needle scans atoms and can even move them at will. Usually, a magnetic atom makes contact with several neighboring atoms, which disrupt the magnetism. Otte and his team achieved the perfect separation between the spin and the orbital rotation they needed by positioning a magnetic iron atom precisely on top of a single, non-magnetic nitrogen atom. In doing so, they created an ideal geometry that rarely occurs spontaneously in nature.

The ability to store bits in individual atoms would increase the current maximum storage capacity by many thousands of times. However, Otte warns that atomic data storage is still a long way off. "The main result is that we have taken another step forward in our ability to control atoms and even the electrons that orbit around them. That is a wonderful goal in and of itself."



Artist's impression of the atom studied under the needle of a tunnel microscope. The spin and orbital angular momentum are indicated by a small and a large arrow respectively. Credit: TU Delft

More information: Rasa Rejali et al. Complete reversal of the atomic unquenched orbital moment by a single electron, *npj Quantum Materials* (2020). DOI: [10.1038/s41535-020-00262-w](https://doi.org/10.1038/s41535-020-00262-w)
<https://phys.org/news/2020-09-bits-atom.html>



Wed, 02 Sep 2020

Giant leap for molecular measurements

Spectroscopy is an important tool of observation in many areas of science and industry. Infrared spectroscopy is especially important in the world of chemistry, where it is used to analyze and identify molecules. The current state-of-the-art method can make approximately 1 million observations per second. UTokyo researchers have greatly surpassed this figure with a new method about 100 times faster.

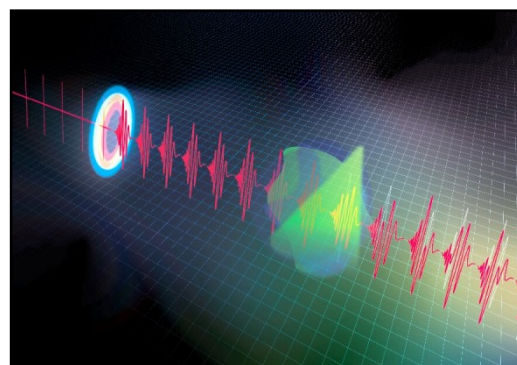
From climate science to safety systems, manufacture to quality control of foodstuffs, infrared spectroscopy is used in so many academic and industrial fields that it's a ubiquitous, albeit invisible, part of everyday life. In essence, infrared spectroscopy is a way to identify what molecules are present in a sample of a substance with a high degree of accuracy. The basic idea has been around for decades and has undergone improvements along the way.

In general, infrared spectroscopy works by measuring infrared light transmitted or reflected from molecules in a sample. The samples' inherent vibrations alter the

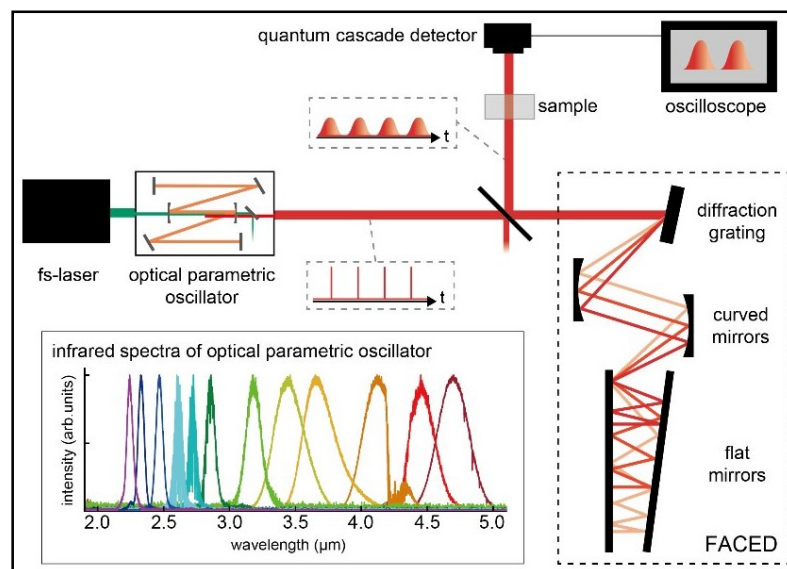
characteristics of the light in very specific ways, essentially providing a chemical fingerprint, or spectra, which is read by a detector and analyzer circuit or computer. Fifty years ago the best tools could measure one spectra per second, and for many applications this was more than adequate.

