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COVID-19: DRDO's Contribution



Mon, 07 Sept 2020

DMRC plans UV light disinfection as Metro services resume tomorrow

By Siddhant Pandey

The Delhi Metro Rail Corporation (DMRC) has made several preparations ahead of the resumption of its services from Monday (September 7).

In light of the coronavirus pandemic, the DMRC has created a "tech-friendly" plan to ensure the safety of passengers.

The Delhi Metro services have been suspended since March 22, three days before the nationwide lockdown was enforced.

- **Plan: DMRC, DRDO to make use of UV for sanitization**

The DMRC has been holding regular video meetings with global transportation experts to discuss best practices of running a mass transit system during a pandemic, *Hindustan Times* reported.

DMRC Managing Director Mangu Singh said the Metro is collaborating with the Defence Research and Development Organisation to operationalize ultraviolet (UV) disinfection technology as opposed to chemical or water disinfection.

- **Quote: 'UV can be used to thoroughly sanitize common area touchpoints'**

Singh told *HT*, "Some of the measures that we have taken in view of the pandemic is that instead of using chemical disinfectants, we are in talks with the DRDO to develop a UV disinfection technology, which can be used to thoroughly sanitize common area touchpoints."

He added, "Till the pandemic lasts, maintaining a hygienic system for passengers will be our ultimate aim."

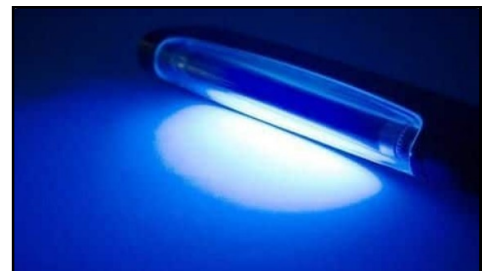
- **Information: 'Technological advances needed for UV LED'**

"Many technological advances are needed for the UV LED to reach its potential for efficiency, reliability, and cost-effectiveness," Christian Zollner, University of California, United States, told *HT*. Zollner has co-authored a study on the large-scale efficacy of the use of UV disinfection.

- **Construction: CCTV cameras to monitor construction work**

Separately, the DMRC is planning to install CCTV cameras at all Phase-4 construction sites to monitor work progress.

Singh said, "The idea is to reduce physical contact between persons as much as possible. The cameras will improve monitoring and increase efficiency at construction sites."



The DMRC had already installed the cameras at some sites before construction activities were allowed to resume on May 3.

- **Resumption: First phase of Metro services to resume tomorrow**

The central government allowed the resumption of Metro services in a phased manner from September 7, under guidelines for the fourth phase of unlocking from the coronavirus lockdown, dubbed 'Unlock 4.0'.

In the first phase, from September 7 to 10, only the Yellow Line (from Samaypur Badli to Huda City Center) and Gurugram Rapid Metro will be functional in two four-hour shifts.

- **Changes: Foot-operated systems installed inside elevators**

When the services resume, commuters will see several changes, including thermal scanners, social distancing stickers, etc.

Foot-operated systems have been installed inside elevators at several stations.

"These foot-operated switches will reduce surface contact," a DMRC spokesperson told *HT*, "When we restart our operations, we will only allow three people to board the lift at a time to ensure social distancing."

<https://www.newsbytesapp.com/timeline/india/65644/309477/coronavirus-delhi-metro-s-plan-to-resume-services>

DRDO Technology News



DEFENCE AVIATION POST
Your Connect To The World Of Defence And Aviation

Mon, 07 Sept 2020

What will be the next deal of Indian Air Force after Rafale?

In September 2016, India and France signed a €7.87 billion Intergovernmental Agreement (IGA) for 36 Rafale multi-role fighter jets in fly-away condition. India chose Dassault over its traditional partner Russia's MiG. The deal has a 50% offset clause to be executed by Dassault Aviation and its partners in partnership with Indian companies. The basic cost of the aircraft is about ₹680 crore.

This deal is India's biggest-ever procurement. Besides the missile systems, the Rafale jets will come with various India-specific modifications, including Israeli helmet-mounted displays, radar warning receivers, low band jammers, 10-hour flight data recording, infra-red search and tracking systems among others.

Defence Minister Rajnath Singh received the first Rafale jet at an air base in France on October 8. The new five Rafale fighters arrived in India on July 28 and touched-down at the Ambala air base in Haryana after covering a journey of 7,000-km from France.

So what next? What will be the next deal of Indian airforce after Rafale fighter aircraft? Here is the list –

IAF's next major deal is actually for a set of two different aircraft and it is going to be signed in the next couple of weeks. Since these are not foreign aircraft, as expected from us, they are not getting due recognition & shout-out.

The first deal is to buy 83 units of LCA Tejas Mk1A from HAL for INR 39,000 Crore. This is going to be the third variant of the Tejas aircraft after IOC & FOC certifications.

The Tejas Mk1A is going to be built indigenously in the HAL Bangalore complex in partnership with private players at the rate of 14 aircraft per year from 2023 & the deliveries for all aircraft will be concluded within a period of 6 years.

There is no noise for the Tejas Mk1A in general public because the name Tejas sounds familiar to them. On the contrary, the Mk1A variant which is going to be bought is a significantly different aircraft from the baseline Tejas Mk1 which has few shortcomings.

The Mk1A will have 40 minor & major improvements from the baseline variant which includes:

- Indigenous Uttam AESA radar.
- SMFD (smart multi-functional display) in the cockpit which will show better display quality & multiple modes.
- An external Self Protection Jammer (SPJ) pod in the outermost pylon. This is the same Israeli pod carried by the Su-30MKI.
- Improved Digital Flight Control Computer (DFCC),
- Capability to fire the ASTRA missile
- Maintainability improvement

This is a very capable aircraft & will reinforce the light aircraft category of the IAF by replacing the MiG-21 Bison aircraft whose retirement is long due now

The second deal is of the Light Combat Helicopter which is being made by the HAL Helicopter Division, Bangalore. The paperwork is complete and the deal is waiting for the customary approval of the Ministry of Finance.

<https://www.defenceaviationpost.com/2020/09/what-will-be-the-next-deal-of-indian-air-force-after-rafale/>

THEWEEK

Mon, 07 Sept 2020

We continue to ensure that the Indian Ocean region remains open and free

Anil Kumar Chawla, flag officer commanding-in-chief, Southern Naval Command

By Navin J Antony

Vice Admiral Anil Kumar Chawla took over the reins of the Southern Naval Command in July 2018, two months after the US military renamed the Pacific Command—its largest and oldest unified combat command—as the Indo-Pacific Command.

Diplomatically, the name change was largely symbolic, done “in recognition of the increasing connectivity between the Indian and Pacific Oceans” and India’s growing importance in “maintaining regional stability”, as US defence secretary Jim Mattis put it. But it has raw implications in maritime matters. China has been widening its footprint in the Indian Ocean region, increasing India’s geopolitical relevance for the US.



Anil Kumar Chawla | Sanjoy Ghosh

For the Indian Navy, challenges are now manifold. As the SNC’s commanding-in-chief, Chawla is also in charge of training all Navy personnel to meet these challenges. In an exclusive interview with THE WEEK, he spoke about the Navy’s plans for sustaining its maritime edge, its growing role as a regional stabiliser, its response to Covid-19, and why “hot wars” have given way to cold, tactical manoeuvres.

Excerpts from the interview:

Q/ You recently inaugurated a training lab for the Naval Communication Network—a secure, captive grid that will give the Navy digital supremacy over its rivals. What are the processes involved in building NCN and how will it achieve its objectives?

A/ NCN was sanctioned by the (Union) government many years ago. In exchange for the spectrum held by the armed forces, we were given a set of landlines, so that the (spectrum) would be of better use to the civilian population.

So, a [land-based, military] communication backbone is being laid out countrywide. The Army and the Air Force, too, have networks of their own. This backbone will enable us expand our operations and improve processes. NCN is a terrestrial network; it would be connected to ships through satellites. It is an advanced communication solution, with a higher level of classification (security).

The Navy’s Signal School in Kochi trains all our communicators. The school will also train personnel for NCN.

Q/ Covid-19 has significantly impacted seafarers, because of the compact environment and ventilation systems in ships. How has the Navy addressed these challenges?

This is a particular challenge for ships and aircraft. The closed-loop system of air conditioning is required because of the electronic systems and (to ensure) comfort of the personnel. So, we have evolved safety protocols.

People are quarantined for 14 to 21 days and then tested before they go on board. They have to stay on board until their duty ends; no contact with outside parties at all. Similarly, any item that comes from ships is disinfected. We have set up a few mechanisms for that.

Q/ Like the indigenously-made, ultraviolet-germicidal chamber for sanitising baggage.

A/ Yes, there are a number of innovations, like foot-operated doors for bathrooms on ships. Ultraviolet cabinets for sanitising small items; bags are irradiated and sprayed with sanitiser in tunnels with conveyor belts.

Another interesting innovation is the aerial evacuation pod. Patients can be evacuated from remote areas like islands in these sealed pods. We have supplied these pods to the Army and the Air Force, the Nagaland government and ONGC, and also to countries like Iran, Maldives, Mauritius, Seychelles and Sri Lanka. But we do hope these pods will never have to be used (smiles).

