

Nov  
2020

# समाचार पत्रों से चयित अंश Newspapers Clippings

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

खंड : 45      अंक : 266      17 नवंबर 2020  
Vol.: 45      Issue : 266      17 November 2020



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## **DRDO hospital in Delhi to get 250 more ICU beds by weekend**

*The Sardar Vallabhbhai Patel Covid Hospital will now have a total of 500 ICU beds by Friday*  
*By Rahul Singh*

New Delhi: The Defence Research and Development Organisation (DRDO) has begun work on expanding the capacity of its Sardar Vallabhbhai Patel Covid Hospital in Delhi Cantonment to deal with an unprecedented surge in coronavirus infections in the capital, DRDO officials said on Monday.

This comes a day after the government announced that the Capital will get hundreds of more intensive care unit (ICU) beds for Covid-19 patients, testing for the coronavirus will be doubled, and doctors from central paramilitary forces will be flown in.

The 1,000-bed DRDO medical facility will get 250 additional ICU beds by Friday to provide treatment to patients who are seriously ill, said one of the officials cited above asking not to be named. This will take the total number of ICU beds at the hospital to 500 though the total capacity of the centre, spread over 25,000 square metres will stay the same.

The hospital --- built by DRDO in record time of 12 days with assistance from the armed forces, ministry of home affairs, ministry of health and family welfare and Tata Trust --- became operational in July and has so far treated and discharged 2,500 people. More than 400 patients are currently being treated at the hospital whose ICU centre is almost full, said a second official.

The doubling of the ICU beds will increase the requirement of doctors and paramedics at the hospital.

“The medical centre currently has around 150 doctors and paramedic. We will need an additional medical staff of around 100 people. This will be provided by the Armed Forces Medical Services and the Central Reserve Police Force,” said a third official, adding that the hospital also plans to get dialysis machines.

The ICU ward in the hospital has been named after Col B Santosh Babu and two other medical wards have been named after Naib Subedar Mandeep Singh and Naib Subedar Satnam Singh to honour the memory of brave hearts killed in action in the June 15 Galwan Valley clash with the People’s Liberation Army in eastern Ladakh.

Delhi chief minister Arvind Kejriwal described the lack of ICU beds as the “biggest challenge” in the fight against Covid-19 at a high-level meeting on Sunday. The meeting was chaired by Union home minister Amit Shah and attendees included Kejriwal, the health ministers of the



Covid-19 patients in the Intensive Care Unit (ICU) of a Delhi hospital. (Representative Photo/REUTERS)

Centre as well as the state, Delhi's lieutenant governor and top officials from Niti Aayog, Indian Council of Medical Research and All India Institute of Medical Sciences (AIIMS).

In a presentation, Niti Aayog's VK Paul described Delhi's situation as "unprecedented" and "likely to become worse."

<https://www.hindustantimes.com/india-news/drdo-hospital-in-delhi-to-get-250-more-icu-beds-by-weekend/story-1eIAzwr8VpOHSk0Izs4qN.html>

## Army Technology

Tue, 17 Nov 2020

# India's DRDO tests Quick Reaction surface-to-air missile system

*The Indian Ministry of Defence (MoD) has announced the completed testing of canister-based Quick Reaction Surface-to-Air Missile (QRSAM)*

The Indian Ministry of Defence (MoD) has announced the completed testing of canister-based Quick Reaction Surface-to-Air Missile (QRSAM).

The system hit a Banshee pilotless target aircraft at medium range and altitude. It was launched when the target was tracked to be in the kill zone and the direct hit was achieved with terminal active homing by RF Seeker guidance.



**QRSAM during its second flight test. Credit: Ministry of Defence / Government of India.**

The test was carried out by the Defence Research and Development Organisation (DRDO) on 13 November. It marks an important milestone towards the induction of the missile.

DRDO conducted the test at the Integrated Test Range at Chandipur, which is located off Odisha coast, India.

The missile was launched using a single-stage solid-propellant rocket motor and features locally manufactured subsystems.

During the flight test, battery multifunction radar, battery surveillance radar, battery command post vehicle, mobile launcher and other QRSAM weapon system elements were deployed.

The system is designed to provide the Indian Army with air defence coverage against strike columns. It can detect and track targets on the move and engages with the target with short halts.

The test saw participation from different DRDO labs, Defence Research and Development Laboratory (DRDL), Electronics & Radar Development Establishment (LRDE), Instruments Research and Development Establishment (IRDE), Integrated Test Range (ITR), Research and Development Establishment (Engineers) R&DE(E) and Research Centre Imarat (RCI).

The system is expected to be ready for induction next year.

Earlier this month, the Indian MoD announced that the enhanced Pinaka rocket completed the flight test on 4 November.

India is enhancing its defence capabilities through increased spending and procurement amid the ongoing conflict with China.

Last week, the Indian Army destroyed a number of army bunkers and positions of Pakistan along the Line of Control (LoC), after Pakistan carried out heavy shelling in many places.

According to reports, the altercation led to the deaths of at least eight Pakistani soldiers and injured twelve more.

Since May, India and China have also been engaged in a military standoff in contested territories along the LAC in Ladakh.

<https://www.army-technology.com/news/indias-drdo-tests-quick-reaction-surface-to-air-missile-system/>

## Defence News

# Defence Strategic: National/International



Tue, 17 Nov 2020

## India to get more eyes to monitor Chinese presence in IOR & SCS: Navy to get P8i Aircraft

*The configuration of the aircraft expected to arrive soon will be of the same configuration as the previous eight that are in service in the Indian Navy. Also, as reported by Financial Express Online earlier, there are plans of installing encrypted communications systems which have been delivered earlier*

*By Huma Siddiqui*

Indian Navy is getting ready to receive one of the four P-8I Maritime Patrol Aircraft later this month. With an additional P-8I aircraft in its fleet, India's surveillance, reconnaissance, and electronic jamming capabilities will get a boost in the Indian Ocean Region (IOR). Sources have confirmed to Financial Express Online, "As per the delivery schedule one out of the four aircraft are expected to arrive soon (before the month ends). And the balance three will arrive next year."

The aircraft which was expected to come earlier was delayed due to the global pandemic COVID-19 and the lockdown.

The configuration of the aircraft expected to arrive soon will be of the same configuration as the previous eight that are in service in the Indian Navy. Also, as reported by Financial Express Online earlier, there are plans of installing encrypted communications systems which have been delivered earlier. After India and the US inked the Communications, Compatibility and Security Agreement (COMCASA), the installation of the encrypted communications systems on these P8i aircraft. These aircraft are coming from the Boeing Company.



The contract for eight P-8I between India and the Boeing Company was inked for USD 2.1 billion in 2009.

### How does COMCASA Agreement help?

It is the way ahead for achieving the interoperability, especially for the US-supplied defence equipment and platforms. It also helps as when the militaries of the two countries are involved in complex drills in sea, air, underwater or on land.

With COMCASA in place, the P8i (specific for the Indian Navy requirement) and P8A Poseidon aircraft, the US Navy variant of the aircraft will be able to share real-time operational intelligence, which also includes a secure Common Tactical Picture.

### **More about the P-8I Contract**

The contract for eight P-8I between India and the Boeing Company was inked for USD 2.1 billion in 2009. These aircraft are coming through the Foreign Military Sales Route (FMS) and India was the first international customer for this aircraft. The Ministry of Defence (MoD) placed a follow on order for additional four P-8I in 2016. And the DAC has given approval for more P-8I in November last year.

### **What is onboard the P8i for the Indian Navy**

These aircraft are equipped with the most modern anti-submarine warfare (ASW) Technology.

These include a Telephonics APS-143. This is not available on the original P-8A Poseidon in use with the USN

The OceanEye Aft Radar System.

Magnetic anomaly detector.

The weapons systems including Harpoon Block-II missiles and MK-54 lightweight torpedoes come with the aircraft India has.

These aircraft are all data-linked with Indian submarines. This makes them capable of passing all critical information about the enemy vessels.

Indian Naval Air Squadron 312A, is the P-8I Squadron, is operating out of naval air station Rajali, based in the South.

In P-8I, the 'I' stands for India and it is the Indian Navy variant of the P-8A Poseidon and is for maritime patrol.

It has the capability to carry around 129 sonobuoys which help in locating the enemy subs and can also be used for launching anti-ship missiles.

Though these aircraft were ordered much before the ongoing standoff between India and China along the Line of Actual Control (LAC) in the eastern Ladakh, more P-8I from the US will help in keeping a watch on the growing presence of the Chinese boats in the region.

China has already managed to acquire a string of ports in the region –Myanmar (Kyaukpyu port), Sri Lanka (Hambantota Port), Pakistan (Gwadar port), Iran (Port of Jask).

### **More about the AGM-84L**

The US administration has recently approved the sale of ten AGM-84L Harpoon Block II air-launched missiles. These will help the P-8I to engage and destroy hostile surface warships of choice.