More recently, a technique called dual-comb spectroscopy achieved a measurement rate of 1 million spectra per second. However, in many instances, more rapid observations are required in order to produce fine-grain data. For example some researchers wish to explore the stages of certain chemical reactions that happen on very short time scales. This drive prompted Associate Professor Takuro Ideguchi from the Institute for Photon Science and Technology, at the University of Tokyo, and his team to look into and create the fastest infrared spectroscopy system to date.

"We developed the world's fastest infrared spectrometer, which runs at 80 million spectra per second," said Ideguchi. "This method, time-stretch infrared spectroscopy, is about 100 times faster



Laser pulses lasting for mere femtoseconds (one-quadrillionth of a second) are stretched to the nanosecond (one-billionth of a second) range. Credit: © 2020 Ideguchi et al.



The new tool consists of various optical components including lasers, mirrors, lenses and detectors. It can detect wavelengths between 4.4 and 4.9 micrometers (thousandths of a millimeter). Credit: © 2020 Ideguchi et al.

than dual-comb spectroscopy, which had reached an upper speed limit due to issues of sensitivity." Given there are around 30 million seconds in a year, this new method can achieve in one second what 50 years ago would have taken over two years.

Time-stretch infrared spectroscopy works by stretching a very short pulse of laser light transmitted from a sample. As the transmitted pulse is stretched, it becomes easier for a detector and accompanying electronic circuitry to accurately analyze. A key high-speed component that makes it possible is something called a quantum cascade detector, developed by one of the paper's authors, Tatsuo Dougakiuchi from Hamamatsu Photonics.

"Natural science is based on experimental observations. Therefore, new measurement techniques can open up new scientific fields," said Ideguchi. "Researchers in many fields can build on what we've done here and use our work to enhance their own understanding and powers of observation."

More information: Akira Kawai, Kazuki Hashimoto, Tatsuo Dougakiuchi, Venkata Ramaiah Badarla, Takayuki Imamura, Tadataka Edamura and Takuro Ideguchi. Time-stretch infrared spectroscopy. *Communications Physics*. DOI: [10.1038/s42005-020-00420-3](https://doi.org/10.1038/s42005-020-00420-3)

Journal information: [Communications Physics](https://phys.org/news/2020-09-giant-molecular.html)
<https://phys.org/news/2020-09-giant-molecular.html>

COVID-19 Research News



Wed, 02 Sep 2020

Face shields, masks with valves ineffective against COVID-19 spread: study

If the United States Centers for Disease Control and Prevention (CDC) guidelines aren't enough to convince you that face shields alone shouldn't be used to stop the spread of COVID-19, then maybe a new visualization study will.

To increase public awareness about the effectiveness of face shields alone as well as face masks with exhalation valves, researchers from Florida Atlantic University's College of Engineering and Computer Science used qualitative visualizations to test how face shields and masks with valves perform in impeding the spread of aerosol-sized droplets. Widespread public use of these alternatives to regular masks could potentially have an adverse effect on mitigation efforts.

For the study, just published in the journal *Physics of Fluids*, researchers employed flow visualization in a laboratory setting using a laser light sheet and a mixture of distilled water and glycerin to generate the synthetic fog that made up the content of a cough-jet. They visualized droplets expelled from a mannequin's mouth while simulating coughing and sneezing. By placing a plastic face shield and an N95-rated face mask with a valve, they were able to map out the paths of droplets and demonstrate how they performed.

Results of the study show that although face shields block the initial forward motion of the jet, the expelled droplets move around the visor with relative ease and spread out over a large area depending on light ambient disturbances. Visualizations for the face mask equipped with an exhalation port indicate that a large number of droplets pass through the exhale valve unfiltered, which significantly reduces its effectiveness as a means of source control.