Q/ The Indian Ocean region is increasingly becoming a geostrategic focal point. For example, the US renamed its Pacific Command.

A/ The US has realised that the economic growth in Asia—10 of the top-20 economies today in the world are in Asia—[depends] on trade, energy and security, and on the traffic between the Indian Ocean and Pacific Ocean regions.

The Indian Navy believes that the Indian Ocean region is a place where we need to be a major force—for good. India is a democratic country; we never had expansionist designs. We have excellent relations with everybody, except for a couple of countries. We have fundamentally strong relations with the entire Africa, southeast Asia, countries in the Persian Gulf, the island countries in the Indian Ocean region, Australia and, of course, with the US, Russia and the European Union. All these countries have accepted that the Indian Navy is a stabilising force, not an aggressive force.

The Navy will continue to keep the Indian Ocean region open and free for navigation for all countries, and ensure that the rule of law is maintained.

Q/ Have the maritime challenges in the region increased in recent times?

A/ Historically, there have always been challenges. World War I, the colonial era, World War II, the post-colonial era, the Cold War, the Gulf war....

Yes, challenges today are manifold. New powers are emerging, new economic interests are shaping up. There is a challenge [because of the rivalry] between the entrenched powers and the new powers. Challenges like global warming and Covid-19 can cause huge dislocation of populations and massive economic disruptions.

Resources are drying up on land, so there is a lot of pressure on the seas. It will become a security issue at some stage. Take fishing, for instance. Some years ago, there was a ban on fishing in the North Sea, imposed by the UK; there is a ban now imposed in the South China Sea by China.

Q/ You mentioned World War II. Is the situation becoming as conflict-ridden as it was before the war?

A/ It is not a world of hot wars now. Weapons have become too destructive to be used indiscriminately. So, it is now more a war of deterrence; a war of minds; of information campaigns; of economics. The ambit is much larger.

Policymakers (must look at) major factors that are shaping the security environment, and then see the threats we face, and plan how to respond to them. The simple answer for everything is that we need to be strong and self-reliant.

Q/ The Navy has long been trying to become self-reliant. Seventy-five per cent of the components on the indigenous aircraft carrier were made in India. But if you look at the other Indian Ocean and Pacific Ocean powers, India's naval expenditure is quite low—15 per cent of its total defence budget. The US spends 30 per cent; Australia and Japan spend around 25 per cent each. Are budgetary constraints affecting the Navy's ambitions?

A/ The government can give only as much money as it has. We can always say that more money will help. But we are also aware of the government's constraints. As professionals, our job is to try and meet our requirements with the money we have.

As the saying goes, when you are poor you think [about how to spend the money well]. The Navy is not poor, but we do have to think about cost-effective (choices).

<https://www.theweek.in/theweek/current/2020/09/03/we-continue-to-ensure-that-the-indian-ocean-region-remains-open-and-free.html>

TIMESNOWNEWS.COM

Mon, 07 Sept 2020

India-China standoff: IAF jets carry out sorties every few hours as surveillance over PLA camps increases

Leh: India personnel have taken positions at different areas which are strategic and are looking over dedicated Chinese People's Liberation Army camps in Moldo

Key Highlights

- **India has taken strategic locations in southern and northern parts of Pangong Tso area along the LAC.**
- **Indian Air Force is carrying out sorties every few hours giving backup to the Indian personnel at the frontline standing against the Chinese soldiers.**
- **Talks are ongoing in Chushul every day at the General as well as the Brigadier level.**

Ladakh: The aerial surveillance in Leh increased on Sunday morning as the fighter jets of the Indian Air Force are carrying out sorties every few hours giving backup to the Indian personnel at the frontline standing against the Chinese soldiers.

After taking strategic locations in southern and northern parts of Pangong Tso area along the Line of Actual Control (LAC), the aerial activity increased in Leh, **Times Now's Sohil Sehran** reported from the ground.

India personnel have taken positions at different areas which are strategic and are looking at dedicated Chinese People's Liberation Army camps in Moldo.

Across Leh, aerial surveillance has increased, satellites images also show.

India is trying to resolve the issue through dialogue but is also committed to fighting for its integrity and sovereignty. Apart from dialogues at the diplomatic level, talks are ongoing in Chushul every day at the General as well as the Brigadier level.

To facilitate the security forces, the Border Road Organisation (BRO) has also started working round the clock to complete the work on all roads connecting Leh and clean the patches which have seen landslides or were blocked otherwise, news agency ANI reported.

Latest types of machines costing crores of rupees to cut the road have been taken in and frequent blasting is also being carried out. The BRO workers and hired labourers have also been asked to work even on weekends and in double shifts. Sensing the gravity of the current situation at the China border, the workforce has also been increased considerably.

The BRO has linked a road to Ladakh through Padam-Yulchung-Sumdo to Khalsi on National Highway 1. This step allows security forces to immediately use this third access route for operational purposes.

<https://www.timesnownews.com/india/article/india-china-standoff-iaf-fighter-jets-carry-sorties-every-few-hours-as-surveillance-over-pla-camps-increases/648519>



Sun, 06 Sept 2020

चीन की हर हरकत को भांप लेती है भारतीय सेना, धरा से अंतरिक्ष तक हो रही निगरानी

एलएसी पर आधुनिक उपकरणों से नजर रख रही सेना को देश के सेटेलाइट के माध्यम से दुश्मन की हर गतिविधि के बारे में सटीक जानकारी मिल रही है।

जम्मू: पूर्वी लद्दाख में चीन अपनी हरकतों से बाज नहीं आ रहा पर भारतीय सेना उसकी हर चाल का करारा जवाब दे रही है। चीन की पीपल्स लिबरेशन आर्मी (पीएलए) थोड़ी-सी भी हलचल करती है और पहले से अलर्ट भारतीय जवान उसके इरादों को नेस्तनाबूद करने में पल भर की देरी नहीं लगाते। धरा से आसमान और इससे भी आगे अंतरिक्ष तक चीन की हर हरकत पर नजर रखी जा रही है। आधुनिक उपकरणों से सुसज्जित जवान उसे कोई और हिमाकत का मौका नहीं दे रहे हैं। इसके अलावा अंतरिक्ष में तैनात अदृश्य जासूस भी सटीक जानकारीयां उपलब्ध करवा हर साजिश को नाकाम बनाने में सहयोग कर रहा है।

सैन्य सूत्रों के अनुसार, एलएसी पर आधुनिक उपकरणों से नजर रख रही सेना को देश के सेटेलाइट के माध्यम से दुश्मन की हर गतिविधि के बारे में सटीक जानकारी मिल रही है। इसी की बदौलत भारतीय जांबांजो ने वास्तविक नियंत्रण रेखा (एलएसी) पर चीन से दो कदम आगे चलते हुए ब्लैक टॉप व और कुछ चोटियों पर कब्जा कर खुद को रणनीतिक रूप से मजबूत कर लिया। इसके साथ दिन-रात उड़ान भर रहे वायुसेना के चिन्कूक हेलीकॉप्टर भी उंचाई से दुश्मन के इलाकों पर पैनी नजर रख रहे हैं।

पूर्वी लद्दाख का दौरा के दौरान थलसेना प्रमुख जनरल एमएम नरवाने ने सेना के निगरानी तंत्र को मजबूत बनाने और हर चुनौती का मुकाबला करने की सेना की तैयारियों की समीक्षा भी की थी। ऐसे में भारत सेना चीन से तकनीकी तौर पर भी मजबूत ही साबित हो रही है। अंतरिक्ष में हमारा यह दोस्त है सेटेलाइट रिसैट 2बी आर1, इसे भारतीय अंतरिक्ष अनुसंधान केंद्र (इसरो) ने कुछ माह पूर्व लांच किया था। हर मौसम में कारगर यह सेटेलाइट राडार इमेजिंग से चीन की हर हरकत पर नजर रखा है।

चीन ने लगाया है सेटेलाइट ट्रैकिंग स्टेशन

सूत्रों के अनुसार, एलएसी के पास डैमचौक क्षेत्र में 60 किलोमीटर की दूरी पर चीन ने अपना सेटेलाइट ट्रैकिंग स्टेशन स्थापित किया है। इस पर भी भारतीय सेटेलाइट ने पूरी नजर जमाई है। भारतीय सेटेलाइट की नजर से बचाने के लिए चीन ने इस सेटेलाइट ट्रैकिंग स्टेशन को बौद्ध धर्मस्थल काल चक्र का रूप दिया है। हमारे यह जासूस चीन के साथ नियंत्रण रेखा पर पाकिस्तान द्वारा की जाने वाली नापाक गतिविधियों पर पैनी नजर रखे हुए हैं। ऐसे सेटेलाइट



एलएसी पर आधुनिक उपकरणों से नजर रख रही सेना को देश के सेटेलाइट के माध्यम से दुश्मन की हर गतिविधि के बारे में सटीक जानकारी मिल रही है।

पाकिस्तान में टेरर कैंपों पर सर्जिकल स्ट्राइक के दौरान और नियंत्रण रेखा पर आतंकवादियों की घुसपैठ की कोशिशों को नाकाम बनाने के लिए भी किए जा रहे हैं।