With a solid propellant well tested sea-skimming missile and a range of 67 nautical miles, Indian Navy will be in a position to undertake Airborne maritime surface target engagement tactics more effectively.

### **Importance of the P-8I Maritime Patrol Aircrafts**

According to Milind Kulshreshtha, C4I expert, “These aircraft have been acknowledged as a force multiplier with its in-built inter-operability capabilities and as an advanced airborne platform by Indian Navy. Thus making the P-8I a multi-mission aircraft with C4I ingrained. “

<https://www.financialexpress.com/defence/india-to-get-more-eyes-to-monitor-chinese-presence-in-ior-scs-navy-to-get-p8i-aircraft/2129490/lite/>

## India now has a dedicated Drones Directorate to focus exclusively on drones

By Soumyarendra Barik

You are reading it here first: India now has a dedicated Drones Directorate that will solely focus on managing the drones ecosystem in the country. The civil aviation regulator, DGCA, obtained the permission to set up the Directorate from the Finance Ministry, and the department — to begin with — will have eight officials from the DGCA, but will be expanded over time, Amber Dubey, joint secretary at the Civil Aviation Ministry said on Monday.

“This is a pleasant surprise since under the pandemic related austerity measures, formation of any new department undergoes extreme scrutiny. One more baby step towards making India the drone capital of the world,” Dubey wrote. At the moment it is unclear who the eight members of this department are, and we have reached out to the Civil Aviation Ministry for more details.

An industry source told MediaNama that the Directorate will have its own financial budget, which is presumably why the DGCA had to receive approval from the Finance Ministry. Another industry source said that the Directorate will help in creating more focus on the drones’ ecosystem, given that both DGCA, and the Civil Aviation Ministry have traditionally prioritised civil aviation operations over drones.

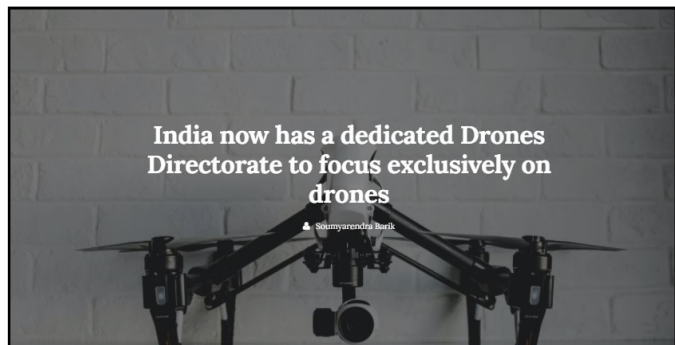
“Getting a single function to look at all the aspects of operations is going to reduce the need for running around to get a complete picture. We see this as a much needed focused measure where all the functions are equally motivated to do dedicated efforts on making India the drone capital of the world,” Ankit Meha, co-founder and CEO of drone maker ideaForge told MediaNama in a statement.

**What the Directorate could look into:** A dedicated [draft legislation](#) for drone use in the country was published in June, and the rules are currently in the draft stage, and the Directorate could look into finalising these rules.

There is another important thing that the Directorate could look into: the multiple delays to rolling out no permission, no takeoff (NPNT) support to the Digital Sky platform. India’s drone rules mandate that only NPNT-compliant drones be allowed to fly, however, given that the functionality is yet to be baked into the Digital Sky platform, this provision has rarely been fulfilled.

**How India’s drone space has changed over the last one year:** The idea to set up a dedicated Drones Directorate was first proposed in 2019, by the then Civil Aviation Minister Jayant Sinha, particularly to issue guidelines for drone operations, and for handling certification of drone pilots, among other things. Since then, India has seen two different Civil Aviation Ministers in Suresh Prabhu, and the incumbent Hardeep Singh Puri; the drone ecosystem has also changed quite significantly:

- Multiple drone training schools have been approved by the DGCA to train and certify drone operators — a prerequisite for obtaining a drone pilot license — and very recently had its first batch of certified drone pilots.
- The DGCA has approved a third-party drone certification scheme to fast track drone certification in the country.



- Insurance regulator, IRDAI, formed a working committee to look into drone insurance, and the group had already come out with a working paper. A few banks have also started offering drone insurance plans.

While the government is building the entire infrastructure for drone use in the country, it is also slowly and steadily allowing for more drone use. The COVID-19 pandemic saw a number of state governments deploy surveillance drones for containment exercises, but even beyond the pandemic, drones are now being deployed in multiple areas — including at critical infrastructure such as thermal power plants.

<https://www.medianama.com/2020/11/223-drones-directorate-india/>



Tue, 17 Nov 2020

## Challenges and opportunities of new era in national security

*In the run-up to the HT Leadership Summit this year, premised on the apt theme of defining a new era, the realm of national security merits attention. An objective assessment of the challenges to India’s national security in the current period would point to the inclusive nature of the concept of national security and how this has affected both the state and the citizen – from China to the coronavirus disease (Covid-19)*

*By C Uday Bhaskar*

National security as related to the flag, state sovereignty and territorial integrity has a theological sanctity accorded to it in India and both the political leadership and an earnest citizenry swear by their commitment to this sacred calling. However, the sustained policy attention and material support to this domain is inversely proportional to the sanctity index.

In the run-up to the HT Leadership Summit this year, premised on the apt theme of defining a new era, the realm of national security merits attention. An objective assessment of the challenges to India’s national security in the current period would point to the inclusive nature of the concept of national security and how this has affected both the state and the citizen – from China to the coronavirus disease (Covid-19).



**Technology has always been at the heart of enhancing and refining capability and a holistic techno-strategic review specific to India’s national security needs the highest priority.**

While the military stand-off with China across the Line of Actual Control (LAC) is more complex and strategic in terms of its subtext, the pandemic and the fact that India has lost about 130,000 citizens to this virus is indicative of how rapidly security challenges can evolve in the 21st Century and the need to prepare for them in an affordable and effective manner.

The contours of the “new era”, where India will have to prepare for its national security road map, is defined by an assertive China, an ambivalent United States (US) and the pandemic with its attendant consequences and constraints.

The fact that Galwan happened and India lost soldiers along the LAC evokes a sense of déjà vu — Delhi was caught unawares and the adversary had surprised India again. Objectively assessed, this points to organisational inadequacy in the overall defence management of the nation as evidenced from 1962 onwards and one reiterates a plea made in the past – that India must rigorously review past lapses and apply the necessary policy corrections.



The most defining feature of the new era for the Indian security planner is the grim reality that the national prosperity index has shrunk, due to the pandemic (it is estimated that GDP may drop by almost 10%), and hence the outlay for the defence sector for 2021-22 will be accordingly depressed. This tightening of the fiscal belt due to Covid-19 will be over and above the steady reduction in the capital component of the defence budget that has taken a beating progressively in real terms over the last decade and more. The adverse impact of this on the military inventory and the modernisation programmes has been significant.

Within the prevailing fiscal constraints and given that the top political leadership of the country will remain invested in the domestic electoral cycle, the three big issues that warrant unwavering institutional focus to effectively navigate the new era are higher defence management organisational review and redress; improvement in material and human resource capabilities of the armed forces; and astute technology investment.

Disaggregated, this translates into recognising lapses noted in detail in the Kargil review and asking those difficult questions as to why Galwan happened. Can the onus be placed on only security forces or should it go further up the pecking order all the way to the highest political level?

Currently, India is in the midst of a major organisational transmutation with the appointment of a chief of defence staff (CDS) and certain macro policies are being unveiled to enhance jointness and an integrated management of single service assets. It is too early to arrive at any definitive conclusion about outcomes but to note that it does not appear all that smooth - which is to be expected.

The most critical area is the nurturing of human resources and a recent proposal relates to reducing the pension outlay for military personnel by pruning the existing model and linking this to length of tenure to ostensibly reduce the pension bill. Alas, this initiative could have very serious long-term implications for the morale and motivation of the Indian fauj – its most cherished USP. If the young Indian soldier scaled the Himalayan peaks against all odds in the Kargil War and asserted ‘yeh dil mange more’ (give me more of this!), due credit must be given to the service conditions of the Indian soldiers by which they have been empathetically nurtured.

Regrettably in recent decades, there has been a progressive lowering of the profile of the armed forces in the institutional framework of India and a number of policy measures to improve the welfare of the government employee have been denied to the soldier. These relate to pay, pensions and medical benefits and the double whammy for the Indian military is that not only the civilian counterpart but the police and paramilitary have moved up the ladder.

India’s ability to effectively deal with the many challenges to national security in the new era will be predicated, metaphorically on the quality of the gun and the man behind the gun. Both are in distress and it would be imprudent for the policymaker to ignore this reality.