"From this latest study, we were able to observe that face shields are able to block the initial forward motion of the exhaled jet, however, aerosolized droplets expelled with the jet are able to move around the visor with relative ease," said Manhar Dhanak, Ph.D., department chair, professor, and director of SeaTech, who co-authored the paper with Siddhartha Verma, Ph.D., lead author and an assistant professor; and John Frankenfeld, a technical professional, all within FAU's Department of Ocean and Mechanical Engineering. "Over time, these droplets can disperse over a wide area in both lateral and longitudinal directions, albeit with decreasing droplet concentration."

To demonstrate the performance of the face shield, researchers used a horizontal laser sheet in addition to a vertical laser sheet revealing how the droplets cross the horizontal plane. Not only did the researchers observe forward spread of the droplets, they found that droplets also spread in the reverse direction. Notably, face shields impede forward motion of the exhaled droplets to some extent, and masks with valves do so to an even lesser extent. However, once released into the environment, the aerosol-sized droplets get dispersed widely depending on light ambient disturbances.

Like the N-95-rated face mask used in this study, other types of masks such as certain cloth-based masks that are available commercially also come equipped with one to two exhale ports, located on either side of the facemask. The N95-rated face mask with the exhale valve used in this study had a small amount of exhaled droplets that escaped from the gap between the top of the mask and the bridge of the nose. Moreover, the exhalation port significantly reduced the effectiveness of the mask as a means of source control, as a large number of droplets passed through the valve unfiltered and unhindered.

"There is an increasing trend of people substituting regular cloth or surgical masks with clear plastic face shields as well as using masks that are equipped with exhalation valves," said Verma. "A driving factor for this increased adoption is better comfort compared to regular masks. However, face shields have noticeable gaps along the bottom and the sides, and masks with exhalation ports include a one-way valve which restricts airflow when breathing in, but allows free outflow of air. The inhaled air gets filtered through the mask material, but the exhaled breath passes through the valve unfiltered."

The researchers say that the key takeaway from this latest study illustrates that face shields and masks with exhale valves may not be as effective as regular face masks in restricting the spread of aerosolized droplets. Despite the increased comfort that these alternatives offer, they say it may be preferable to use well-constructed, high quality cloth or surgical masks that are of a plain design, instead of face shields and masks equipped with exhale valves. Widespread public adoption of the alternatives, in lieu of regular masks, could potentially have an adverse effect on ongoing mitigation efforts against COVID-19.

"The research conducted by professors Dhanak and Verma on the importance of proper face coverings to stop the spread of COVID-19 has literally illuminated the world," said Stella Batalama, Ph.D., dean of FAU's College of Engineering and Computer Science. "While broad acceptance regarding the need for face coverings has risen steadily, there is an increasing trend of people who are substituting regular cloth or surgical masks with clear plastic face shields, and with masks equipped with exhalation valves. This latest research provides important evidence to further support CDC guidelines and inform the public to make better selections in their choice for face coverings for their benefit and for public safety."



Although face shields block the initial forward motion of the jet, the expelled droplets move around the visor with relative ease and spread out over a large area depending on light ambient disturbances. Credit: Florida Atlantic University's College of Engineering and Computer Science

More information: "Visualizing droplet dispersal for face shields and masks with exhalation valves," *Physics of Fluids*, aip.scitation.org/doi/pdf/10.1063/5.0022968

Journal information: *Physics of Fluids*
<https://phys.org/news/2020-09-shields-masks-valves-ineffective-covid-.html>



Wed, 02 Sep 2020

Mapping the 3-D geometry of SARS-CoV-2's genome

By Anna Marie Pyle

The novel coronavirus uses structures within its RNA to infect cells. Scientists have now identified these configurations, generating the most comprehensive atlas to date of SARS-CoV-2's genome.

Although contained in a long, noodle-like molecule, the new coronavirus's genome looks nothing like wet spaghetti. Instead, it folds into stems, coils, and cloverleaves that evoke molecular origami.