चीन की हो रही 24 घंटे सर्वेलांस: ब्रिगेडियर अनिल गुप्ता

सेवानिवृत्त ब्रिगेडियर अनिल गुप्ता के अनुसार, भारतीय सेना इस समय पूर्वी लद्दाख में चीन का सामना करने के लिए सशक्त है और 24 घंटे निगरानी की जा रही है। उन्होंने बताया कि आज की चुनौतियों का सामना करने के लिए आधुनिक तकनीक बहुत अहम है। भारतीय वायुसेना रोजाना रात के समय उड़ान भर अंधेरे में दुश्मन की हर गतिविधि पर निगाह रख रही है। इसके साथ सेना थर्मल इमेजर्स, हैंड हेल्ड इमेजर से भी दुश्मन की कड़ी निगरानी कर रही है। इस कार्य में अंतरिक्ष में धूम रहे 'जासूस' भी अहम भूमिका है। ब्रिगेडियर गुप्ता ने बताया कि कारगिल के बाद सेना के सर्वेलांस सिस्टम को और मजबूत बनाने की जरूरत महसूस की गई थी। आज सेना, वायुसेना के पास विश्व के बेहतर निगरानी यंत्र हैं। इनमें आधुनिक मानवरहित टोही विमान(यूपवी) व ड्रोन भी शामिल हैं।

क्या है रिसैट-2बीआर1

रिसैट-2बीआर1 दिन और रात दोनों समय काम करता है और यह किसी भी मौसम में तस्वीरें लेने में सक्षम है। यह माइक्रोवेव फ्रीक्वेंसी पर काम करने वाला सेटेलाइट है। इसलिए इसे राडार इमेजिंग सेटेलाइट कहते हैं। यह रिसैट-2 का आधुनिक वर्जन है और भारत का निगहबान भी। यह अंतरिक्ष में 576 किमी की ऊंचाई से देश की सीमाओं पर नजर रख रहा है।

<https://www.jagran.com/news/national-indian-army-is-also-monitoring-china-from-satellite-in-eastern-ladakh-20712333.html>

The Hitavada

Sun, 06 Sept 2020

Sharang Gun system inducted in Army

After receiving green signal from the Ministry of Defence, the indigenously-developed Sharang Gun system manufactured by Vehicle Factory Jabalpur (VFJ) was officially inducted in the Indian Army, on Friday. Principal Scientific Officer, Controllerate of Quality Assurance (Weapons) (CQAW), A K Adkar has handed over the I-Note of two Sharang guns to General Manager, Vehicle Factory, Atul Gupta during a ceremony organised on Friday. It may be mentioned that induction of Sharang Gun in the Indian Army will enhance the national security in land-locked border areas to destroy enemies with more effective and accurate firing efficiency.

Other eminent officers Controller, WDT, Brigadier Jayant Kar, Lieutenant Colonel Rajat Tandon, Additional General Manager, VFJ, OP Tiwari and Group Officer, Sarang Project, Joint General Manager, Rameshwar Meena. Induction of Sharang Gun in the Indian Army will strengthen the national security in land-locked border areas to destroy enemies with more effective and accurate firing efficiency. GCF, Joint General Manager and Spokesman, Sanjay Shrivastava, while talking to 'The Hitavada', informed that the first batch of nine Sharang Guns successfully passed through rigorous proof trials and final inspection by different agencies and got all the necessary clearances. It has been expected that competent authorities may anytime release induction order for supplying the first lot of Sharang Guns.



The Sharang 155mm/45calibre Gun system was indigenously developed with modification of Soltam 130 mm imported Russian Gun System at Gun Carriage Factory. Indigenous production of Sharang Guns is being carried out at Gun Carriage Factory (GCF) and Vehicle Factory Jabalpur (VFJ). First lot of Sharang Gun system was successfully accomplished all the technical parameters in a rigorous proof firing at Long Proof Range (LPR) Khamaria. Sharang Guns are being simultaneously developed at Gun Carriage Factory and Vehicle Factory Jabalpur. It is the first time when any indigenised gun system was given green signal for bulk production within a record time due to indigenisation and proof trials of guns in the same city.

<https://www.thehitavada.com/Encyc/2020/9/5/Sharang-Gun-system-inducted-in-Army.html>

hindustantimes

Mon, 07 Sept 2020

‘Pakistan, China planning against us’: BSF Chief to jawans on visit to LoC

Though the Army has the operational command of the 744-km long LoC, the BSF has also been deployed to assist the former

By Ravi Krishnan Khajuria

Jammu: On the last leg of his three-day visit to Jammu region, director general of Border Security Force Rakesh Asthana visited Line of Control (LoC) in Rajouri and Poonch sector underscoring the force being the first line of defence on the border, urging it to be wary as both “China and Pakistan are planning against us”.

Though the Army has the operational command of the 744-km long LoC, the BSF has also been deployed to assist the former.

“On Sunday, the third day of his visit, Director General of Border Security Force, Rakesh Asthana visited various forward defence locations in Poonch and Rajouri sector and took stock of the situation. He was accompanied by SS Panwar, ADG (WC) and NS Jamwal, IG BSF, Jammu Frontier,” said an official spokesperson.

The DG was briefed by ID Singh, DIG Rajouri and field commanders on the LoC regarding the operational preparedness and situation.

Appreciating the measures adopted by the troops while maintaining domination, the DG emphasised on meeting the security challenges more effectively.

Lauding the excellent synergy amongst all the security forces, the DG exhorted all ranks to maintain a high standard of discipline and professionalism.

He also addressed Sainik Sammelan in the BSF Paloura Camp Jammu and said that since Pakistan and China were planning against India, the BSF’s role became more important in guarding the borders.

“This is a very crucial time for all, as both our neighbouring countries are planning against us. So, our role has become more important now as we are the first line of Indian defence,” the spokesperson quoted the DG as saying.

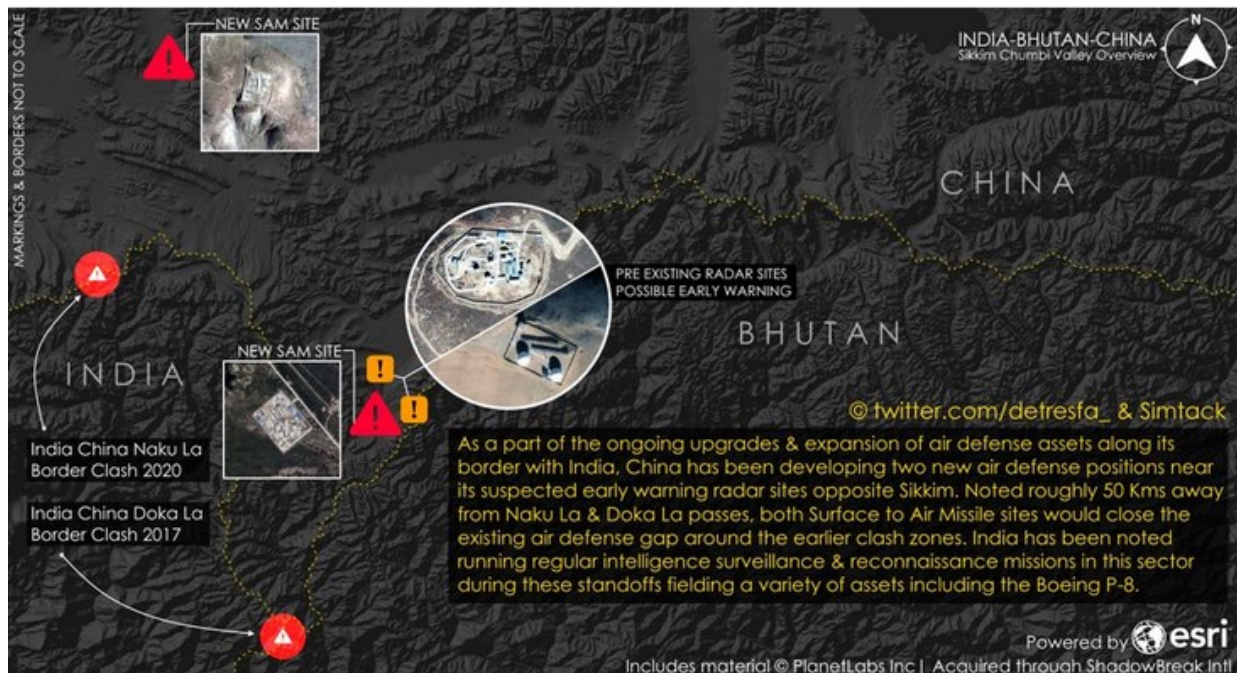
He was very appreciative of the vigilant BSF jawans who guard the nation’s border 24x7 defying all hostile conditions.

<https://www.hindustantimes.com/india-news/pakistan-china-planning-against-us-bsf-chief-to-jawans-on-visit-to-loc/story-EYkDZLzPuEUwfBOKxq8fOO.html>

China deploys latest HQ-9 missiles near LAC to check Indian fighter jets

Amid renewed tensions between Indian and Chinese PLA troops in the Ladakh region, many experts now believe that the PLAGF (PLA Ground Force) has deployed their HQ-9 long-range air defense systems along the LAC; the de-facto border between India and China

According to information published by the Forbes, the satellite imagery observers have pointed out two new Surface-to-Air Missile (SAM) sites in the Chumbi valley of Tibet, a place at the tri-junction of Indian, Bhutanese, and Tibetan border which lies at the eastern periphery of Sikkim.