Technology has always been at the heart of enhancing and refining capability and a holistic techno-strategic review specific to India’s national security needs the highest priority. China’s footprint in various hi-tech sectors such as 5G and AI is illustrative. Given the Covid-19 triggered resource constraints, India needs to innovatively harness its talent, both within the country and in the diaspora to create a road map for appropriate niche technology induction.

The new era will emerge with many challenges and opportunities that will impact national security in a continuous manner. An informed and nimble higher defence institutional grid that will focus on man, material and technology in a more creative manner is imperative.

*(C Uday Bhaskar is the director of Society for Policy Studies. Views expressed are personal)*

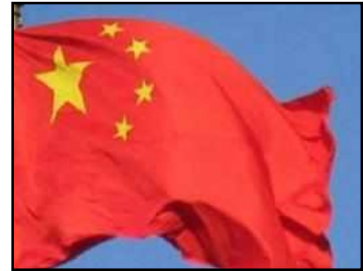
<https://www.hindustantimes.com/htls/challenges-and-opportunities-of-new-era-in-national-security/story-1Osvoa0wYVjPGOp32zKEeO.html>

## China's ballistic missiles and uncertainty at sea

Hong Kong: On August 26, China fired two of its most capable conventional missiles - a DF-26 intermediate-range ballistic missile (IRBM) and DF-21D anti-ship ballistic missile (ASBM) - into the South China Sea from bases in mainland China. Now, nearly three months later, a Chinese source is claiming that these missiles hit a moving ship target near the Paracel Islands.

Allegedly, the target was in disputed waters south of Hainan Island and north of the Paracel Islands. The exercise was presumably overseen by the PLA's Southern Theater Command.

It is unclear why China took so long to make such a claim about hitting a mobile at-sea target, but it is surely related to bolstering a Chinese propaganda effect. The source of the claim was Wang Xiangsui, a former senior colonel of the People's Liberation Army (PLA), who now holds a professorial tenure at Beihang University in Beijing. At the time of August's missile firings, it was obvious to most that Beijing was sending "warning shots" via the PLA Rocket Force (PLARF) against an ongoing American presence in international waters, amidst strategic friction between the two nations.



Indeed, a day earlier the US military had flown a U-2S Dragon Lady spy plane near a Chinese naval live-fire drill in the Bohai Sea off China's northeast coast. The previous month, the US Navy (USN) had sailed two aircraft carrier strike groups (USS Nimitz and USS Ronald Reagan) in the South China Sea "in support of a free and open Indo-Pacific".

Concerning the former, China had declared a no-fly zone in international airspace above the Bohai Sea, meaning its declaration had no legal merit. That is why the US said the flight was "within the accepted international rules and regulations governing aircraft flights", and that the air force would "continue to fly and operate anywhere international law allows, at the time and tempo of our choosing".

Wang, speaking in a closed meeting of the Moganshan Forum in Zhejiang in October, reportedly claimed, "So several days later [after the aircraft carrier manoeuvres], we launched the DF-21 and DF-26, and the missiles hit a vessel sailing south of the Paracel Islands." Wang added, "Shortly after that, an American military attache in Geneva complained and said it would lead to severe consequences if the missiles hit an American aircraft carrier. They see this as a show of force, but we are doing this because of their provocation." He underscored, "This is a warning to the US, asking it not to take any military risks. Such actions mark the bottom line of Sino-US confrontation."

Of course, Wang's comments make a mockery of Wu Qian, spokesman for the Chinese Ministry of National Defense, who said at the time that the missile drills were not aimed at any particular country. However, he added, "China opposes and is not afraid of US provocation ... We urge some US politicians to assess the reality objectively, stop provocation and pull Sino-US relations back to a normal track."

Back in August, the US Department of Defense (DoD) said Beijing's "actions, including missile tests, further destabilize the situation in the South China Sea". Interestingly, an American RC-135S Cobra Ball spy plane flew from Okinawa into the South China Sea area at the time of this drill. The platform, able to collect imagery, telemetry and electronic intelligence on ballistic missiles, was presumably gathering data on the missile drill.

What about the missiles fired on August 26? The DF-26B was launched from Qinghai Province in northwest China (approximately 2,500 km away), and the DF-21D ASBM from eastern China in Ningbo, Zhejiang Province (a distance of 1,600 km).

The DF-21D "carrier killer" has a range of approximately 1,800km. The DF-26 IRBM, on the other hand, has a 4,000km range and it can carry either a nuclear or conventional warhead. The nomenclature of "DF-26B" is intriguing, as it is unknown what improvements this missile possesses over its predecessor.

The DF-21D and DF-26 are in categories banned under the Russia-US Intermediate-Range Nuclear Forces (INF) Treaty, which the US withdrew from in 2019. China was never a signatory, and Washington cited China's possession of such weapon categories as one justification for its INF withdrawal.

Quite apart from the direct challenge to the US military, the PLARF's firing of these missiles against moving targets is a technological milestone. Indeed, the South China Morning Post quoted Song Zhongping, a former instructor with the PLA's former Second Artillery Corps, as saying, "To hit a moving object is not an easy task, especially for ballistic missiles, which normally hit a stationary target. The mission shows Chinese missiles are a real deterrent against US warships."

One expert on China's naval prowess is Doctor Andrew Erickson, Professor of Strategy at the US Naval War College. In an interview with Harry J. Kazianis of the Center for the National Interest, Erickson said he was not surprised at the speed of China's ASBM development.

The DoD's 2020 report on China's military development stated, "The PLA has fielded approximately 200 IRBM launchers and more than 200 missiles." Erickson elaborated, "To me, this is the single most important sentence in what I believe is the best-written report to Congress yet in the two decades that the Pentagon has been issuing them. Reported ranges for systems currently in the PLA Rocket Force inventory suggest that these 200 IRBMs are DF-26s, with some number of the DF-26B ASBM variant among them."

Erickson continued: "The DF-26's dominance of China's arsenal within that set of operationally important range parameters suggests great confidence in this particular missile for two major reasons: (1) extraordinarily fast production and deployment in high numbers of a modern weapon system; and (2) no apparent need to hedge with multiple missile types with broadly overlapping capabilities."

Regarding the news that these missiles hit a moving ship target, Erickson assessed: "With its recent ASBM tests, reportedly against moving targets, Beijing seeks to demonstrate a maturing capability and enhance deterrence. It seeks to overawe audiences limited in access to technical details and limited in understanding of basic technical principles - and thereby to generate deference that it has not earned operationally

"But however sophisticated and successful, these tests are but one element in a far greater equation. First, ASBMs' effectiveness in practice hinges on a comprehensive reconnaissance and targeting architecture."

The American acknowledged that China is working diligently to develop such architecture, "But it remains a work in progress that has not been validated concretely in critical respects. Second, growing American countermeasures make this at least a two-sided contest."

Should countries like the USA be concerned with China's ASBM development? Erickson responded, "The US Navy has taken this threat very seriously, both in terms of hard-kill and soft-kill systems. There is certainly more work to be done, but America is pacing the threat with manifold potent countermeasures." American countermeasures thus far include Aegis ballistic-missile defense, SM-6 missiles and electronic warfare systems that can confuse incoming ASBMs with false targets.

Another naval expert is Collin Koh, Research Fellow at the Institute of Defence and Strategic Studies, part of Singapore's S. Rajaratnam School of International Studies. Concerning Wang's claims, Koh advised exercising "some caution and seek to ascertain its veracity," even though authoritative confirmation from either the Chinese government or Pentagon may be hard to come by.

Koh pondered: "Let's assume the PLA has, over the years, honed its ISR [intelligence, surveillance and reconnaissance] capabilities focusing on the near seas ... There's, after all, the

possibility that the PLA manages to minimize the intervening physical factors to an accurate shot. We aren't too sure how many times has the PLA validated the capability to ensure the ISR and kinetic systems work in a seamlessly integrated fashion, especially how midcourse targeting works in this scenario, nor how many times this ASBM complex has been tested on moving targets." Koh continued, "The question is then if the missile indeed hit the target, is it a fluke shot? Though of course that still counts as a hit anyway to brandish as a colourful report card to domestic audiences and the Americans."

The other obvious question is how many targets were there? If only one, as Wang implied, what was the extent of damage, and why was it not sunk after the first successful hit? Koh did not expect transparency from China in any case. Amidst the current "Wolf Warrior" diplomatic environment, it would be well-nigh impossible for a missed target to be reported. Additionally, "The PLA has every incentive, if pushed, to support Wang's assertion, even if it's not true. You may even argue that the Pentagon has reason to magnify this claim as well if it means justification for more funding to acquire countervailing capabilities."

Furthermore, questions need to be asked about the source of the solitary claim to date. "Wang himself is known to make some outlandish claims. Just earlier this year in a TV program he claimed that should a cross-strait war erupt, Taiwan President Tsai Ing-Wen can easily be captured within a night. No context or supporting material to back this assessment."