A team led by RNA scientist Anna Marie Pyle has now made the most comprehensive map to date of these genomic structures. In two preprints posted in July 2020 to bioRxiv.org, Pyle's team mapped structures across the entire RNA genome of the coronavirus SARS-CoV-2, using living cells and computational analyses.

SARS-CoV-2 relies on its unique RNA structures to infect people and cause the illness COVID-19. But these structures' contribution to infection and disease is often underappreciated, even among scientists, says Pyle, a Howard Hughes Medical Institute Investigator at Yale University.

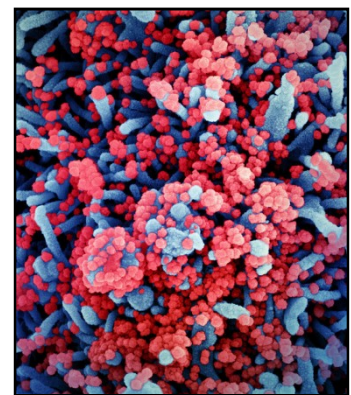
"The general wisdom is that if we just focus on the proteins encoded in the virus's genome, we'll understand how SARS-CoV-2 works," Pyle says. "But for these types of viruses, RNA structures in the genome can influence their ability to function as much as encoded proteins."

Researchers can now begin to tease out just how these structures aid the virus—information that could ultimately lead to new treatments for COVID-19. Once scientists have identified RNA structures that carry out key tasks, for instance, it may be possible to devise ways to disrupt them—and interfere with infection.

More bang for the buck

Both DNA and its molecular relative RNA store information using a four-letter code. Within human cells, pairs of letters can form bonds spanning two strands of DNA. These strands twist together, forming the familiar double helix. RNA can form helices too, but in viruses such as SARS-CoV-2 and its relatives, it does so when a single molecule folds back on itself.

The result is not only stem-like double helices, but also three- and four-stranded structures, knot-like regions, and multi-stem junctions. Like building blocks, these simple configurations become the basis for even more complex architecture within the genome.



Colorized scanning electron micrograph of a cell (blue) heavily infected with SARS-CoV-2 virus particles (red), isolated from a patient sample. Image captured at the NIAID Integrated Research Facility (IRF) in Fort Detrick, Maryland. Credit: NIAID

Measuring about 30,000 RNA letters, SARS-CoV-2's genome is unusually long for an RNA virus. Even so, it is still quite stubby compared to the genomes of people, plants, and even bacteria. Contorting its RNA into three-dimensional shapes gives SARS-CoV-2 another set of tools with which to compensate for a limited number of genes. "An RNA virus gets the most bang for its buck in terms of how it uses its genome," Pyle says.

Research on other viruses has teased out how they use RNA structures to do their dirty work. The hepatitis C virus, for example, uses a complex configuration of RNA to trick cells into making viral protein, according to Jeffrey Kieft, an RNA structural biologist and virologist at the University of Colorado Anschutz Medical Campus, who was not involved with Pyle's team's work. "It's kind of amazing, all the different things RNA structures can do in viral infection," he says.

Charting new territory

Pyle's group set out to decipher the configuration of SARS-CoV-2's genome with two parallel approaches. In one study, they examined the RNA's structure from within the virus's natural environment: infected cells.

It is difficult to access viral RNA within cells, where it mixes with the host's RNA. However, a quirk of SARS-CoV-2 infection—its RNA becomes unusually abundant—helped the team create a snapshot of the RNA genome's full structure. This was the first time anyone has captured such a comprehensive picture of a viral genome from within living cells. Previous efforts using HIV- and hepatitis C-infected cells did not produce enough information to create a full inventory of RNA structures.

In a related computational study, the team tried to predict how SARS-CoV-2's RNA genome, as well as other pieces of viral RNA made by the cell, might fold and interact with themselves. The two studies have not yet undergone the scientific vetting process known as peer review, but together, they reveal that SARS-CoV-2's genome has a complex, compact architecture. "The coronavirus genome has more structure than any RNA my lab has studied in the past," Pyle says.