The place was notably a hotbed for clashes during the 1962 Sino-Indian war and adjoins the Doklam Plateau, which saw a fierce stand-off between Indian and PLA troops in 2017.

The analyst mentions that the sites where the SAM batteries have been placed are situated just 50 kilometers from where the 2017 India-China skirmishes occurred. While the reports do not mention the type of missiles deployed, experts suggest that these could be, with a high degree of possibility, the HQ-9 systems.

According to the recent reports by the Pentagon, the PRC has one of the world's largest forces of advanced long-range surface-to-air systems—including Russian-built S-400s, S-300s, and domestically produced systems—that constitute part of its robust and redundant integrated air defense system architecture.

The SAM facilities that have been made in the Chumbi valley are strikingly similar to the ones built around the Mansarovar Lake, the analysts said.

“As a part of the ongoing upgrades & expansion of air defense assets along its border with India, China has been developing two new air defense positions near its suspected early warning radar sites opposite Sikkim,” according to the caption on the Twitter satellite imagery graphic.

“Noted roughly 50 km from Naku La and Doka La passes, both surface to air missiles sites would close the existing air defense gap around the earlier clash zones. India has been noted running regular intelligence surveillance & reconnaissance missions in this sector during these standoffs fielding a variety of assets including the Boeing P-8 [patrol aircraft]”

However, according to the information published by Forbes, the research director for the U.S. Air Force's China Aerospace Studies Institute, Rod Lee, says that these constructions are not that 'new' as claimed. Their constructions had begun in 2019.

The Indian Air Force maintains a strong presence of its air-superiority fighters, the Su-30MKI and the upgraded supersonic interceptors the MiG-21 'Bisons' in the region. "Either way, more Chinese anti-aircraft missiles in Tibet will be another headache for Indian military planners faced with Chinese incursions along the 2,500-mile Sino-Indian border", Michael Peck writes for the Forbes.

<https://eurasianimes.com/china-has-deployed-hq-9-missiles-near-sikkim-to-counter-indian-su-30-mkis-mig-21-bisons/>

Business Standard

Mon, 07 Sept 2020

Indian, Chinese militaries hold Brigade Commander-level talks in Ladakh

The nearly four-hour brigade commander-level interaction near Chushul could not produce any tangible outcome

Indian and Chinese militaries on Sunday held another round of talks in eastern Ladakh in an attempt to calm tensions even as the situation remained "delicate" with both sides further rushing in additional troops and weapons following last week's confrontations, government sources said.

The nearly four-hour brigade commander-level interaction near Chushul could not produce any tangible outcome, they said.

The sources said the Indian Army has been on a very high level of alert and is ready to deal with any eventuality in the area.

The overall situation in the region continued to be delicate, they said.

Tension escalated in the region after Indian troops foiled attempts by Chinese military to occupy Indian territories in the southern bank of Pangong lake area on the intervening night of August 29 and 30.

Following the confrontation, India occupied a number of strategic heights in the Chushul sector overlooking crucial bases of the Chinese military. Since then, China has deployed additional troops, tanks and anti-tank guided missiles in the area.

India too has strengthened its combat capabilities following reinforcements by the Chinese People's Liberation Army (PLA).

The two sides held extensive talks on Monday, Tuesday and Wednesday, each lasting over six hours, but no concrete result emerged from the negotiations.

In talks with his Chinese counterpart Gen. Wei Fenghe on Friday in Moscow, Defence Minister Rajnath Singh conveyed that China's actions like amassing a large number of troops, its aggressive behaviour and attempts to alter the status quo in Ladakh were in violation of bilateral pacts.

He also told Wei that China must strictly respect the Line of Actual Control(LAC) and not make attempts to unilaterally change its status quo.

Sources said that Singh told Wei firmly that India will not "cede an inch of land" and is determined to protect the integrity and sovereignty of the country at "all cost".



The sources said the Indian Army has been on a very high level of alert and is ready to deal with any eventuality in the area

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 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.

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://www.business-standard.com/article/current-affairs/indian-chinese-militaries-hold-brigade-commander-level-talks-in-ladakh-120090600842_1.html

ThePrint

Mon, 07 Sept 2020

India yet to formally invite Australia to join Malabar naval exercise along with US & Japan

Sources said the decision to invite Australia rests on how the talks between India and China on the LAC standoff proceed

By Nayanima Vasu & Amrita Nayak Dutta

New Delhi: India is yet to formally invite Australia to the Malabar naval exercise, even as tensions between New Delhi and Beijing continue to soar. Talks are also on over whether or not the annual naval exercise should be postponed this year, ThePrint has learnt.

According to top Indian diplomatic and defence sources, New Delhi has not yet officially communicated to Canberra whether it can be part of the annual Malabar exercise that takes place between India, Japan and the US.

This comes at a time when India is engaged in a major border standoff with China, touted as the most serious challenge New Delhi faced since the 1962 war, in the Ladakh sector of the Line of Actual Control (LAC).

Inviting Australia to the Malabar at this juncture would mean a "major signalling" to Beijing that countries are standing up against China within the larger Indo-Pacific construct. But sources said such a move can irk Beijing, disrupting the ongoing talks on disengagement and de-escalation between India and China.



Representational image of Indian Navy ships | Photo: Commons

A senior Navy officer explained that the importance of Australia is its geographical location in the deep South Indian Ocean, from where the far reaches of choke-points such as the Sunda Strait and the Wetar Strait can be kept under surveillance for approaching Chinese ships and submarines.

“So it is important both politically and militarily to have Australia as an ally in the quad,” the officer said, adding that the Malabar exercise will check interoperability between the navies and is an instrument of foreign policy.

“It will definitely be a messaging (to China),” the officer added.

Exercise may be postponed

According to a diplomat from one of the participating countries, the Malabar exercise may not take place this year owing to the coronavirus pandemic, coupled with other factors such as the US presidential elections in November and stepping down of Japanese Prime Minister Shinzo Abe even as his successor is yet to be announced.

India is gearing up to hold a foreign ministers’ meeting of the Quad — the US, India, Australia and Japan — in October. It is significant as this is for the first time New Delhi will be hosting a meeting of the Quad, also known as Quadrilateral Security Dialogue.

During this meeting, the issue of Malabar naval exercise may also come up.

The matter is also on agenda for the summit meeting between India and Japan. Prime Minister Narendra Modi will be virtually holding the summit with Japan’s outgoing PM later this month. India and Japan also expected to sign the crucial defence logistics pact, Acquisition and Cross Servicing Agreement (ACSA).

“Our immediate problem is not in the ocean but in the land when it comes to China. So right now what is important is the right kind of signal. Inviting Australia at this time may create some disturbance in the dialogue process that is going on between India and China,” said Rajiv Bhatia, former diplomat and distinguished fellow at Gateway House, a Mumbai-based think-tank. “When and if Malabar will be held, Australia will be invited. But right now India’s priorities are different.”

Changing dynamics between Australia and China

Australia did take part in the bilateral India-US exercise in 2007. But even after Japan joined in 2015, New Delhi did not show any interest in inviting Canberra due to the latter’s proximity with Beijing, and also India did not want to upset its own equation with China.

But now, sources said, that scenario has changed. China’s increasing aggression with countries within the Indo-Pacific region, coupled with the pandemic, has led to a paradigm shift in the bilateral ties between Canberra and Beijing.

In July this year, Modi and his Australian counterpart Scott Morrison upgraded their ties to the level of ‘Comprehensive Strategic Partnership’ as both signed the long pending ‘Mutual Logistics Support’ agreement paving the way for greater defence cooperation.

Former Navy Chief Admiral Arun Prakash (retd) told ThePrint the Indo-US Malabar naval exercises are more than 25 years old but Australia’s proposed participation this year will carry a special significance because of the India-China stand-off.

He said the importance of this year’s Malabar is not so much in the Covid-19 situation as in China’s aggressive conduct in the Indo-Pacific as well as on India’s northern borders.

“From our point of view, Australia joining Malabar, will send another signal to China that a broader Indo-Pacific consensus is emerging against it,” the former Navy chief said, adding that Australia will become one more “partner in the alliance” to oppose China’s aggressive conduct.

<https://theprint.in/diplomacy/india-yet-to-formally-invite-australia-for-malabar-naval-exercise-with-us-japan/497105/>

India also needs Anti Access Area Denial Capabilities

By Brig Anil Gupta

With the fire-spitting dragon becoming aggressive by the day and two-front threat becoming almost a certainty, India needs to shed its historic “continentalist” mind set and transform from a military force to military power. In order to become a recognised military power India apart from strengthening its maritime power has also to develop non-kinetic warfare capabilities in the cyber, space and electronic warfare domains.

India has the technology but has so far been keen on using it for civilian use rather than military use. A minor policy change will enable us to develop systems purely for military use. There is an urgent need to develop threat specific responses to ward off threat to our national security from belligerent China and Pakistan.