Koh assessed: "Conclusion: sans independent verification, and if we only have PRC and US info to utilize, there's no way for sure to probe deeper into this claim, and all we are left is a black box of info, from which we can only speculate, keep guessing and make certain assumptions. This black box thus contributes to the shaping of perceptions and feeds into this security dilemma since either party has to, in the face of inadequate info, assume and prepare for the worst. Unfortunately, this is how we got to this current stage and the situation won't improve."

Chinese ambiguity over its missiles is contributing to regional consternation. The Singaporean thus adjudged, "The reality now is that the enigma surrounding the ASBM contributes to strategic ambiguity and helps bolster PLA deterrence. Though of course, we can expect the US, not least the navy, to remain unfazed and still persist in traversing the South China Sea just to make the point." In fact, August 2020 was not the first time China fired ballistic missiles into the South China Sea.

It did so in mid-2019, with what are presumed to have been DF-21D and/or DF-26 missiles. At that time, Doctor Bates Gill, professor of Asia-Pacific security studies at the Department of Security Studies and Criminology at Macquarie University in Australia, told ANI: "This is a very big deal. It is not only because they were fired over contested waters and islets. It is also important because this would be the closest the PLA has ever come to the real thing."

The fact that the PLARF's DF-26 can carry either conventional or nuclear warheads muddies the issue, raising the stakes for miscalculation. When a DF-26 missile is launched, how can a potential target know what kind of warhead is fitted? It may therefore retaliate in a way that escalates the situation.

Both China and the US will continue to use each other's actions in the South China Sea as *raison d'être* for deploying medium- and intermediate-range ballistic missiles. Of course, this also raises the chance of misunderstanding. China's latest missile launch into the South China Sea, where US warships are conducting freedom of navigation operations at a relatively frenetic pace, will raise American mistrust of Chinese intentions.

China's ability to fire such missiles from deep in the mainland also represents a potent threat to foreign warships. The presence of longer-range missiles adds depth to China's defensive layer, plus they are less vulnerable to hostile attack. Nevertheless, launching ballistic missiles at warship targets still requires a reliable chain of surveillance and guidance technologies, which remain untested in combat conditions.

<https://timesofindia.indiatimes.com/world/china/chinas-ballistic-missiles-and-uncertainty-at-sea/articleshow/79244958.cms>

## Both India & China likely to acquire Russian Stealth Fighter Jets – Su-57: Chinese State Media

As bonhomie between Russia and China continues to grow especially against US assertiveness against both the nations, there are reports that Beijing could be acquiring the Russian, fifth-generation, stealthy, and the most potent warplane in the Russian armory – the Su-57 jets.

According to reports in Chinese state media the Global Times (GT), military experts in the world's second-biggest economy are becoming increasingly convinced about the competence of Su-57 warplanes but also remain skeptical if the Russian jets can integrate into the Chinese system since China has developed its own stealth jets – the J-20s.

GT citing the Jane's Defense Weekly writes – the Su-57E, an export version of the Su-57, is expected to receive export approval from Russian President Vladimir Putin in a few weeks, said Viktor Kladov, director of international cooperation and regional policy at Russia's Rostec defense industrial holding company, at a media briefing at the Langkawi International Maritime and Aerospace Exhibition in Malaysia.



Kladov termed China as a potential customer. “China has recently taken delivery of 24 Su-35 aircraft, and in the next two years [China] will make a decision to either procure additional Su-35s, build the Su-35 in China, or buy a fifth-generation fighter aircraft, which could be another opportunity for the Su-57E,” he said.

Xu Guangyu, a senior consultant at the China Arms Control and Disarmament Association, told the Global Times that it is likely that China could acquire the Russian Su-57s as Beijing needs to analyze and learn from other countries, whenever possible.

Wang Yongqing, the chief designer of the Shenyang Aircraft Design Institute said that the Su-57 is designed to have powerful supersonic cruise and maneuverability, and intentionally reduces stealth, a capability said to be crucial to a fifth-generation fighter, the GT wrote in its report.

While US warplanes focus on stealth and beyond visual range missiles, the Su-57 can dodge incoming hostile missiles through its super-maneuverability and engage enemies at close range, a situation where stealth is not so significant as super-maneuverability, Wang said.

India could also be keen in acquire the Su-57 jets, Kladov said. Unlike China, India does not have a fifth-generation warplane and will not be able to develop one anytime soon, so the Su-57 is a very attractive option for India, Wang Ya'nan said.

The twin-engine for SU-57 is built at the Komsomolsk-on-Amur aircraft plant in the Russian Far East. According to a report in *Forbes* by David Axe, Sukhoi originally planned to hand over the first two production-standard SU-57s in late 2019 and two more in 2020. But the December 2019 crash of one of the jets compelled the company to halt the work on the program.

As reported earlier by the EurAsian Times, the SU-57 fighter jet is designed to have supercruise, supermaneuverability, stealth, and advanced avionics to overcome the prior generation fighter aircraft as well as ground and naval defenses.

Russia is marketing a number of high-end combat jets to India and alongside continued sales of MiG-29 and SU-30MKI fighters. New Delhi could also possibly purchase the Yak-130 fighter-trainer and the MiG-35 next-generation medium fighter jet.

India has shown some interest in Russia's Su-57 next-generation heavyweight fighter, although the aircraft is yet to enter service in the Russian Air Force. New Delhi is likely to wait and assess its performance before giving any assurances.

Experts stated that the possibility remains that India could seriously consider acquiring an initial batch of 'off the shelf' Su-57 jets from Russia to evaluate their capabilities – before entering into a contract for joint production.

<https://eurasianimes.com/both-india-china-likely-to-acquire-russian-stealth-fighter-jets-su-57-chinese-state-media/>



Tue, 17 Nov 2020

## Indo-Nepal relations: Army Chief Naravane's bridge-building

*Home Minister of Nepal announced that 100 more border posts will be built over the boundary lines of the new map to confront the Indian army*

*By Col J P Singh*

As immediate neighbours, India and Nepal shared a unique relationship of friendship till the recent past which is characterized by a common culture, deep-rooted people-to-people, military-to-military and above all the traditional kinship (roti-beti relationship). But the Parliament of Nepal gave a stunning blow to this relationship at a time when India was grappled with deadly pandemic on the one hand and Dragon's warmongering in Ladakh on the other. It was then that the Parliament of Nepal voted unanimously to amend the Constitution to redraw the country's political map and include the key strategic areas of Lipulekh, Kalapani and Limpiyadhura, along the border with India, otherwise Indian territory, as Nepalese territory. As if the deadly pandemic was not enough to deal with, why was Nepal adding to mutual hardships and hatred remains to be answered.

There may be differing perception over these areas but there wasn't any visible dispute. The simmering dispute, if any, finally erupted on 13 June 2020 when Nepal Parliament took the neighbour head-on by allowing Indian territory to be included in its map. Adding fuel to the fire were verbal accusations and targeting of India by top Nepalese leaders. Home Minister of Nepal announced that 100 more border posts will be built over the boundary lines of the new map to confront the Indian army. Reacting to Nepalese claim over these areas, India invited Nepal for talks to resolve the border issue through diplomatic means but the offer was rejected outright.



As immediate neighbours, India and Nepal shared a unique relationship of friendship. (PTI Image)

Indo-Nepalese relations have soured in the recent past because of various political reasons. Nepal alleges too much Indian interference in internal affairs of Nepal. Kalapani issue they say is an old issue. But unilateral altering the maps by Nepal was mischievous. Kalapani is close to Lipulekh Pass on the India China border. It is an approved border trade point and route to holy/spiritual Mount Kailash-Mansarovar the pilgrimage which is sacred to Hindus, Buddhists and Jains. Large number of Indian undertake a spiritual pilgrimage to Kailash-Mansarovar every year through Kalapani. With Nepal's unilateral action of declaring the crossing point as Nepalese

territory accompanied by other actions, if any, to deny this route to the holy pilgrimage next post-Corona summer can lead to military clashes.

Nepal is a landlocked country and shares 1850 km long border with five Indian States ie Sikkim, West Bengal, Bihar, Uttar Pradesh & Uttarakhand. Border with these states is open and there has been a long tradition of free movement of people across these states. And 'India-Nepal Treaty of Friendship 1950', which is the bedrock of the past special relationship opens Nepal to the world. This treaty allows free movement of Nepalese trade and transit. Long Indo-Nepal border is lightly policed which is invariably exploited by terrorist outfits and insurgent groups with impunity. Large scale fake Indian currency is smuggled through Indo-Nepal border. Internal Security threats from Nepal is a major concern for India.

Nepal is very important to India and approximately 6,00,000 Indians are living/working there as workers, seasonal/migratory labourers, businessmen, traders and professionals in health, construction & IT and many Nepalese work in India. About 250 small and large rivers flow from Nepal to India and constitute an important part of the Ganges river basin. They are major sources of irrigation and power for Nepal and India.