To study any RNA virus, and SARS-CoV-2 in particular, scientists need a roadmap of its genomic landscape, Kieft says. "Dr. Pyle has created a sort of global atlas that is a great starting point for the next round of more targeted experiments," he says. "In many ways, it scratches the surface of the richness of RNA structure that probably exists in this virus. I suspect there's going to be a lot of surprises."

The mapping effort also represents a preliminary step toward new drugs that might target the virus's RNA structures. However, that road could be long. Since 2014, when his lab discovered a knot-like structure that viruses like dengue and West Nile use to evade cellular defenses, Kieft has been trying to find a way to neutralize it. He cautions that the research community is not fully geared up to identify RNA structure-disrupting drugs. "This strategy just hasn't been studied or pursued in the way that it has for proteins," he says. However, when dealing with a pandemic virus like SARS-CoV-2, "initially you try everything."

More information: Nicholas C. Huston et al. Comprehensive in-vivo secondary structure of the SARS-CoV-2 genome reveals novel regulatory motifs and mechanisms, (2020). DOI: [10.1101/2020.07.10.197079](https://doi.org/10.1101/2020.07.10.197079)
<https://phys.org/news/2020-09-d-geometry-sars-cov-genome.html>

Link found between metabolic syndrome and worse COVID-19 outcomes

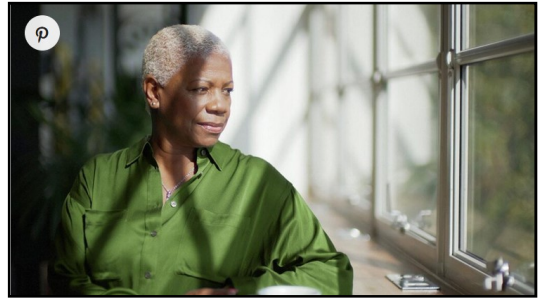
New research has linked metabolic syndrome with an increased risk of worse outcomes in people with COVID-19

A new study has found that people with metabolic syndrome, which refers to a cluster of conditions that increase a person's risk of cardiovascular issues, are more likely to have worse COVID-19 outcomes — including requiring ventilation and death.

The research, which appears in the journal *Diabetes Care*, provides further information on the underlying risk factors that affect the severity of COVID-19.

Since its emergence in Wuhan, China, in December 2019, COVID-19 has spread rapidly across the world. However, its effects are not equal.

As journals started publishing the results of observational studies drawing on data from the first wave of the pandemic, it became clear that some underlying medical conditions were associated with a greater chance of a person developing severe COVID-19.



Research finds that people with conditions that make up metabolic syndrome have an increased risk of severe COVID-19 outcomes.

According to the Centers for Disease Control and Prevention (CDC), some groups most at risk of severe disease include older adults and those with certain underlying medical conditions, such as cardiovascular diseases, obesity, and type 2 diabetes.

The new research highlights that obesity, hypertension, and diabetes, in particular, are more common in people who die from COVID-19 than heart or lung conditions.

Metabolic syndrome

According to the National Heart, Lung, and Blood Institute, metabolic syndrome is an umbrella term for several conditions that affect a person's risk of heart conditions and other health problems.

To receive a diagnosis of metabolic syndrome, an individual needs to have three of five specific medical conditions.

According to the new research, these are:

- obesity
- diabetes or prediabetes
- hypertension
- hypertriglyceridemia
- low high-density lipoprotein (HDL) levels

If a person has metabolic syndrome, they are likely to have an ongoing low level of inflammation in their body.

The recent study explored the individual effects of obesity, hypertension, and diabetes on COVID-19 severity and compared them with their combined effect in metabolic syndrome.

Observational study

To investigate, the researchers drew on data from 287 COVID-19 patients at two hospitals in New Orleans, LA, between March 30 and April 5, 2020. This was the initial local peak of the pandemic.

Over 85% of the people the researchers included in the study were non-Hispanic Black. The average age of the participants was 61, and almost 57% were women.

In total, 80% of the patients had hypertension, 65% had obesity, 54% had diabetes, and 39% had low HDL levels.

Overall, 66% of the people met the threshold for metabolic syndrome.