Our strategy so far relies on the offensive capabilities of the Indian Air Force to counter the threat posed by our adversaries. But China has deployed an array of Surface to Air Missiles (SAMs) in both Xinxiang and Tibet regions and is also providing military assistance including proliferation of banned technology to Pakistan to upgrade its Integrated Air Defence System (IADS).

At the same time China and Pakistan have colluded to ensure that we remain fixated towards our land borders and have to spend so heavily to keep them secure that the much wanted expansion of Indian Navy to ward off maritime threat and counter China’s growing interest in the Indian Ocean.

Two-front threat is certainly a measure taken by the Chinese to keep India focussed to the threat on its land borders and remain distracted from its maritime ambitions which were exhibited in the recently enhanced budget of the Navy and its impressive acquisition list including aircraft carriers, destroyers, frigates, amphibious transport ships, submarines, and surveillance aircraft. “An increasing realization that the destiny of our nation is entwined with our maritime destiny,” as stated by a former Naval Chief.

While China is very sensitive to the vulnerabilities of its Sea Lines of Communications (SLOCs) which cater for 80% of its trade and move of oil and goods from the Middle East to the Chinese ports. To keep the Chinese supply chain going safe SLOCs are very critical. Nevertheless, it is taking steps to mitigate its “Malacca dilemma,” from building up its surface naval forces and undersea fleet, to financing deep-water commercial ports in littoral and island nations, to making diplomatic inroads with key actors across the Indian Ocean basin.

As part of its string of pearls policy to encircle India, it is negotiating with India’s neighbours namely Bangladesh, Myanmar and Sri Lanka. In the future, these efforts could give China the ability to sustain forward-deployed forces in greater numbers—and might tilt in its favour the maritime military balance in the region.

The development of Gwadar port, the Karakoram Highway and use of Iranian ports after signing the strategic treaty with Iran will to a great extent mitigate the Chinese problems at sea. Yet in quest of becoming a global power PLA Navy (PLAN) will still continue to struggle for dominance of the Indian Ocean and pose a threat to India’s claim of the most powerful resident power in the Indian Ocean.



India also needs Anti Access Area Denial Capabilities

While Russia was the pioneer of developing the Anti-Access Area Denial (A2/AD) Capability to check the NATO forces and primarily the USA during Cold War, China in the modern days has made considerable progress in mastering the technology and development of systems to keep the US Navy away from the South China Sea and the disputed maritime claims of 9-dash line. It did not hesitate to fire its deadly hypersonic “Fleet Killer” missile in the disputed Spratly Islands when the USA was busy conducting the ten-nation RIMPAC naval exercise off the Hawaiian Coast in the Pacific Ocean.

Incidentally an Indian Naval ship was also deployed in the South China Sea at that time. The DF 21 Killer Missile is claimed to have the capability of destroying a moving carrier at sea. With this China displayed its Area Denial capabilities and sent a stern warning to both USA and India.

India also needs to develop A2/AD capabilities to prevent any future build-up of Chinese forces in the Tibet region and neutralise any threat from Pakistan by grounding the Pakistan Airforce before it is able to be airborne as far as our land frontiers are concerned. Along the maritime borders the capability will enable us to prevent access of PLAN and restrict the freedom of movement of Pakistan Navy. Inherent in it would be the development of countermeasures needed to ensure freedom of movement and operation of own air and maritime forces across the land and maritime frontiers.

To develop the A2/AD capability, it is necessary to understand its philosophy. Action intended to slow deployment of friendly forces into a theatre or cause forces to operate from distances farther from the locus of conflict than they would otherwise prefer is called as Anti-Access (A2). It affects movement of adversary forces into a theatre. Action intended to impede friendly operations within areas where it is difficult to prevent access of inimical forces is termed Area Denial (AD). AD affects manoeuvre within a theatre. The two are not mutually exclusive.

A2/AD capabilities are overlapping and spread across multi-domains to include both kinetic and non-kinetic systems with the sole purpose of degrading the adversaries’ war-fighting capabilities at land, sea, air, cyber, space and EW. The emerging technologies representing military revolution in technologies like the Artificial Intelligence (AI), Quantum Technology, Swarm Technology and hypersonic weapons form the backbone of these capabilities. A potent A2/AD capability will pose a serious threat to the ability of both our adversaries to deploy and employ forces across our land and maritime boundaries.

India needs to develop A2/AD capabilities not only as countermeasures to the combined threat posed by both China and Pakistan but also to pose a similar threat to them both at land and sea.

A2/AD capabilities have to be an integration of terrestrial, air and space based sensors which can defeat stealth technology, array of long range deep penetrating cruise, surface to air and air to surface missiles, space weapons, satellites, hypersonic weapons and aerial platforms both manned and unmanned. India is having an arsenal of formidable missile systems and aerial platforms, it has invested in the Russian S-400 Air Defence System, Phalcon AWACS, armed drones and other Air Defence systems but it still needs more to develop a formidable A2/AD capability particularly to dominate the Indian Ocean and keep PLAN at bay.

For purposes of command and control the existing Strategic Forces Command should be nominated. India needs to invest more in boosting aero-space capabilities and cyber warfare capabilities. Need for an Aero-Space and a Cyber Command has become more pressing now.

As countermeasures to the adversaries’ A2/AD capability in Tibet region and against our western neighbour, we need to invest heavily in development of Stealth, Stand Off precision strike, Manned Unmanned Teaming (MUT), Swarming technologies and development of a robust Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) and Electronic Warfare(EW) potential. Meanwhile IAF will have to be boosted with the next generation stand-off strike capability in form of missiles and unmanned platforms.

As far as Indian Ocean is concerned, India will always be constrained by resources to invest heavily in power projection naval platforms. Due to the nature of threat to India’s security, Indian Army and the IAF will remain the main focus centres as far as defence expenditure is concerned.

But at the same time in order to score over China, India will need to cash upon the Chinese Malacca Strait Dilemma. The best option for India in such an eventuality is to spend on A2/AD capability rather than investing in maritime power-projecting forces with more concentration on Anti- Access capabilities because India enjoys the advantage of home turf viz a viz PLAN. India's

For this, India's island territories namely the Lakshadweep Islands off of its southwest coast and especially the Andaman and Nicobar Islands to the southeast will play a very crucial role. These territories, which overlook critical Indian Ocean sea-lanes, give India a toehold in the Arabian Sea and the Bay of Bengal. India has already taken steps to bolster its military presence on these strategically positioned islands during the ongoing standoff with China. These could be developed as epicentres of our A2/AD capabilities to guard our maritime frontiers.

India's joint warfare doctrine will need to focus on countering the adversaries' A2/AD capabilities to ensure operational freedom of friendly forces with minimum down gradation of our warfighting capability and also to include the potential of own A2/AD capabilities to cause maximum attrition to the adversaries' war fighting potential and their exploitation.

With the Himalayan defences becoming impregnable, a fool hardy enemy will only attempt a major/decisive battle there. While mind games and provocations will continue along the LAC, decisive blow to the Chinese will be delivered at the sea only. In order to counter China's growing expansionism and belligerence, India should seriously explore the option of converting the QUAD from a mere security dialogue to a security alliance followed by QUAD+.

The combined GDP of QUAD is double that of China thus neutralising the growing economic muscle of the Dragon. Also, the move will benefit India as far as the Aatam Bharat Mission is concerned. The availability of high-end technology will become easier giving a boost to the domestic production and also ensure safety of supply chain lines.

<http://www.thenorthlines.com/india-also-needs-anti-access-area-denial-capabilities/>

Splitting water molecules for a renewable energy future

The future economy based on renewable and sustainable energy sources might utilize battery-powered cars, large-scale solar and wind farms, and energy reserves stored in batteries and chemical fuels. Although there are examples of sustainable energy sources in use already, scientific and engineering breakthroughs will determine the timeline for widespread adoption.

One proposed paradigm for shifting away from fossil fuels is the hydrogen economy, in which hydrogen gas powers society's electrical needs. To mass produce hydrogen gas, some scientists are studying the process of splitting water—two hydrogen atoms and one oxygen atom—which would result in hydrogen fuel and breathable oxygen gas.

Feng Lin, an assistant professor of chemistry in the Virginia Tech College of Science, is focusing on energy storage and conversion research. This work is part of a new study published in the journal *Nature Catalysis* that solves a key, fundamental

barrier in the electrochemical water splitting process where the Lin Lab demonstrates a new technique to reassemble, revivify, and reuse a catalyst that allows for energy-efficient water splitting. Chunguang Kuai, a former graduate student of Lin's, is first author of the study with Lin and co-authors chemistry graduate students Zhengrui Xu, Anyang Hu, and Zhijie Yang.

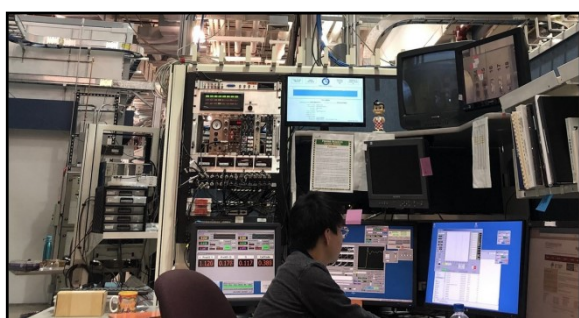
The core idea of this study goes back to a subject in general chemistry classes: catalysts. These substances increase the rate of a reaction without being consumed in the chemical process. One way a catalyst increases the reaction rate is by decreasing the amount of energy needed for the reaction to commence.