India-Nepal military relationship is equally unique because 40,000 Nepalese nationals are soldiers in the Indian army. They have fought alongside Indian soldiers in every war. Chief of the Indian Army holds the Hon'y rank of General in the Nepalese Army and a reciprocal honour is conferred on Chief of the Nepal Army. As of now, 1.23 lakh Nepali nationals, as ex-servicemen of Indian Army, are residing in Nepal who are paid their pension by India.

But there has been anti-India feeling among certain ethnic groups in Nepal which has grown ever since K P Sharma Oli came to power in 2018 riding on the crest of shrill nationalism with a loud anti-India overtone. He is from the Communist Party of Nepal (United Marxist-Leninist) which is closer to the Chinese Communist Party. Thereby establishment of close diplomatic relations between Nepal and China and its growing influence in the politics of Nepal has also resulted in misunderstandings and declining traditional Indian leverage in Nepal. In 2020 when the world was grappled with COVID, PM Oli whipped up the anti-India sentiment by blaming India of spreading pandemic in Nepal. When PLA tried to unilaterally alter LAC in Ladakh in May-June 2020, Nepal challenged Indian claim over Kalapani which is seen as china betted grave provocation.

Luckily special relations between two armies are intact. Cooperation between the two armies encompasses nearly all facets of military activity. Indian training facilities are open to Nepali officers & men. Joint military exercises are held periodically. Cadets of Nepalese army join NDA & IMA for pre-commission training and their officers attend various professional courses including prestigious National Defense College (NDC). Current Chief of Nepal Army Gen Purna Chandra Thapa is alumni of NDC. Hence Gen M M Naravane's recent visit to Nepal despite Kalapani tensions is part of the long-standing and customary friendship between the Indian and Nepalese armies and allows for renewing these strong bonds. India-Nepal army ties are epitomized by a unique tradition of conferment of Honorary rank of General to each other's Chief. Gen Naravane received this honour from the President of Nepal. He also called on the prime minister of Nepal. He addressed the Army's Command & Staff College and laid a wreath at Kathmandu Bir Smarak. Gen Naravane gifted medical equipment for two army hospitals and additional ventilators for Hospitals over and above 25 Tonnes of essential medicines earlier sent by India, which has been appreciated by Nepal. Indian Chief's visit is seen as a turn in the tide.

All in all, Nepalese past inimical actions were immature. They have alienated the people of India who are their traditional friends. The blame goes to Nepalese leadership, not the public. However, their gesture to invite the Indian army chief and Chief's decision to accept the invitation indicate mutual interest in moving towards bringing back the relations to pristine glory. Visit of the army chief has received unusual media attention and the public connect in both countries. Hopefully, it will pave the way for the more frequent high-level military to military engagements between India, Nepal and other inimical neighbours. Let the armies which are seen as warmonger be the torch-bearer of peace in Indo-Pacific. Pandemic should also teach us a lesson to value

human life and brotherhood. Let pandemic be the reason for spreading brotherhood and militaries be the torchbearer of peace.

*(The author is an Indian Army Veteran. Views are personal)*

<https://www.financialexpress.com/defence/indo-nepal-relations-army-chief-naravanes-bridge-building/2129318/>

 **The Indian EXPRESS**

Tue, 17 Nov 2020

## Phase 2 of Malabar naval exercise to commence on November 17

***This is the first time in over a dozen years that the four countries, India, US, Japan and Australia, are participating in such a large war-gaming naval exercise***

New Delhi: The second phase of the multilateral naval exercise Malabar, in which India, US, Japan and Australia are participating, will be held in the Arabian Sea from November 17 to November 20. This is the first time in over a dozen years that the four countries are participating in such a large war-gaming naval exercise.

The first phase was conducted off the Visakhapatnam shore earlier this month. The exercise involves aircraft carriers, fighter jets, submarines and other ships participating together.

“The second phase of Exercise Malabar 2020 will be conducted in the Northern Arabian Sea from 17 to 20 November 2020,” the Navy said, adding that it will take “forward the synergy achieved in the recently concluded Phase 1 of Exercise Malabar 2020, which was conducted in the Bay of Bengal” from November 3 to November 6.



The first phase of the Malabar exercise was conducted off the Visakhapatnam shore earlier this month. (Photo: [Twitter/@indiannavy](https://twitter.com/indiannavy))

“This phase will involve coordinated operations of increasing complexity between the navies of Australia, India, Japan and the United States,” the Navy said.

The four participating nations are also members of the Quadrilateral Security Dialogue, or the Quad, and their coming together for a major war-gaming exercise sends a strong message to China at a time when India and China are involved in an over-six-month military standoff in eastern Ladakh.

The second phase, the Navy said, “will witness joint operations, centered around the Vikramaditya Carrier Battle Group of the Indian Navy and Nimitz Carrier Strike Group of the US Navy”.

“The two carriers, along with other ships, submarine and aircraft of the participating navies, would be engaged in high intensity naval operations over four days. These exercises include cross-deck flying operations and advanced air defence exercises by MIG 29K fighters of Vikramaditya and F-18 fighters and E2C Hawkeye from Nimitz. In addition, advanced surface and anti-submarine warfare exercises, seamanship evolutions and weapon firings will also be undertaken to further enhance inter-operability and synergy between the four friendly navies.”

Apart from INS Vikramaditya and its fighter aircraft and helicopter air-wings, the Navy mentioned that “indigenous destroyers Kolkata and Chennai, stealth frigate Talwar, Fleet Support Ship Deepak and integral helicopters will also participate in the exercise, led by Rear Admiral Krishna Swaminathan, Flag Officer Commanding Western Fleet”.



The indigenously built submarine Khanderi and Navy's P8I maritime reconnaissance Poseidon aircraft will also showcase their capabilities during the exercise.

American Navy's Strike Carrier Nimitz "will be accompanied by cruiser Princeton and destroyer Sterett in addition to P8A maritime reconnaissance aircraft" and "Royal Australian Navy will be represented by frigate Ballarat along with its integral helicopter". Japan Maritime Self Defense Force, the Japanese Navy, will also participate in the exercise, the statement said.

The Malabar series of exercises, which began as an annual bilateral naval exercise between India and the US in 1992, said, the Navy, "has seen increasing scope and complexity over the years" and the current, 24th edition, "highlights enhanced convergence of views amongst the four vibrant democracies on maritime issues, and showcases their commitment to an open, inclusive Indo-Pacific and a rules-based international order".

<https://indianexpress.com/article/india/phase-2-of-malabar-naval-exercise-to-commence-on-november-17-7053493/>

## प्रभात खबर

Tue, 17 Nov 2020

### आज से अरब सागर में ताकत दिखायेगी भारतीय नौसेना, दोस्त राष्ट्र भी होंगे शामिल

नयी दिल्ली: चीन के साथ जारी तनाव (India China Faceoff) के बीच भारतीय नौसेना (Indian Navy) के युद्धाभ्यास 'मालाबार' का दूसरा चरण आज से उत्तरी अरब सागर में शुरू हो रहा है। इस युद्धाभ्यास में भारतीय नौसेना का विमानवाहक पोत आईएनएस विक्रमादित्य, अमेरिकी विमान वाहक पोत निमित्ज और ऑस्ट्रेलिया एवं जापान की नौसेना की अग्रिम मोर्चा पर तैनात पोत चार दिन तक अरब सागर में संयुक्त युद्धाभ्यास करेंगे।

इस बाबत अधिकारियों ने पीटीआई भाषा को बताया कि इस युद्धाभ्यास के दौरान 'क्वाड' समूह के देशों की नौसेनाओं द्वारा मिलकर कार्य करने की क्षमता को बढ़ाने के लिए समन्वित अभियान का अभ्यास किया जायेगा। उल्लेखनीय है कि मालाबार युद्धाभ्यास का पहला चरण तीन से छह नवंबर के बीच बंगाल की खाड़ी में संपन्न हुआ और इस दौरान पनडुब्बी युद्ध और समुद्र से हवा में मार करने की क्षमता का अभ्यास किया गया था।



Symbolic ImageFile

यह युद्धाभ्यास ऐसे समय हो रहा है जब पिछले छह महीने से भारत और चीन के बीच पूर्वी लद्दाख में सीमा पर गतिरोध चल रहा है जिससे दोनों देशों के रिश्तों में तनाव आया है। नौसेना ने एक बयान में बताया, 'मालाबार युद्धाभ्यास का दूसरा चरण उत्तरी अरब सागर में 17 से 20 नवंबर के बीच होगा।' बयान के मुताबिक अभियान के केंद्र में विक्रमादित्य विमान वाहक पोत और निमित्ज पोत पर तैनात युद्ध समूह होगा।