Metabolic syndrome linked to death

The researchers compared the patients with metabolic syndrome with those without, looking at the severity of COVID-19 as measured by admission to intensive care, ventilation, the development of acute respiratory distress syndrome (ARDS), or death.

Of the patients with metabolic syndrome:

- 56% required intensive care (vs. 24% of those without metabolic syndrome)
- 48% required ventilation (vs. 18% of those without metabolic syndrome)
- 37% developed ARDS (vs. 11% of those without metabolic syndrome)
- 26% died due to COVID-19 (vs. 10% without metabolic syndrome)

Even after accounting for a range of variables — including age, sex, race, and the location of the hospital — the researchers found that people with metabolic syndrome had a significantly higher chance of dying from COVID-19 (3.4 times as likely, overall) than people without metabolic syndrome.

People with metabolic syndrome were also almost five times as likely to be admitted to an intensive care unit, need ventilation, or develop ARDS.

Interestingly, the researchers found that there was no association between the individual conditions that collectively make up metabolic syndrome and death due to COVID-19.

However, obesity and diabetes were associated with a higher likelihood of needing admittance to intensive care and requiring ventilation.

According to lead study author Dr. Joshua Denson, an assistant professor of medicine at the Tulane University School of Medicine in New Orleans, LA: “Together, obesity, diabetes and prediabetes, high blood pressure, and abnormal cholesterol levels are all predictive of higher incidents of death in these patients. The more of these diagnoses that you have, the worse the outcomes.”

“The underlying inflammation that is seen with metabolic syndrome may be the driver that is leading to these more severe cases.”

This means that “[m]etabolic syndrome should be considered a composite predictor of COVID-19 lethal outcome, increasing the odds of mortality by the combined effects of its individual components.”

<https://www.medicalnewstoday.com/articles/link-found-between-metabolic-syndrome-and-worse-covid-19-outcomes#Metabolic-syndrome-linked-to-death>

Covid-19 vaccines: What is coming and when?

By Ana Rivas

- *As countries and companies race to produce a safe and effective coronavirus vaccine, here's a guide to the front-runners*

Some 170 Covid-19 vaccines are in development around the world, according to the World Health Organization, each one promising to protect people from the deadly coronavirus and allow them to go back to work and school.

Now, a handful are starting or nearing the final stage of testing. Depending on the results, some companies say their vaccines could be greenlighted for use as soon as this year.

The Front-Runners

Among the first vaccine candidates to start the final round of testing is one developed by the University of Oxford and AstraZeneca PLC. Also far along are experimental shots from Pfizer Inc. and its partner BioNTech SE, as well as Moderna Inc.

China National Pharmaceutical Group Co., or Sinopharm, has a vaccine in Phase 3. A vaccine from another Chinese company, CanSino Biologics, is expected to begin the pivotal testing soon. But remember, many vaccines that show promise in early testing fail during the final round.

The **Oxford/AstraZeneca vaccine** is designed to provide protection by delivering into a person's cells the genetic code for the spikes protruding from the new coronavirus. Then the cells can produce the spike proteins, generating an immune response that would be able to fight off the coronavirus. Delivering those genetic instructions is a weakened, harmless version of a virus that causes the common cold in chimpanzees.

In early testing, the vaccine successfully produced immune responses in humans with only minor side effects. A Phase 3 trial enrolling 30,000 subjects in the U.S. began in August. Other late-stage trials are under way with several thousand volunteers in the U.K., Brazil and South Africa.

Production capacity estimate: AstraZeneca aims to make two billion doses available world-wide, and has said that one billion may be available this year.

The **Moderna vaccine** also uses a gene-based technology to provoke an immune response, though the code it delivers takes the form of messenger RNA. Those molecules, commonly referred to as mRNA, are the body's molecular couriers ferrying DNA instructions for making proteins. The vaccine delivers to cells mRNA for making the coronavirus's spike protein.

Moderna and the U.S. National Institute of Allergy and Infectious Diseases are testing a two-dose shot. It was the first candidate to enter human testing in the U.S. The vaccine produced an immune response in early-stage testing and was generally well-tolerated, with minor side effects observed in test subjects.