Water may seem basic as a molecule made up of just three atoms, but the process of splitting it is quite difficult. But Lin's lab has done so. Even moving one electron from a stable atom can be energy-intensive, but this reaction requires the transfer of four to oxidize oxygen to produce oxygen gas.

"In an electrochemical cell, the four-electron transfer process will make the reaction quite sluggish, and we need to have a higher electrochemical level to make it happen," Lin said. "With a higher energy needed to split water, the long-term efficiency and catalyst stability become key challenges."

In order to meet that high energy requirement, the Lin Lab introduces a common catalyst called mixed nickel iron hydroxide (MNF) to lower the threshold. Water splitting reactions with MNF work well, but due to the high reactivity of MNF, it has a short lifespan and the catalytic performance decreases quickly.

Lin and his team discovered a new technique that would allow for periodic reassembling to MNF's original state, thus allowing the process of splitting water to continue. (The team used fresh



Chemistry graduate student Zhijie Yang is operating synchrotron measurement computer at Advanced Photon Source of the Argonne National Lab in a photo taken before the COVID-19 pandemic. Credit: Virginia Tech

water in their experiments, but Lin suggests salt water—the most abundant form of water on Earth—could work as well.)

MNF has a long history with energy studies. When Thomas Edison tinkered with batteries more than a century ago, he also used the same nickel and iron elements in nickel hydroxide-based batteries. Edison observed the formation of oxygen gas in his nickel hydroxide experiments, which is bad for a battery, but in the case of splitting water, production of oxygen gas is the goal.

"Scientists have realized for a long time that the addition of iron into the nickel hydroxide lattice is the key for the reactivity enhancement of water splitting," Kuai said. "But under the catalytic conditions, the structure of the pre-designed MNF is highly dynamic due to the highly corrosive environment of the electrolytic solution."

During Lin's experiments, MNF degrades from a solid form into metal ions in the electrolytic solution—a key limitation to this process. But Lin's team observed that when the electrochemical cell flips from the high, electrocatalytic potential to a low, reducing potential, just for a period of two minutes, the dissolved metal ions reassemble into the ideal MNF catalyst. This occurs due to a reversal of the pH gradient within the interface between the catalyst and the electrolytic solution.

"During the low potential for two minutes, we demonstrated we not only get nickel and iron ions deposited back into the electrode, but mixing them very well together and creating highly active catalytic sites," Lin said. "This is truly exciting, because we rebuild the catalytic materials at the atomic length scale within a few nano-meter electrochemical interface."

Another reason that the reformation works so well is that the Lin Lab synthesized novel MNF as thin sheets that are easier to reassemble than a bulk material.

Validating findings through X-rays

To corroborate these findings, Lin's team conducted synchrotron X-ray measurements at the Advanced Photon Source of Argonne National Laboratory and at Stanford Synchrotron Radiation Lightsource of SLAC National Accelerator Laboratory. These measurements use the same basic premise as the common hospital X-ray but on a much larger scale.

"We wanted to observe what had happened during this entire process," Kuai said. "We can use X-ray imaging to literally see the dissolution and redeposition of these metal ions to provide a fundamental picture of the chemical reactions."

Synchrotron facilities require a massive loop, similar to the size of the Drillfield at Virginia Tech, that can perform X-ray spectroscopy and imaging at high speeds. This provides Lin high levels of data under the catalytic operating conditions. The study also provides insights into a range of other important electrochemical energy sciences, such as nitrogen reduction, carbon dioxide reduction, and zinc-air batteries.

"Beyond imaging, numerous X-ray spectroscopic measurements have allowed us to study how individual metal ions come together and form clusters with different chemical compositions," Lin said. "This has really opened the door for probing electrochemical reactions in real chemical reaction environments."

More information: Chunguang Kuai et al, Phase segregation reversibility in mixed-metal hydroxide water oxidation catalysts, *Nature Catalysis* (2020). DOI: [10.1038/s41929-020-0496-z](https://doi.org/10.1038/s41929-020-0496-z)

Journal information: *Nature Catalysis*

<https://phys.org/news/2020-09-molecules-renewable-energy-future.html>

Painting with light: Novel nanopillars precisely control intensity of transmitted light

By Ben P. Stein

By shining white light on a glass slide stippled with millions of tiny titanium dioxide pillars, researchers at the National Institute of Standards and Technology (NIST) and their collaborators have reproduced with astonishing fidelity the luminous hues and subtle shadings of "Girl With a Pearl Earring," Dutch artist Johannes Vermeer's masterpiece. The approach has potential applications in improving optical communications and making currency harder to counterfeit.

For example, by adding or dropping a particular color, or wavelength, of light traveling in an optical fiber, scientists can control the amount of information carried by the fiber. By altering the intensity, researchers can maintain the brightness of the light signal as it travels long distances in the fiber. The approach might also be used to "paint" paper money with small but intricate color details that a counterfeiter would have great difficulty forging.

Other scientists have previously used tiny pillars, or nanopillars, of varying sizes to trap and emit specific colors when illuminated with white light. The width of the nanopillars, which are about 600 nanometers in height, or less than one-hundredth the diameter of a human hair, determines the specific color of light that a pillar traps and emits. For a demanding test of such a technique, researchers examined how well the nanopillars reproduced the colors of a familiar painting, such as the Vermeer.

Although several teams of researchers had successfully arranged millions of nanopillars whose sizes were tailored to transmit red, green or blue light to create a specific palette of output colors, the scientists had no way to control the intensity of those colors. The intensity, or brightness, of colors determines an image's light and shadow—its chiaroscuro—and enhances the ability to convey impressions of perspective and depth, a signature feature of Vermeer's work.

Now, by fabricating nanopillars that not only trap and emit specific colors of light but also change its polarization by varying degrees, the NIST researchers and their collaborators from Nanjing University in China have for the first time demonstrated a way to control both color and intensity. The researchers, who include Amit Agrawal and Wenqi Zhu of NIST and the University of Maryland in College Park, and Henri Lezec of NIST, describe their findings in the September 20 issue of the journal *Optica*, posted online today.

In their new work, the NIST team fabricated on a glass slide nanopillars of titanium dioxide that had an elliptical cross section rather than a circular one. Circular objects have a single uniform diameter, but elliptical objects have a long axis and a short axis.

The researchers designed the nanopillars so that at different locations their long axis was more aligned or less aligned with the polarization of the incoming white light. (Polarized light is light whose electric field vibrates in a particular direction as it journeys across space.) If the nanopillar's long axis was exactly aligned with the direction of polarization of the incoming light, the polarization of the transmitted light was unaffected. But if the long axis was rotated by some angle—for instance 20 degrees—relative to the direction of polarization of the incoming light, the

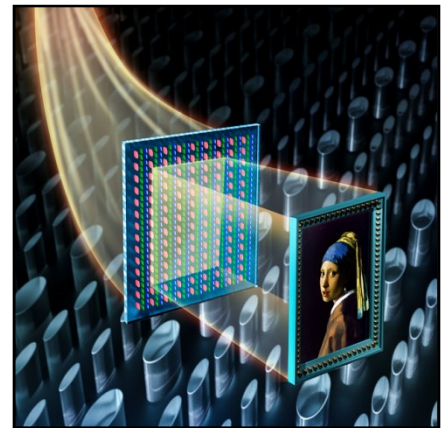


Illustration depicts a faithful reproduction of Johannes Vermeer's "Girl With a Pearl Earring" using millions of nanopillars that control both the color and intensity of incident light. Credit: T. Xu/Nanjing University

nanopillar rotated the polarization of the incident light by twice that angle—in this case, 40 degrees.

At each location on the glass slide, the orientation of a nanopillar rotated the polarization of the red, green or blue light it transmitted by a specific amount.

By itself, the rotation imparted by each nanopillar would not in any way alter the intensity of the transmitted light. But in tandem with a special polarizing filter placed on the back of the glass slide, the team achieved that goal.

The filter was oriented so that it prevented any light that had retained its original polarization from passing through. (Sunglasses work in much the same way: The lenses act as vertically polarized filters, reducing the intensity of horizontally polarized glare.) That would be the case for any place on the glass slide where a nanopillar had left unaltered the polarization of the incident light. Such a region would project as a dark spot on a distant screen.

In places where a nanopillar had rotated the polarization of the incident white light, the filter permitted a certain amount of the red, green or blue light to pass. The amount depended on the rotation angle; the greater the angle, the greater the intensity of the transmitted light. In this way, the team, for the first time, controlled both color and brightness.

Once the NIST researchers had demonstrated the basic design, they created a digital copy of a miniature version of the Vermeer painting, about 1 millimeter long. They then used the digital information to guide the fabrication of a matrix of millions of nanopillars. The researchers represented the color and intensity of each picture element, or pixel, of the Vermeer by a group of five nanopillars—one red, two green and two blue—oriented at specific angles to the incoming light. Examining the millimeter-size image that the team had created by shining white light through the nanopillars, the researchers found that they reproduced "Girl With the Pearl Earring" with extreme clarity, even capturing the texture of oil paint on canvas.