नौसेना ने कहा कि यह युद्धाभ्यास समुद्री मुद्दे पर चार जीवंत लोकतांत्रिक देशों के बीच समन्वय बढ़ाने के लिए और हिंद-प्रशांत क्षेत्र को खुली, समावेशी और नियम आधारित अंतरराष्ट्रीय व्यवस्था बनाए

रखने की प्रतिबद्धता को दिखाने के लिए है। ऑस्ट्रेलियाई नौसेना का प्रतिनिधित्व फ्रिगेट बल्लार्ट और हेलीकॉप्टर करेंगे। भारतीय नौसेना ने बताया, 'दो विमान वाहक पोतों के साथ अन्य पोत, पनडुब्बी और विमान अभ्यास में शामिल होंगे और चार दिनों तक गहन समुद्री अभियान को अंजाम देंगे।'

नौसेना ने बताया कि युद्धाभ्यास में 'क्रॉस डेक फ्लाइंग ऑपरेशन' और विक्रमादित्य पर तैनात मिग-29 के और निमित्त पर तैनात एफ-18 लड़ाकू विमान और ई2सी हॉकआई के जरिए हवाई रक्षा का अभ्यास किया जायेगा। इसके अलावा पनडुब्बी युद्ध का भी अभ्यास किया जायेगा। भारत की आईएनएस विक्रमादित्य के अलावा हवाई इकाई के हेलीकॉप्टर, डेस्ट्रॉयर कोलकाता और चेन्नई, स्टील्थ फ्रिगेट तलवार और सहायक पोत दीपक भी इस युद्धाभ्यास में भारत की ओर से शामिल होंगे।

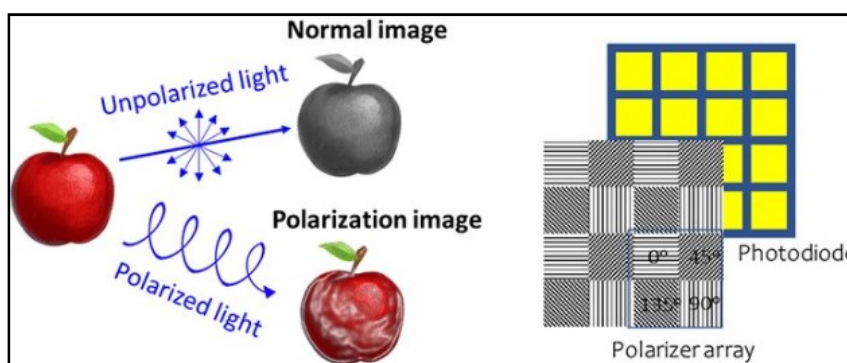
भारतीय दल का नेतृत्व रियर एडमिरल और पश्चिमी बेड़े के फ्लैग ऑफिसर कृष्ण स्वामीनाथन करेंगे। मालाबार युद्धाभ्यास के दूसरे चरण में देश में ही निर्मित पनडुब्बी खंडेरी और पी8आई समुद्री टोही विमान भी भारतीय नौसेना की ओर से अपनी क्षमता का परिचय देंगे। इस युद्धाभ्यास से चीन के तेवर चढ़े हुए हैं।

<https://www.prabhatkhabar.com/national/india-china-faceoff-indian-navy-show-strength-in-arabian-sea-from-today-the-military-exercise-with-friend-countries-start-from-today-aml>

## Highly sensitive detection of circularly polarized light without a filter

Under JST Strategic Basic Research Programs, PRESTO researcher Ayumi Ishii, (Toin University of Yokohama, specially appointed lecturer) has developed a photodiode using a crystalline film composed of lead perovskite compounds with organic chiral molecules to detect circularly polarized light without a filter.

A technology to detect 'polarization,' or oscillation direction of light can visualize object surfaces with damages, foreign objects, and distortions. Furthermore, detection of circularly polarized light, or rotating electric field of light makes it possible for us to identify stress intensity and distribution of objects. Conventional photodiodes for camera or



Visualized images obtained by detection of polarized light and conventional polarization image sensor. Credit: Japan Science and Technology Agency

sensor applications cannot detect polarization of light directly, and therefore, various types of filters must be attached on top of the device to separate the information of polarization spatially. These structures cause substantial losses of sensitivity and resolution in the light detection, especially detection of circularly polarized light is heretofore considered difficult. Thus, it has been much desired to develop a new sensor for detection of circularly polarized light without any filters.

In the present study, Dr. Ishii prepared an organic-inorganic hybrid chiral crystalline film consisting of lead perovskite compounds and organic molecules with chirality, which cannot be superposed on its mirror image like right and left hands. This study exhibited that the hybrid film forms a helical one-dimensional (1D) chain structure and the spiral direction allows for selective absorption of left or right-handed circularly polarized light. The photodiode based on this 1D chiral crystalline film successfully detected rotational direction of circularly polarized light without a filter. The ratio of sensitivities between left- and right-handed circularly polarized light detections achieved the world's highest value of 25 or higher for a filterless circular polarization detector.

Direct detection of circularly polarized light without a filter as shown in the present result allows for higher sensitivity and miniaturization of photodetectors. It is anticipated to become a new sensor technology that would achieve acquisition of a previously unidentified information and recognition of stress.

**More information:** A. Ishii et al, Direct detection of circular polarized light in helical 1D perovskite-based photodiode, *Science Advances* (2020). DOI: [10.1126/sciadv.abd3274](https://doi.org/10.1126/sciadv.abd3274)

**Journal information:** [Science Advances](https://phys.org/news/2020-11-highly-sensitive-circularly-polarized-filter.html)  
<https://phys.org/news/2020-11-highly-sensitive-circularly-polarized-filter.html>

## Researchers develop world's first all-silicon optical transmitter at 100Gbps

Silicon photonics researchers from the Optoelectronics Research Centre (ORC) have demonstrated the first all-silicon optical transmitter at 100Gbps and beyond without the use of digital signal processing.

The optical modulator almost doubles the maximum data rate of current state-of-the-art devices, demonstrating the potential for low power low-cost all-silicon solutions that avoid complicating fabrication processes with new materials that are not CMOS compatible.

The research team, led by Professor Graham Reed within the Zepler Institute for Photonics and Nanoelectronics, have published their findings in the Optical Society's prestigious journal *Optica*.

The optical modulator is a critical component in systems serving modern information and communication technologies, not only in traditional data communication links but also in microwave photonics or chip-scale computing networks.

Dr. Ke Li, lead author and lead inventor on the technology's associated patents, says: "In contrast to previous work in the field, we have introduced a new design philosophy where photonics and electronics must be considered as a single integrated system in order to tackle the demanding technical challenges of this field."

The new research was advanced within Southampton's Silicon Photonics Group as part of the £6 million Engineering and Physical Sciences Research Council (EPSRC) Programme Grant Silicon Photonics for Future Systems.

Professor Reed, Deputy Director of the ORC, says: "Our results are based upon a fully integrated electronic-photonic system, not a laboratory probed stand-alone silicon modulator. In all other work to date that does not rely on digital signal processing to recover signal integrity, integration of the electronics and photonics has resulted in an inferior system performance as compared to the performance of the individual components, resulting in a maximum data rate of approximately 56Gbps.

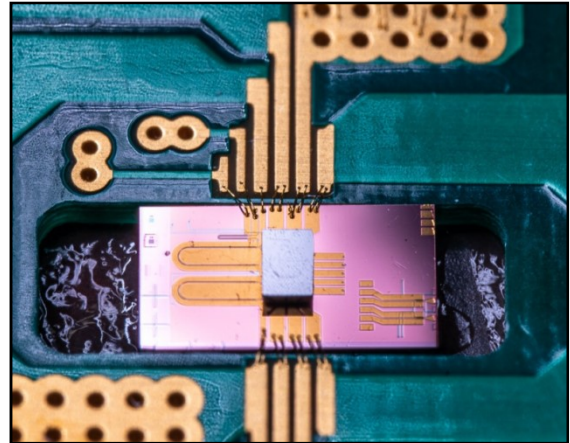
"At a time when most researchers around the world are striving for a system level improvement of the order of five to 10 percent, our results represent close to a 100 percent improvement, so we are delighted that our design philosophy is proving successful. This is why we believe these results are important, as they can change the way designers configure datacom transmission systems of the future."

The silicon modulator was fabricated through Southampton's CORNERSTONE research fabrication foundry service, and integrated with bespoke modulator drivers that are designed in-house and fabricated at the TSMC electronics foundry in Taiwan. Fabrication and integration work is carried out at the University of Southampton's Mountbatten cleanroom complex.