Final-stage testing is under way in the U.S. with a 30,000-person trial that could yield interim results in the fall. An mRNA vaccine has never been approved for any disease.

Production capacity estimate: 500 million to one billion doses a year starting in 2021.

The vaccine developed by **Pfizer and German partner BioNTech SE** also uses mRNA. In a Phase 1 trial, the vaccine generated neutralizing antibodies that promise to fight off the coronavirus and was generally well tolerated. Phase 3 testing began in the U.S. in July, enrolling about 30,000 people, and will expand overseas to include about 120 sites.

The U.S. government has agreed to pay Pfizer and BioNTech nearly \$2 billion for 100 million doses. Pfizer aims to seek regulatory approval or an emergency-use authorization in October.

Production capacity estimate: up to 100 million doses world-wide by the end of 2020, and about 1.3 billion by the end of 2021.

China's state-owned **Sinopharm** is developing two vaccines with the government agencies Wuhan Institute of Biological Products and Beijing Institute of Biological Products. Both are based on an older vaccine-making technique.

The group has entered agreements to conduct testing in several countries, including Pakistan and the United Arab Emirates. The Wuhan Institute has drawn concern over its safety record, including over some of its vaccines for children.

The government says it started what it calls "emergency use" of some of its Covid-19 vaccines on medical workers and border inspection officials in late July. Chinese officials have said they aim to make a vaccine available to the public before the end of the year.

Production capacity estimate: about 220 million doses a year.

Sinovac, a private Chinese company, began its final-stage trial in July in São Paulo, Brazil, where it is testing its vaccine to take advantage of a higher infection rate. Sinovac has also struck a deal with Indonesian state-owned pharmaceutical holding company PT Bio Farma to make up to 250 million vaccine doses each year for the Indonesian public, according to China's state news agency.

Production capacity estimate: about 300 million doses a year at a Beijing plant.

CanSino's vaccine is aimed initially at the Chinese military. Chinese company CanSino developed the shot with the military based on a weakened virus behind the common cold. A Phase 1 study was conducted in March in Wuhan, the early epicenter of Covid-19. The shot got government clearance in June for military use for one year.

Production capacity estimate: 100 million to 200 million doses a year starting in 2021.

Johnson & Johnson is developing a vaccine that uses a weakened form of a common-cold virus, known as an adenovirus. A single dose of this vaccine provoked a strong immune response in early animal testing. The company plans to launch by late September a 60,000-person global study, which could be the largest late-stage clinical trial of a Covid-19 vaccine. The company will carry out the study at nearly 180 locations in the U.S. and eight other countries where transmission rates are high, including Brazil, Chile and South Africa.

Production capacity estimate: one billion world-wide by the end of 2021, including 100 million doses for the U.S., with an option for an additional 200 million, and 30 million doses for the U.K., with an option for an additional purchase of up to 22 million.

The Russian state-owned **Gamaleya Research Institute** is developing a vaccine based on a combination of two adenoviruses, which it has already tested on volunteers. Russia effectively approved use of the vaccine in early August, though the shot hadn't gone through final-stage testing. The Russian government plans for mass vaccination to start in October, and will aim rollout at high-risk groups including health workers.

Production capacity estimate: 500 million doses a year, with mass production starting September 2020.

U.S.-based **Novavax Inc.** is making a vaccine that consists of two shots given 21 days apart that deliver proteins resembling the spike jutting out from the new coronavirus. Researchers hope the proteins will trigger the production of antibodies and immune cells that can fight off the coronavirus.

The shots also contain a component, called an adjuvant, to boost the immune response. In Phase 1 testing, the vaccine was generally well-tolerated and produced promising numbers of antibodies. Phase 2 testing began in August, and the company has said Phase 3 could start in September.

Production capacity estimate: 100 million doses for use in the U.S., with delivery beginning by the end of this year. Plans to manufacture for other countries.

(This story has been published from a wire agency feed without modifications to the text.)

<https://www.livemint.com/science/health/covid-19-vaccines-what-is-coming-and-when-11598949040138.html>