"The quality of the reproduction, capturing the subtle color gradations and shadow details, is simply remarkable," said NIST researcher and study co-author Agrawal. "This work quite elegantly bridges the fields of art and nanotechnology."

To construct the nanopillars, Agrawal and his colleagues first deposited a layer of an ultrathin polymer on glass, just a few hundred nanometers thick. Using an electron beam like a miniature drill, they then excavated an array of millions of tiny holes of varying dimensions and orientations in the polymer.

Then, using a technique known as atomic layer deposition, they backfilled these holes with titanium dioxide. Finally, the team etched away all of the polymer surrounding the holes, leaving behind millions of tiny pillars of titanium dioxide. The dimension and orientation of each nanopillar represented, respectively, the hue and brightness of the final millimeter-size image.

The nanopillar technique can easily be adapted to transmit specific colors of light, with particular intensities, to communicate information through an optical fiber, or to imprint a valuable item with a miniature, multihued identification mark that would be hard to replicate.

More information: Pengcheng Huo et al, Photorealistic full-color nanopainting enabled by a low-loss metasurface, *Optica* (2020). [DOI: 10.1364/OPTICA.403092](https://doi.org/10.1364/OPTICA.403092)

Journal information: [*Optica*](#)

This story is republished courtesy of NIST. Read the original story [here](https://phys.org/news/2020-09-nanopillars-precisely-intensity-transmitted.html).
<https://phys.org/news/2020-09-nanopillars-precisely-intensity-transmitted.html>

Mon, 07 Sept 2020

China's first reusable spacecraft lands after 2-day flight

China's first reusable spacecraft landed Sunday after two days in orbit, a possible step toward lower-cost space flight, the government announced.

The secretive, military-run space program has released few details of the craft, which was launched Friday aboard a Long March 2F rocket from the Jiuquan Satellite Launch Center in China's desert northwest.

The craft landed as planned at Jiuquan, the official Xinhua News Agency said.

State media have yet to publish any photos. The craft's size and shape are unclear.

The flight "marks an important breakthrough in our country's research on reusable spacecraft" that promise a "more convenient and inexpensive way" to reach space, Xinhua said.

China fired its first astronaut into orbit in 2003 and has launched a space station. Last year, it became the first country to land a robot rover on the moon's little-seen far side. A probe carrying another robot rover is en route to Mars.

The United States and the former Soviet Union both flew reusable spacecraft.

The U.S. space shuttle flew 134 missions from the 1980s until 2011. Since then, the U.S. military has developed the X-37, a robot glider that made its sixth flight in May.

The Soviet space plane, Buran, orbited the Earth twice during its single unscrewed flight in 1988.

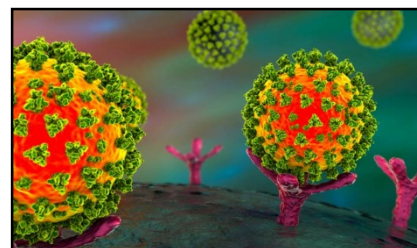
<https://phys.org/news/2020-09-china-reusable-spacecraft-day-flight.html>

IIT Guwahati researchers design engineered surfaces to detect, prevent COVID-19

Bio-interface interactions between the virus and the surface spike protein used

Researchers at the Indian Institute of Technology (IIT), Guwahati, have developed methods to detect and prevent the novel coronavirus using bio-interface interactions between the virus and the surface spike protein.

According to the team of researchers, the novel coronavirus (SARS-CoV-2) is composed of inner nucleic acid which is covered with surface spike glycoprotein and the engineered surfaces can be potentially applied for the detection as well as prevention of COVID-19—the disease caused by the virus.



"So far we are using antibody-based assays and RT-PCR based methods for testing during pandemic. However, longer assay time, cost, complex procedures and false positive or negative results are a few bottlenecks of these methods," Lalit M. Pandey, associate professor, Department of Biosciences and Bioengineering, said.

"The bio-interface interactions between virus surface spike protein and the surface can be explored for the rapid detection of coronavirus," he said.

"The interaction between the spike protein and contacting surfaces constitutes the key step of transmission of coronavirus. Thus, surface engineering, on one hand, shall facilitate a quick detection method and on the other hand, it would be a very secure method of protection against the virus, for example when applied on PPEs," he added.

The team's research on surface modifications and analysis of the bio-interfacial (protein-surface) interactions have been published in reputed journals like *Materials Science and Engineering C*, *Applied Surface Science*, *Langmuir*, *J. Phys. Chem. C* and *ACS Biomaterials Science and Engineering*.

"We have developed an interesting method of surface modifications by forming various self-assembled monolayers (SAMs) on different surfaces, which result in a wide range of surface hydrophobicity depending on the terminal functional groups with nano-scale smooth surfaces. The formation of SAMs involves a fast attachment followed by a slow reorientation step," Pandey said.

"Mixed SAMs have been prepared to design the surface with intermediate wettability. The thumb rule of increase in the adsorbed amount of protein with an increase in surface hydrophobicity does not hold true for all systems. This is because protein adsorption is a complex process and depends on the hydrophobicity of both surfaces and proteins," he said.

Hydrophobicity is the physical property of a molecule that is seemingly repelled from a mass of water.

The research has revealed that a protein adapts to different conformations depending on surface properties.

"Thus, the characteristics of protein can be tuned by engineered surfaces for various applications including biosensors, implants, and drug delivery. A recent special report suggested that the engineered sensor surface can be applied in Quartz Crystal Microbalance-based techniques, which are known for label-free, rapid and real-time detection with sensitivity," Pandey said.

"The surfaces based strategies not only offer an advantage of rapid virus detection from swab samples but also allow the reuse of the same surface over multiple cycles (samples)," he said.

"The role of newly developed engineered surfaces is, however, to destabilise the viral envelope protein through surface-protein interactions, disintegrate, and finally, inactivate the viruses," Pandey said.

"Thus, the surface treatments of personal protective equipment (PPE), which possess antiviral properties and prevent the contagious infections of coronavirus. The surfaces of PPEs can be engineered to achieve strong surface-protein interactions," he said.

<https://www.theweek.in/news/sci-tech/2020/09/iit-guwahati-researchers-design-engineered-surfaces-to-detect-prevent-covid-19.html>

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ICMR paves the way for walk-in Covid-19 tests

A doctor's prescription will no longer be required for people to get a Covid-19 test, the Indian Council of Medical Research (ICMR) said in its revised testing advisory to states on Saturday, paving the way for walk-in tests

By Anonna Dutt

New Delhi: A doctor's prescription will no longer be required for people to get a Covid-19 test, the Indian Council of Medical Research (ICMR) said in its revised testing advisory to states on Saturday, paving the way for walk-in tests.

The move comes after a prod by the Delhi high court that asked why people who show no symptoms of the disease – which can be a large proportion of Covid-19 patients – cannot get a test. The rule until now required people to either have flu-like symptoms or come in close contact with an infected person, following which a doctor could issue a prescription for a test.

"The new guidelines will allow people to get tested for Covid-19 without any prescription. The guidelines also say that states can have their own "simplified modalities" for testing. What this means is that states cannot put in any restrictive requirements on testing.

There were some states where people needed a chief medical officer or someone to certify that they needed the test; those restrictions will have to be removed," said a senior official from the Union health ministry, asking not to be named.

"ICMR's advisory is generic in nature and may be modified as per the discretion of state health authorities," said the advisory. In a Delhi HC hearing over improving testing in the Capital, the ICMR stated on September 3 it was just an advisory body and states were free to make changes as per their needs.

"With the new strategy, the doctors will be a little freer in ordering testing. Influenza-like illnesses was too restrictive a category for testing, especially as many patients with Covid-19 are asymptomatic. Clinical testing or depending on a doctor's judgement should have been allowed a long time ago. This is what is good for medical care," said Dr Jacob John, former professor of virology at Christian Medical College in Vellore.

He added that the government should now move to an approach where patients with Covid-19-like symptoms living in an area where the disease is in transmission should be considered a positive case and treated as such.



The move comes after a prod by the Delhi high court that asked why people who show no symptoms of the disease – which can be a large proportion of Covid-19 patients – cannot get a test (File photo for representation)

The guidelines also suggest testing those with atypical presentation for Covid-19 such as stroke, encephalitis, blood mixed sputum, pulmonary embolism, acute heart conditions, and Guillain-Barre syndrome (a condition where the body's immune system attacks the nerves causing weakness in legs, multiple organ dysfunction, progressive gastrointestinal symptoms, and inflammatory disease) in paediatric patients.

“The new guidelines make testing more freely available and this decision has been taken after ramping up India's testing capacity to over a million a day,” the ministry official quoted above said.

Dr Lalit Kant, former head of epidemiology at Indian Council of Medical Research, said that the non-ambiguous guidelines will help resolve many systemic issues. “This will make testing more accessible. Although, this was even true earlier, but the clear-cut guidelines on who to test in a hospital or when to do an RT-PCR is helpful in addressing any ambiguities. Like in Delhi, we should increase RT-PCR testing (elsewhere),” he said.

The guidelines also mentions places where molecular testing – such as RT-PCR, CBNAAT, and TrueNat – should be preferred over the cheaper and faster but less accurate rapid antigen tests (RAT).