**More information:** Ke Li et al. Electronic-photonic convergence for silicon photonics transmitters beyond 100 Gbps on-off keying, *Optica* (2020). [DOI: 10.1364/OPTICA.411122](https://doi.org/10.1364/OPTICA.411122)

**Journal information:** [Optica](#)

<https://phys.org/news/2020-11-world-all-silicon-optical-transmitter-100gbps.html>



Credit: University of Southampton

## Team reveals simple method to produce high-performing lithium selenium batteries

Rechargeable lithium-ion batteries (LIBs) are considered the best hope for next-generation battery technology, thanks to their long-life cycle, high specific power and energy density. However, they have not met the ever-increasing demands of emerging technologies such as electric vehicles. Li-Se battery technology is increasingly considered a real alternative to LIBs because of its high theoretical volume capacity and much higher conductivity.

In the first study of its kind, published by the *Nature Communications* journal, engineers from Surrey's Advanced Technology Institute (ATI), in collaboration with the team at University Technology of Sydney detail how they used a single-atom catalyst to create highly effective cathodes for Li-Se batteries. They demonstrate that their batteries have a superior rate capability and outstanding long-term cycling performance.

The Surrey team used to delicately control zeolitic imidazolate framework (ZIF) particles that were placed on the surface of polystyrene spheres. The core-shell of the ZIF was then converted into a hollow structured carbon material.

Through further fine-tuning, the team from the ATI successfully produced atomic cobalt electrocatalyst, nitrogen-doped hollow porous carbon, nitrogen-doped hollow porous carbon and cobalt nanoparticles. By embedding selenium in hollow structured carbon particles, carbon/selenium composites were produced.

The atomic cobalt electrocatalysts were used as cathode materials for Li-Se batteries and clearly showed superior electrochemical performance including a superior rate capability ( $311 \text{ mA h g}^{-1}$  at 50 C) and excellent cycling stability ( $267 \text{ mA h g}^{-1}$  after 5000 cycles with a 0.0067% capacity decay per cycle at a current density of 50 C) with the Coulombic efficiency of  $\sim 100\%$ .

Dr. Jian Liu, one of the lead authors and associate professor of energy materials at the ATI, said:

"We truly believe that our atomic cobalt-doped synthesized material can pave the way for lithium selenium batteries to be the go-to battery technology for future generations. While our results are incredibly encouraging, there is still some way to go to make our dream of high-capacity, sustainable battery technology a reality."

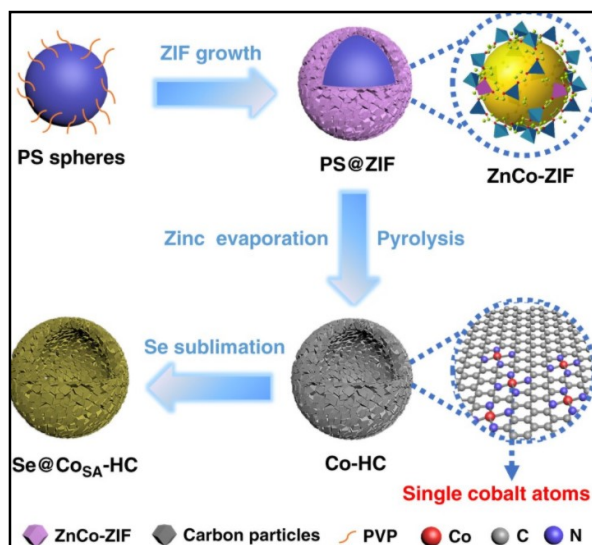
Professor Ravi Silva, director of the ATI at the University of Surrey, said:

"We are incredibly proud of the highly creative and excellent work that Dr. Liu's team has produced—a piece of research that may be a defining moment for sustainable battery technology development."

**More information:** Hao Tian et al. High-power lithium–selenium batteries enabled by atomic cobalt electrocatalyst in hollow carbon cathode, *Nature Communications* (2020). DOI: [10.1038/s41467-020-18820-y](https://doi.org/10.1038/s41467-020-18820-y)

**Journal information:** [Nature Communications](https://www.nature.com)

<https://phys.org/news/2020-11-team-reveals-simple-method-high-performing.html>

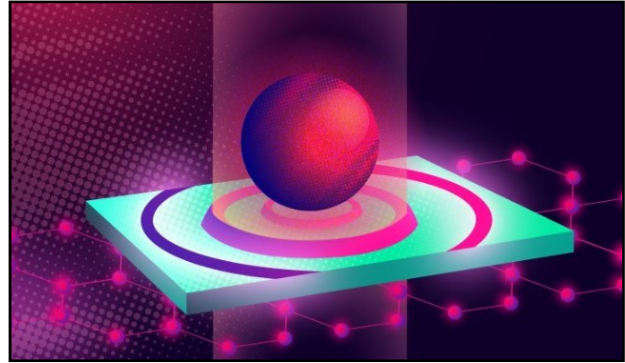


SAC preparation process. Credit: *Nature Communications* (2020). DOI: [10.1038/s41467-020-18820-y](https://doi.org/10.1038/s41467-020-18820-y)

## No losses: Scientists stuff graphene with light

Physicists from MIPT and Vladimir State University, Russia, have converted light energy into surface waves on graphene with nearly 90% efficiency. They relied on a laser-like energy conversion scheme and collective resonances. The paper was published in *Laser & Photonics Reviews*.

Manipulating light at the nanoscale is a task crucial for being able to create ultracompact devices for optical energy conversion and storage. To localize light on such a small scale, researchers convert optical radiation into so-called surface plasmon-polaritons. These SPPs are oscillations propagating along the interface between two materials with drastically different refractive indices—specifically, a metal and a dielectric or air. Depending on the materials chosen, the degree of surface wave localization varies. It is the strongest for light localized on a material only one atomic layer thick, because such 2-D materials have high refractive indices.



Credit: Daria Sokol/MIPT

The existing schemes for converting light to SPPs on 2-D surfaces have an efficiency of no more than 10%. It is possible to improve that figure by using intermediary signal converters—nano-objects of various chemical compositions and geometries.

The intermediary converters used in the recent study in *Laser & Photonics Reviews* are semiconductor quantum dots with a size of 5 to 100 nanometers and a composition similar to that of the solid semiconductor they are manufactured from. That said, the optical properties of a quantum dot vary considerably with its size. So by changing its dimensions, researchers can tune it to the optical wavelength of interest. If an assembly of variously sized quantum dots is illuminated with natural light, each dot will respond to a particular wavelength.

Quantum dots come in various shapes—cylinders, pyramids, spheres, etc.—and different chemical compositions. In its study, the team of Russian researchers used ellipsoid-shaped quantum dots 40 nanometers in diameter. The dots served as scatterers positioned above the surface of graphene, which was illuminated with infrared light at a wavelength of 1.55 micrometers. A dielectric buffer several nanometers thick separated the graphene sheet from the quantum dots.

The idea to use a quantum dot as a scatterer is not new. Some of the previous graphene studies used a similar arrangement, with the dots positioned above the 2-D sheet and interacting both with light and with surface electromagnetic waves at a common wavelength shared by the two processes. This was made possible by choosing a quantum dot size that was exactly right. While such a system is fairly easy to tune to a resonance, it is susceptible to luminescence quenching—the conversion of incident light energy into heat—as well as reverse light scattering. As a result, the efficiency of SPP generation did not exceed 10%.

"We investigated a scheme where a quantum dot positioned above graphene interacts both with incident light and with the surface electromagnetic wave, but the frequencies of these two interactions are different. The dot interacts with light at a wavelength of 1.55 micrometers and with the surface plasmon-polariton at 3.5 micrometers. This is enabled by a hybrid interaction scheme," says study co-author Alexei Prokhorov, a senior researcher at the MIPT Center for Photonics and 2-D Materials, and an associate professor at Vladimir State University.

The essence of the hybrid interaction scheme is that rather than using just two energy levels—the upper and lower ones—the setup also includes an intermediate level. That is, the team used an energetic structure akin to that of the laser. The intermediate energy level serves to enable the strong connection between the quantum dot and the surface electromagnetic wave. The quantum dot undergoes excitation at the wavelength of the laser illuminating it, whereas surface waves are generated at the wavelength determined by the SPP-quantum dot resonance.

"We have worked with a range of materials for manufacturing quantum dots, as well as with various types of graphene," Prokhorov explained. "Apart from pure graphene, there is also what's called doped graphene, which incorporates elements from the neighboring groups in the periodic table. Depending on the kind of doping, the chemical potential of graphene varies. We optimized the parameters of the quantum dot—its chemistry, geometry—as well as the type of graphene, so as to maximize the efficiency of light energy conversion into surface plasmon-polaritons. Eventually we settled on doped graphene and indium antimonide as the quantum dot material."

Despite the highly efficient energy input into graphene via the quantum dot intermediary, the intensity of the resulting waves is extremely low. Therefore, large numbers of dots have to be used in a specific arrangement above the graphene layer. The researchers had to find precisely the right geometry, the perfect distance between the dots to ensure signal amplification due to the phasing of the near fields of each dot. In their study, the team reports discovering such a geometry and measuring a signal in graphene that was orders of magnitude more powerful than for randomly arranged quantum dots. For their subsequent calculations, the physicists employed self-developed software modules.

The calculated conversion efficiency of the newly proposed scheme is as high as 90%-95%. Even accounting for all the potential negative factors that might affect this figure of merit, it will remain above 50%—several times higher than any other competing system.

"A large part of such research focuses on creating ultracompact devices that would be capable of converting light energy into surface plasmon-polaritons with a high efficiency and on a very small scale in space, thereby recording light energy into some structure," said the director of the MIPT Center for Photonics and 2-D Materials, Valenty Volkov, who co-authored the study. "Moreover, you can accumulate polaritons, potentially designing an ultrathin battery composed of several atomic layers. It is possible to use the effect in light energy converters similar to solar cells, but with a several times higher efficiency. Another promising application has to do with nano- and bio-object detection."

**More information:** Mikhail Yu. Gubin et al. Hybrid Schemes for Excitation of Collective Resonances with Surface Plasmon Polaritons in Arrays of Quantum Dots in the Proximity of Graphene, *Laser & Photonics Reviews* (2020). DOI: [10.1002/lpor.202000237](https://doi.org/10.1002/lpor.202000237)  
<https://phys.org/news/2020-11-losses-scientists-graphene.html>

### Coronavirus vaccine update: Moderna says Covid-19 shot 94% effective, Bharat Biotech to start phase III trials

*Monday saw good news from the world of novel coronavirus vaccine development with US company Moderna announcing positive interim results from ongoing human trials for its Covid-19 vaccine candidate. And back home, Bharat Biotech said it is starting late-stage trials of the indigenously developed vaccine candidate Covaxin*

*By Dev Goswami*

New Delhi: US biotech company Moderna said Monday that its coronavirus vaccine candidate was shown to provide strong protection against the deadly virus. Moderna said interim results from ongoing human trials show that its novel coronavirus vaccine candidate appears to be 94.5 per cent effective in preventing a Covid-19 infection, the deadly disease that has caused a global pandemic.

Meanwhile, pharma giant Johnson & Johnson has announced that it is launching a two-dose late stage trial of its Covid-19 vaccine candidate. This third stage trial will enroll 30,000 participants worldwide and will run parallel to an ongoing single-dose trial; both the trials will test the efficacy of the coronavirus vaccine candidate.

And back home, the Hyderabad-based Bharat Biotech said it is starting last-stage trials for its Covaxin coronavirus vaccine candidate. The trial will have 26,000 people participating.

All these developments come as scientist across the world race to develop a vaccine that can bring the novel coronavirus pandemic to an end. According to the World Health Organisation, there are nearly 50 vaccine candidates currently under human trials with 11 of them in phase III (typically the last stage of vaccine research) testing around the world.



According to the World Health Organisation, there are nearly 50 novel coronavirus vaccine candidates currently under human trials with 11 of them in phase III testing around the world (AFP photo for representation)

#### MODERNA ANNOUNCEMENT FOLLOWS PFIZER NEWS

Moderna's announcement Monday comes a week after Pfizer, an American pharma giant, delivered similar news saying its coronavirus vaccine candidate (which is being developed in collaboration with German biotech firm BioNTech) was more than 90 per cent effective in preventing Covid-19.

Moderna's and Pfizer's back-to-back positive announcements offer the world much-needed hope. Experts have repeatedly warned that there can be no returning to "normal" until a Covid-19 vaccine is widely available in the market -- a sentiment recently echoed by BioNTech co-founder Ugur Sahin, who said he does not expect normal life to resume until winter next year.

#### RADICAL TECHNOLOGY BEHIND COVID-19 VACCINES

Incidentally, both Moderna's and Pfizer's Covid-19 shots are based on a radical vaccine technology that has never been tested in the real world, apart from in highly controlled human



trials. Both the vaccines 'deliver' instructions to human body cells with the help of molecules known as mRNA.

These instructions ask the body's cells to produce a particular part of the novel coronavirus (not the entire virus cell) that the human immune system uses to teach itself how to recognise and destroy the virus.

### **mRNA COVID-19 VACCINE: CONCERNS FOR INDIA**

While the news about the initial success of the Moderna and Pfizer vaccines have brought cheer to the world, there are concerns about whether India has the logistical ability to store and transport these highly sophisticated vaccines.

These mRNA vaccines need an extremely cold environment for storage and transport, something that experts worry may not be easily possible in India. AIIMS director Dr Randeep Guleria highlighted this in his reaction to Pfizer's announcement last week.

"Pfizer vaccine has to be kept at -70 degrees Celsius, which is a challenge for developing countries like India where we will have difficulties in maintaining a cold chain, especially on rural missions. Overall, it is encouraging news in vaccine research for those in Phase III trials," Dr Randeep Guleria said.

### **JOHNSON & JOHNSON MOVES TO TWO-DOSE TRIAL OF VACCINE CANDIDATE**

On Monday, US pharma giant Johnson & Johnson announced that it was moving ahead with a two-dose phase III human trial for its vaccine candidate JNJ-78436735. The potential Covid-19 vaccine has been developed by J&J's Janssen Pharmaceutical Companies.

The two-dose trial of the Janssen coronavirus vaccine candidate will run parallel to an ongoing trial that aims to check the efficacy of a single dose of the potential shot. Earlier J&J had announced that interim results of the vaccine candidate's phase 1/2a human trials had shown positive results.

Janssen's JNJ-78436735 is based on traditional vaccine technology that sees actual particles of the novel coronavirus being treated in laboratories in order to 'kill' or inactivate them. These inactivated -- and so potentially safe -- particles are then injected into the human body in the hope that the immune system learns how to recognise and fight an actual novel coronavirus infection.

### **BHARAT BIOTECH BEGINS PHASE III TRIALS OF COVAXIN**

Back home, Hyderabad-based Bharat Biotech announced Monday that it was beginning phase III trials for Covaxin, an inactivated novel coronavirus vaccine candidate. The phase III trials will involve 26,000 volunteers across 25 centres in India and will be conducted in partnership with ICMR, the company said in a statement.

The vaccine has previously been tested on around 1,000 people in phase I/II trials. A phase III trial is typically the last stage of vaccine development; positive results in this phase could set a vaccine on track to receive government approval for public use.

<https://www.indiatoday.in/coronavirus-outbreak/story/coronavirus-vaccine-update-moderna-covid-19-shot-effective-bharat-biotech-phase-iii-trials-1741394-2020-11-16>

## Bharat Biotech's COVID-19 vaccine 'Covaxin' into phase-3 trials

*By Simran Kashyap*

Hyderabad: COVID-19 vaccine - Covaxin - being developed by Bharat Biotech, is now undergoing phase-3 trials, Chairman and Managing Director of the company Krishna Ella said on Monday.

Speaking at a virtual programme organised by the Indian School of Business, Ella said the company is also working on another vaccine for COVID-19 which would be in the form of nasal drops and can be ready by next year. "We partnered with ICMR (Indian Council of Medical Research) for a COVID-19 vaccine as we speak it will be entering the phase-3 trials," he said.



Bharat Biotech is the only vaccine company in the world which has BSL3 production facility (Biosafety-level 3), he said. Last month, the vaccine-maker said it had successfully completed interim analysis of Phase-I and -II trials of the vaccine and is initiating Phase-III trials in 26,000 participants.

Covaxin is being developed by Bharat Biotech, in collaboration with the ICMR - National Institute of Virology (NIV).

The city-based vaccine-maker had, on October 2, sought the Drug Controller General of India's (DCGI) permission to conduct phase-3 randomised double-blind placebo-controlled multicentre trial of its COVID-19 vaccine, sources said.

"We are working on another vaccine through nasal drops. My feeling is by next year it will reach the population," Ella said.

Bharat Biotech in September said it had entered into a licensing agreement with Washington University School of Medicine in St Louis for a novel 'chimpanzee adenovirus' (chimpanzee adenovirus), a single-dose intranasal vaccine for COVID-19.

Meanwhile a press release from Bharat Biotech said the Phase-III trials of Covaxin would involve 26,000 volunteers across 25 centres in India and it is being conducted in partnership with ICMR. It is the largest clinical trial conducted for a COVID-19 vaccine in India.

This is India's first phase-3 efficacy study for a COVID-19 vaccine, and the largest phase-III efficacy trial ever conducted in the country. Participating volunteers, who undergo vaccination in the phase-II trials, would be monitored over the next year to detect occurrence of COVID-19. The trial volunteers would receive two intramuscular injections approximately 28 days apart, it said.

<https://www.oneindia.com/india/bharat-biotech-s-covid-19-vaccine-covaxin-into-phase-3-trials-3177402.html>