Within containment zones, a rapid antigen test is the preferred modality for screening. Those to be screened include all persons with influenza-like illnesses, all direct and high-risk contacts (family members, colleagues, above the age of 65, immunocompromised, or have conditions such as diabetes, hypertension, or heart, kidney, and lung diseases).

“Ideally, it is suggested that 100% people living in the containment zones should be tested by RAT particularly in cities where there has been widespread transmission of the infection,” the guidelines mention.

In non-containment areas, however, the ICMR strategy suggests that preference should be given to molecular methods to test those with influenza-like symptoms, all symptomatic contacts, and all asymptomatic high-risk contacts. RT-PCR, CBNAAT, or TrueNat should also be used for routine surveillance of all symptomatic travellers within seven days of illness, and health care or frontline workers involved in Covid-19 management.

Within hospitals, the ICMR strategy says molecular tests should be preferred for testing those with severe acute respiratory infections, influenza-like symptoms, high-risk contacts in need of hospitalisation, asymptomatic patients undergoing surgery or other invasive procedures, and all pregnant women in or near labour.

The guidelines state that no emergency procedure should be delayed for the want of a test; a sample can be sent simultaneously.

Hospitals have been instructed not to refuse admission to pregnant women citing lack of testing facility.

<https://www.hindustantimes.com/india-news/icmr-paves-the-way-for-walk-in-tests/story-6tTIOsqhoO7Hn8ZrWUAe0I.html>

Covaxin: Phase 2 clinical trials for India's first indigenous COVID-19 vaccine to begin on Monday - Reports

The Hyderabad-based vaccine company has received approvals from the Central Drug Standard Control Organisation, under the Directorate General of Health Services to conduct the trials, the news agency reported

New Delhi: Bharat Biotech, in partnership with the Indian Council of Medical Research, began research on the first homegrown COVID-19 vaccine in the country a few months ago. The vaccine was currently in the phase 1 trials, being conducted at several locations around the country.

According to a report by the news agency IANS, the stage for phase 2 trials of Bharat Biotech's Covaxin, is now ready, and the trials may begin on Monday.

The Hyderabad-based vaccine company has received approvals from the Central Drug Standard Control Organisation, under the Directorate General of Health Services to conduct the trials, the news agency reported.

The approval was given in the form of a letter written by Joint Drugs Controller Dr S. Eswara Reddy to Bharat Biotech.

The phase 2 trials of BBV152, also dubbed as Covaxin, will reportedly be conducted on 380 participants, who will have to be screened four days after the vaccine is administered to them.

In the letter, and as reported by IANS, the Joint Drugs Controller said that the directorate had no objection to conducting the trial titled 'An adaptive, seamless Phase I, followed by Phase II randomized, double-blind, multicentre study to evaluate the safety, reactogenicity, tolerability and immunogenicity of the whole-virion inactivated SARS-CoV-2 vaccine (BBV152) in healthy volunteers'.

The letter mentions that Bharat Biotech's request for approval to initiate phase II clinical trials was examined in consultation with the Subject Expert Committee (COVID-19) experts held through virtual meeting on September 3.

"This is to inform you that the subject proposal was examined in consultation with SEC (COVID-19) experts held through virtual meeting on 03-09-2020, wherein the committee recommended for the conduct of Phase II part of clinical trials with 380 participants subject to the condition that time for screening the participants should be revised to 4 days," reads the letter dated September 3.

Trials conducted so far

Phase 1 trials for Covaxin began on July 15 at 12 centres across the country. Healthy individuals were given two doses of the vaccine, with a gap of about 14 days. The phase 1 trials were conducted on over 350 people, and are still continuing.

In phase 1 trials, the volunteers were examined after every two days. The period will be extended to 4 days in phase 2 clinical trials.

Earlier, a report had said that the first phase trials of Covaxin had shown that the jab is both effective and safe against the novel coronavirus.

<https://www.timesnownews.com/health/article/covaxin-phase-2-clinical-trials-for-indias-first-indigenous-covid-19-vaccine-to-begin-on-monday-reports/648355>



Covaxin: Phase 2 clinical trials for India's first indigenous COVID-19 vaccine to begin on Monday - Reports | Photo Credit: iStock Images

Many things about Covid, including vaccine efficacy, still unknown — top Indian experts write

In an editorial in Indian Journal of Medical Research, Dr Priya Abraham and Dr Rajesh Bhatia note that 'unknowns' about Covid-19 exceed the 'known'

By Himani Chandna

New Delhi: Indian health experts have admitted science has answered few questions on the Covid-19 pandemic so far, and “unknowns about the virus exceed known” even today.

In an editorial published in the Indian Journal of Medical Research (IJMR), a peer-reviewed medical journal by the Indian Council of Medical Research (ICMR), top health experts Dr Priya Abraham and Dr Rajesh Bhatia said the “efficacy of vaccines” also remains uncertain.

Abraham is the director at Pune-based National Institute of Virology (NIV), an institute under the ICMR, while Bhatia is a former director of communicable diseases, World Health Organization, South East Asia.



Representational image | A health worker draws a blood sample as part of the serological survey | Photo: Manisha Mondal | ThePrint

“Combating the pandemic shall require complete understanding of the virus, its pathogenesis, epidemiological and clinical dimensions, and availability of safe and efficacious therapeutic and prophylactic tools especially for vulnerable and high risk populations,” said the editorial, titled ‘*The enigmatic COVID-19 pandemic*’, published on 5 September.

It added, “Answers to these research questions may get us closer to having reliable and affordable pharmaceutical and non-pharmaceutical interventions.”

Immune response of Covid-19 vaccines uncertain

According to the authors, Covid-19’s “duration of persistence of protective immunity remain elusive till date”.

“The uncertainty of long-term immune response has potential implications for the efficacy of vaccines,” they added.

Till now, vaccines are being considered as the ultimate intervention to contain the pandemic.

However, the editorial noted that “the real impact of vaccines on this pandemic will become evident only once it has been widely in use for a few months in different populations”.

The editorial elaborated on the globally “accelerated” race to find vaccines, and also mentioned Sputnik V — Russia’s proposed Covid-19 vaccine that induced an antibody response in all participants in early trials with no serious adverse effects.

“Currently, there are about 165 different candidate vaccines for COVID-19 being developed around the world and several of these are in different phases of clinical trials,” the authors noted.

Progress under Millennium Development Goals pushed back

According to Abraham and Bhatia, the pandemic has also pushed back progress made under the Millennium Development Goals (MDGs) and is hampering the ambitious United Nations Sustainable Development Goals.

The MDGs were eight international development goals formed by the UN, which included targets such as halving extreme poverty rates to halting the spread of HIV/AIDS and providing universal primary education, till the target year of 2015.

The UN also adopted 17 Sustainable Development Goals (SDGs) in 2015 as a universal call to action to end poverty, protect the planet and ensure all people enjoy peace and prosperity by 2030.

“It is still not clear as to how the global community will make up for the pandemic-induced setback to its critical operations of major disease elimination programmes such as for tuberculosis,” the editorial noted.

<https://theprint.in/health/many-things-about-covid-including-vaccine-efficacy-still-unknown-top-indian-experts-write/496992/>

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Russia's Covid-19 vaccine may be released for public use this week: Report

The vaccine “Sputnik-V” will be released for widespread use after the permission is granted for its widespread usage by the country’s health ministry, TASS

Russian News Agency quoted expert Denis Logunov as saying

Edited By Arpan Rai

New Delhi: Russia stunned the world last month when it claimed that it has become the first country to create a vaccine for the coronavirus disease. And now, one of the country’s top officials has said that the Covid-19 vaccine will be released for civilian use as early as this week.

The vaccine “Sputnik-V” will be released for widespread use after the permission is granted for its widespread usage by the country’s health ministry, TASS Russian News Agency quoted expert Denis Logunov as saying.

“Its examination is to begin within days. Also, within days we are to obtain permission. There is a certain procedure of authorizing a batch for civilian use. It must pass the quality check of the medical watchdog Roszdravnadzor. Within days, between September 10 and 13, we are to obtain permission to release a batch of the vaccine for civilian use. Respectively, from that moment on the population will begin to be vaccinated,” Denis Logunov, deputy director for research, associate member of the Russian Academy of Sciences said.

The vaccine’s distribution will be carried out under Russian health ministry’s scrutiny.

Logunov said that distribution will be prioritised for high-risk groups as the health ministry has tasked itself to protect the ones fighting the Covid-19 outbreak battle severely.

Marking another stage of progress on Friday, “Sputnik-V” produced an antibody response in all participants in early-stage trials, according to results published by The Lancet medical journal.

The two trials for “Sputnik-V” were conducted in June-July this year and involved 76 participants. The results showed 100 per cent of participants developing antibodies to the new coronavirus and no serious side effects, The Lancet said.

<https://www.hindustantimes.com/india-news/russia-s-covid-19-vaccine-may-be-released-for-public-use-this-week-report/story-ssWC5MdTod4Ebl4TZvWPgP.html>



A scientist filters out samples during the research and development of a vaccine against the coronavirus disease at a laboratory of BIOCAD biotechnology company in St Petersburg, Russia. (REUTERS)

